

TECHNICAL REPORT  
NATICK/TR-15/007



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# **2012 ANTHROPOMETRIC SURVEY OF U.S. ARMY PERSONNEL: METHODS AND SUMMARY STATISTICS**

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| 14. ABSTRACT<br>This report presents results of a comprehensive anthropometric survey of U.S. Army Soldiers (ANSUR II), completed in 2012 by the Natick Soldier Research, Development and Engineering Center. Goals of the survey were to acquire a large body of data from comparably measured males and females to serve the Army's current design and engineering needs, as well as those anticipated well into the future. Ninety-four directly measured dimensions, 39 derived dimensions, and three-dimensional (3-D) head, foot, and full-body scans were obtained on each subject in this study. The sample consisted of 7435 men and 3922 women. This includes Active Duty, National Guard, and Army Reserve Soldiers. Results of the directly measured dimensions are given here in the form of summary statistics, percentile data, and frequency distributions. Also included are well-illustrated descriptions of the measurements and of the landmarks used to define them; an explanation of the manual and 3-D procedures used in the study; demographic data characterizing the sample in terms of its racial/ethnic, gender, age, geographic, and occupational distribution; comparative statistics showing changes in the body sizes of Army personnel since the last large-scale survey in 1988; and, a detailed explanation of how observer error was calculated for this study to ensure optimum reliability. The sampling strategy (rationale and execution) is detailed in an appendix. Other appendices include information on the comparability of the measurement techniques used in this survey with those used in other large-scale military surveys, visual indices to help readers locate dimensions with unfamiliar names, and a cross-reference table to help readers accustomed to locating dimensions by number. |                  |                            |                               |                                                                     |                                                           |  |
| 15. SUBJECT TERMS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                            |                               |                                                                     |                                                           |  |
| SURVEYS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | HUMAN BODY       | ARMY PERSONNEL             | THREE DIMENSIONAL             | ACCURACY                                                            |                                                           |  |
| SCANNING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ARMY RESERVE     | ANTHROPOMETRY              | COMPUTER PROGRAMS             | SAMPLING                                                            |                                                           |  |
| BODY SIZE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | METHODOLOGY      | STANDARDIZATION            | BODY MEASUREMENTS             | CLOTHING                                                            |                                                           |  |
| BODY SCANS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | DEMOGRAPHY       | SIZES(DIMENSIONS)          | MEASURING INSTRUMENTS         | STATISTICS                                                          |                                                           |  |
| COMPARISON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MEASUREMENT      | WHOLE BODY SCAN            | ARMY NATIONAL GUARD           | USER MANUALS                                                        |                                                           |  |
| HUMAN FACTORS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ENGINEERING      | FREQUENCY DISTRIBUTIONS    | INFORMATION RETRIEVAL         |                                                                     |                                                           |  |
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## TABLE OF CONTENTS

|                                                                     | <u>Page</u> |
|---------------------------------------------------------------------|-------------|
| LIST OF FIGURES.....                                                | v           |
| LIST OF TABLES.....                                                 | vi          |
| EXECUTIVE SUMMARY.....                                              | viii        |
| CHAPTER I INTRODUCTION .....                                        | 1           |
| 1.1 Selection of Survey Dimensions .....                            | 2           |
| 1.2 Overview of the Sample.....                                     | 3           |
| 1.3 How to Use this Report.....                                     | 4           |
| CHAPTER II THE SURVEY .....                                         | 6           |
| 2.1 Participant Processing and Measurer Training .....              | 6           |
| 2.2 Data Management Procedures .....                                | 9           |
| 2.3 Data Editing Routines .....                                     | 10          |
| 2.4 Anthropometric and Landmarking Instruments .....                | 10          |
| 2.5 Three-Dimensional Scanners .....                                | 17          |
| 2.6 The Landmarks.....                                              | 18          |
| CHAPTER III THE SAMPLE .....                                        | 31          |
| CHAPTER IV THE BODY MEASUREMENTS .....                              | 44          |
| CHAPTER V THE DERIVED DIMENSIONS .....                              | 231         |
| CHAPTER VI THREE-DIMENSIONAL SCANNING .....                         | 315         |
| 6.1 Participant Preparation .....                                   | 315         |
| 6.1.1 Whole-Body Scanning .....                                     | 320         |
| 6.1.2 Head Scanning.....                                            | 320         |
| 6.1.3 Foot Scanning .....                                           | 321         |
| 6.2 The Utility of 3-D Scanning .....                               | 322         |
| 6.3 Traditional Anthropometry and 3-D Scanning .....                | 323         |
| 6.4 Posture .....                                                   | 324         |
| CHAPTER VII OBSERVER ERROR.....                                     | 326         |
| 7.1 Observer Error in the Anthropometric Literature .....           | 327         |
| 7.2 Observer Error Test.....                                        | 328         |
| 7.3 Results.....                                                    | 330         |
| 7.4 Daily Observer Error .....                                      | 338         |
| 7.5 Estimated Observer Error for Derived Dimensions .....           | 344         |
| 7.6 Technical Error of Measurement and Reliability Coefficient..... | 348         |

## TABLE OF CONTENTS Continued

|                                                                                              | <u>Page</u> |
|----------------------------------------------------------------------------------------------|-------------|
| REFERENCES .....                                                                             | 354         |
| INDEX .....                                                                                  | 359         |
| APPENDICES                                                                                   |             |
| A Applications for Measured and Derived Dimensions .....                                     | 371         |
| B Sampling Strategy for the ANSUR II Database.....                                           | 377         |
| C Visual Index of Body Measurements .....                                                    | 389         |
| D Visual Index of Derived Dimensions .....                                                   | 405         |
| E Statistical Measures.....                                                                  | 417         |
| F Dimension-Number Cross-Reference Table .....                                               | 421         |
| G Comparability of ANSUR II Dimensions with<br>Dimensions of Other Large-Scale Surveys ..... | 429         |
| H Demographic/Biographical Form .....                                                        | 437         |
| I Glossary of Anatomical and Anthropometric Terms.....                                       | 441         |

## LIST OF FIGURES

| <u>Figure</u> |                                                                            | <u>Page</u> |
|---------------|----------------------------------------------------------------------------|-------------|
| 1             | Participant Flow .....                                                     | 7           |
| 2             | Anthropometer: Assembled and in Parts .....                                | 11          |
| 3             | Beam Caliper .....                                                         | 11          |
| 4             | Spreading Caliper .....                                                    | 11          |
| 5             | Sliding Caliper .....                                                      | 11          |
| 6             | Holtain Caliper .....                                                      | 11          |
| 7             | Poech Sliding Caliper .....                                                | 12          |
| 8             | Steel Tape .....                                                           | 12          |
| 9             | Scale .....                                                                | 12          |
| 10            | Pupillometer .....                                                         | 13          |
| 11            | Modified Brannock Device® .....                                            | 13          |
| 12            | Modified Height Gauge .....                                                | 14          |
| 13            | Wall Chart .....                                                           | 14          |
| 14            | Modified Steel Tape .....                                                  | 15          |
| 15            | Modified Beam Caliper with Dowel .....                                     | 15          |
| 16            | Landmark Transfer Rod .....                                                | 16          |
| 17            | Scye Marking Aid .....                                                     | 16          |
| 18            | WBX Scanner .....                                                          | 17          |
| 19            | PX Scanner .....                                                           | 17          |
| 20            | Foot Scanner .....                                                         | 18          |
| 21            | Scanning Instruments .....                                                 | 315         |
| 22            | Lateral View of Head Scanning Landmarks .....                              | 316         |
| 23            | Anterior View of Head Scanning Landmarks .....                             | 317         |
| 24            | Lateral View of Body Scanning Landmarks .....                              | 318         |
| 25            | Anterior (Left) and Posterior (Right) Views of Body Scanning Landmarks ... | 319         |
| 26            | Anterior View of Whole-Body Scan .....                                     | 320         |
| 27            | Lateral View of Whole-Body Scan .....                                      | 320         |
| 28            | Anterior View of Head Scan .....                                           | 321         |
| 29            | Lateral View of Head Scan .....                                            | 321         |
| 30            | Lateral View of Foot Scan .....                                            | 322         |
| 31            | Plantar View of Foot Scan .....                                            | 322         |
| 32            | Traditional and ANSUR II Posture .....                                     | 325         |

## LIST OF TABLES

| <u>Table</u>                                                                                                             | <u>Page</u> |
|--------------------------------------------------------------------------------------------------------------------------|-------------|
| 1 Age Distribution of the ANSUR II Participants .....                                                                    | 3           |
| 2 Racial/Ethnic Distribution of the ANSUR II Participants.....                                                           | 3           |
| 3 Percentages of the ANSUR II Participants by Age Group and<br>Racial/Ethnic Category.....                               | 4           |
| 4 ANSUR II Measuring Sites and Total Count at Each Site.....                                                             | 32          |
| 5 ANSUR II Database Sex and Component Disbributions .....                                                                | 34          |
| 6 ANSUR II Database Sex and Age Group Distributions.....                                                                 | 34          |
| 7 ANSUR II Database Sex and DOD Racial/Ethnic Distributions .....                                                        | 34          |
| 8 Population Subgroups in the ANSUR II Databases .....                                                                   | 35          |
| 9 U.S. Birthplaces of ANSUR II Participants.....                                                                         | 36          |
| 10 International Birthplaces of ANSUR II Participants .....                                                              | 37          |
| 11 Ages of ANSUR II Participants .....                                                                                   | 38          |
| 12 Grades and Ranks of ANSUR II Participants .....                                                                       | 39          |
| 13 Age Group and Grade of ANSUR II Participants.....                                                                     | 40          |
| 14 Military Occupations of ANSUR II Participants .....                                                                   | 41          |
| 15 Time Elapsed Since Last Deployment for ANSUR II Participants.....                                                     | 42          |
| 16 Relationship of Age to Deployment Experience among ANSUR II<br>Participants .....                                     | 42          |
| 17 Last Deployment Location for ANSUR II Participants.....                                                               | 43          |
| 18 Future Deployments Scheduled for ANSUR II Participants .....                                                          | 43          |
| 19 Deployments Scheduled for Previously Not-Deployed<br>ANSUR II Participants .....                                      | 43          |
| 20 ANSUR Mean Values Used in Derived Dimensions .....                                                                    | 231         |
| 21 Absolute Differences (ABS) of Dimensions by Measurer: New Dimensions                                                  | 330         |
| 22 Absolute Differences (ABS) of Dimensions by Measurer: Dimensions for Which<br>New Allowable Errors Were Proposed..... | 331         |
| 23 Absolute Differences (ABS) of Dimensions by Measurer: Modified<br>Technique .....                                     | 332         |
| 24 Measurements Tested for Technique/Instrument Modification: Mean over Four<br>Measurers.....                           | 333         |
| 25 Landmark Transfer/No Landmark Transfer Decision Summary.....                                                          | 334         |
| 26 New Technique/Instrument Decision Summary.....                                                                        | 335         |
| 27 Allowable Errors: Tested Dimensions .....                                                                             | 337         |
| 28 Observer Error for Standing Heights .....                                                                             | 339         |
| 29 Observer Error for Sitting Heights.....                                                                               | 339         |
| 30 Observer Error for Lengths .....                                                                                      | 340         |
| 31 Observer Error for Breadths .....                                                                                     | 341         |
| 32 Observer Error for Depths and Weight .....                                                                            | 341         |

## LIST OF TABLES Continued

| <u>Table</u> |                                                      | <u>Page</u> |
|--------------|------------------------------------------------------|-------------|
| 33           | Observer Error for Large Circumferences .....        | 341         |
| 34           | Observer Error for Small Circumferences.....         | 342         |
| 35           | Observer Error for Head Dimensions .....             | 342         |
| 36           | Observer Error for Hand Dimensions .....             | 343         |
| 37           | Observer Error for Foot Dimensions.....              | 343         |
| 38           | Observer Error for Reach Dimensions.....             | 343         |
| 39           | Estimated Observer Error for Derived Dimensions..... | 347         |
| 40           | TEM and R for Standing Heights .....                 | 349         |
| 41           | TEM and R for Sitting Heights .....                  | 349         |
| 42           | TEM and R for Lengths .....                          | 350         |
| 43           | TEM and R for Breadths .....                         | 350         |
| 44           | TEM and R for Depths and Weight.....                 | 351         |
| 45           | TEM and R for Large Circumferences .....             | 351         |
| 46           | TEM and R for Small Circumferences .....             | 351         |
| 47           | TEM and R for Head Dimensions .....                  | 352         |
| 48           | TEM and R for Hand Dimensions .....                  | 352         |
| 49           | TEM and R for Foot Dimensions .....                  | 352         |
| 50           | TEM and R for Reach Dimensions .....                 | 353         |

## EXECUTIVE SUMMARY

A comprehensive anthropometric survey of the U.S. Army was completed by the Natick Soldier Research, Development and Engineering Center (NSRDEC) in 2012. The goals of the survey were to acquire a large body of data from comparably measured males and females to serve the Army's current design and engineering needs, as well as those anticipated well into the future. Ninety-three directly measured dimensions and 41 derived dimensions, as well as three-dimensional head, foot, and whole-body scans, were obtained in this study. The sample here, which represents the Total Army, was composed of 4,082 men and 1,986 women, measured between October 4, 2010 and April 5, 2012. Results of the traditionally measured and derived dimensions were compiled in the form of summary statistics, percentile data, and frequency distributions. Demographic data characterizing the sample were collected in terms of the racial/ethnic, gender, age, geographic, and occupational distribution of the participants, and a detailed explanation of how observer error was calculated for the study to ensure optimum reliability..

The impetus for this survey was the concern that Army body size and shape had changed since the last anthropometric survey in 1987-1988 (ANSUR). A pilot study conducted in 2006 confirmed that significant changes had taken place. Army body size for a number of dimensions had increased, on average, and the variability had increased as well. Further, ANSUR included only Active Duty personnel, whereas today's forces are integrated as part of the Total Army concept. To the extent that the current anthropometry is different from ANSUR, equipment and workspaces may no longer be optimal.

# **2010-2012 ANTHROPOMETRIC SURVEY OF U.S. ARMY PERSONNEL: METHODS AND SUMMARY STATISTICS**

## **CHAPTER I**

### **INTRODUCTION**

This report contains results of an anthropometric survey of U.S. Army Soldiers completed between October 2010 and April 2012 by the Natick Soldier Research, Development and Engineering Center (NSRDEC).

All U.S. military services and many foreign militaries compile and maintain extensive collections of body-size information used primarily to guide design and sizing of clothing, personal protective equipment, work stations, and computer-generated digital human models. To be effective, such a database must be updated periodically to accurately reflect the body sizes and proportions of the military population it represents.

The last anthropometric survey of U.S. Army (ANSUR) men and women was conducted in 1988 (Gordon et al., 1988), 26 years, or the equivalent of a military generation, ago. ANSUR only included active duty personnel, but today's Active, Guard, and Reserve forces are integrated as part of the Total Army concept. Since past anthropometric data of Army National Guard and Army Reserves components have been limited, both these contingents needed to be included in this survey.

Women now make up almost 16% of the total U.S. Army population, and with each passing year, more jobs are filled by women. This means that clothing, protective equipment, and workspaces, originally sized and designed to accommodate only males, must be modified and redesigned to accommodate the larger variations represented by an integrated male/female population.

In 2006, amid concerns that the Army's anthropometric database no longer adequately represented Army personnel, a preliminary study was undertaken to determine whether a new anthropometric survey was needed. The results of that study (Bradtmiller et al., 2009; Paquette et al., 2009) indicated that the Army had become larger in overall body size and more variable in body proportion. Dimensions consisting of significant fleshy components (e.g., Weight, Buttock Circumference, and Waist Circumference) had the largest increases in standard deviation substantially affecting product designs, which are developed from extreme low and high values. In addition, the different components of the Army were sufficiently different to necessitate a database not based exclusively on active duty personnel. Therefore, a new survey was needed to correct these deficiencies and to provide new data that were previously unavailable.

In 2009, NSRDEC undertook the task of conducting a comprehensive body-size study of U.S. Army men and women. The goals of this U.S. Army anthropometric survey (ANSUR II) were to acquire a large body of data from comparably measured males and

females to serve the Army's current design and engineering needs, as well as those anticipated well into the future. A specific innovation added to address future needs was the addition of three-dimensional (3-D) scans of the head, the foot, and the whole-body. These scans provide geometric and morphological data on the human body that cannot be gathered using traditional body measurements alone.

ANSUR II was conducted in conjunction with the Marine Corps anthropometric survey (MC-ANSUR). Since MC-ANSUR preceded ANSUR II, the majority of the planning occurred 6 months before either survey. During this time, candidate dimensions were reviewed for relevance, replicability, and comparability to arrive at the final selection, which included 94 directly measured dimensions and 41 derived dimensions. Summary statistics for these traditional measurements, including percentile and frequency tables, are reported in this volume. Whole-body, head, and foot scans were also taken of each measured individual, although they are not included in this report.

## 1.1 SELECTION OF SURVEY DIMENSIONS

The list of dimensions was developed from the 1987-1988 ANSUR, the U.S. military's most comprehensive anthropometric survey. A team of government and contractor scientists evaluated each dimension on the list, assessing its usefulness for Army needs. Dimensions that have not proved useful were dropped. Dimensions that could reliably be estimated from other measured dimensions were also dropped. Dimensions that would have been useful, but were not measured in ANSUR, as well as a few additional dimensions recommended by international standards, were added.

After the dimension list was established, the specific definition for each dimension was reviewed. In general, the ANSUR definitions were used both because they were well defined in 1987 and a consistent definition would allow comparisons between newly collected data and historic data. However, a few definitions were modified. In some cases, the modification simply improved the clarity of the original ANSUR definition. In other cases, the new definitions reflected international standards. Finally, some modifications were necessary due to changes in human physique over the decades. In every case where a definition in this report differs from the ANSUR definition, it is noted in the dimension description.

The final dimension list includes dimensions that can be used in many different applications. Appendix A shows seven categories of uses (e.g., clothing design, workstation design, and human analog design) and identifies which of the 94 measured dimensions and 41 derived dimensions are most useful for meeting those needs.

## 1.2 OVERVIEW OF THE SAMPLE

The Army participants were chosen using rostering and random sampling methods to obtain an appropriate mix of ages, racial/ethnic backgrounds, and sex. Chapter III and Appendix B provide more details of the sampling strategy. Tables 1 through 3 provide an overview of the ANSUR II database by age, race/ethnicity, and gender.

TABLE 1

Age Distribution of the ANSUR II Participants

| Age Group | Males     |         | Females   |         |
|-----------|-----------|---------|-----------|---------|
|           | Frequency | Percent | Frequency | Percent |
| ≤20       | 422       | 10.34   | 258       | 12.99   |
| 21-25     | 1145      | 28.05   | 611       | 30.77   |
| 26-30     | 874       | 21.41   | 429       | 21.60   |
| 31-40     | 1001      | 24.52   | 429       | 21.60   |
| ≥41       | 640       | 15.68   | 259       | 13.04   |
| Total     | 4082      | 100.00  | 1986      | 100.00  |

TABLE 2

Racial/Ethnic Distribution of the ANSUR II Participants

| Race/Ethnicity                   | Males     |         | Females   |         |
|----------------------------------|-----------|---------|-----------|---------|
|                                  | Frequency | Percent | Frequency | Percent |
| White, not of Hispanic descent   | 2647      | 64.85   | 914       | 46.02   |
| Black, not of Hispanic descent   | 502       | 12.30   | 524       | 26.38   |
| Hispanic                         | 346       | 8.48    | 194       | 9.77    |
| Asian                            | 66        | 1.62    | 43        | 2.17    |
| Native American                  | 7         | 0.17    | 11        | 0.55    |
| Native Hawaiian/Pacific Islander | 36        | 0.88    | 25        | 1.26    |
| More than one and Other          | 478       | 11.71   | 275       | 13.85   |
| Total                            | 4082      | 100.00  | 1986      | 100.00  |

TABLE 3

Percentages of the ANSUR II Participants by Age Group and Racial/Ethnic Category

| Age Group | White, not<br>of Hispanic<br>descent | Black, not<br>of Hispanic<br>descent | Hispanic | Asian | Native<br>American | Native<br>Hawaiian/<br>Pacific Islander | More than<br>One and<br>Other |
|-----------|--------------------------------------|--------------------------------------|----------|-------|--------------------|-----------------------------------------|-------------------------------|
| Males     |                                      |                                      |          |       |                    |                                         |                               |
| ≤ 20      | 6.76                                 | 1.15                                 | 0.88     | 0.12  | 0.02               | 0.10                                    | 1.30                          |
| 21-25     | 18.74                                | 2.89                                 | 1.98     | 0.61  | 0.10               | 0.12                                    | 3.60                          |
| 26-30     | 14.11                                | 2.03                                 | 1.89     | 0.44  | 0.02               | 0.20                                    | 2.72                          |
| 31-40     | 15.14                                | 3.63                                 | 2.45     | 0.34  | 0.02               | 0.32                                    | 2.62                          |
| ≥ 41      | 10.09                                | 2.60                                 | 1.27     | 0.10  | 0.00               | 0.12                                    | 1.49                          |
| Females   |                                      |                                      |          |       |                    |                                         |                               |
| ≤ 20      | 6.29                                 | 2.77                                 | 1.41     | 0.20  | 0.10               | 0.25                                    | 1.96                          |
| 21-25     | 15.36                                | 7.30                                 | 3.12     | 0.50  | 0.10               | 0.35                                    | 4.03                          |
| 26-30     | 10.02                                | 5.44                                 | 2.32     | 0.70  | 0.10               | 0.15                                    | 2.87                          |
| 31-40     | 8.96                                 | 6.45                                 | 2.11     | 0.50  | 0.15               | 0.35                                    | 3.07                          |
| ≥ 41      | 5.39                                 | 4.43                                 | 0.86     | 0.25  | 0.10               | 0.10                                    | 1.91                          |

### 1.3 HOW TO USE THIS REPORT

The landmarks used to define the origin and termination of the measurements made in this survey are listed and briefly described in Chapter II. That chapter also summarizes the operational aspects of the survey and includes descriptions, illustrations, and sources of the instruments used. A full explanation of the sampling strategy appears in Chapter III and Appendix B; Chapter III also includes a number of tables that describe the demographic character of the ANSUR II database.

The anthropometric data in this report are given in Chapters IV and V, which include summary statistics and descriptions of the body measurements and the derived measurements, respectively. Each dimension is described and illustrated. Summary statistics are reported separately for males and females. Visual indices designed to help readers identify and locate those dimensions by their anthropometric designations appear in Appendices C (measured) and D (derived). Users should note that the body positions represented in the visual indices are approximate. To confirm exact body positions and measurement procedures for the body measurements, users should consult the specific dimension descriptions in the Measurer's Handbook (Hotzman et al., 2011). Appendix E contains a brief explanation of the summary statistics used to report the measurement data in Chapters IV and V.

Chapter VI discusses 3-D scanning equipment, landmarks, and scan protocols, and Chapter VII details the procedures developed to minimize observer error throughout the duration of the survey.

For users familiar with the original numbers assigned to dimensions in the 1988 ANSUR survey, a cross-reference table is provided in Appendix F linking ANSUR II dimension numbers to those of comparably measured dimensions from ANSUR. This table can also be used as a quick reference to determine which of the ANSUR dimensions were identically defined in the current survey and which dimensions were modified. An assessment of the comparability of measurements obtained in this survey with measurements from other major anthropometric surveys appears in tabular form in Appendix G. A copy of the demographic/biographical form completed by each soldier is located in Appendix H. Finally, a glossary of anatomical and anthropometric terms (Appendix I) and an index are included to further help the reader understand the terminology used in this report and to locate dimensions of interest quickly.

## CHAPTER II

### THE SURVEY

#### 2.1 PARTICIPANT PROCESSING AND MEASURER TRAINING

The survey team visited 12 Army installations during an 18-month period to collect body measurements and 3-D scans. Considerable advance planning took place both at Anthrotech and at NSRDEC. In preparation for assembling a measuring team, project personnel prepared a training manual designed to serve as the primary instructional guide for the survey measurers (Hotzman et al., 2011). This handbook contained detailed written and illustrated instructions for marking and measuring participants, and explained the operation and maintenance of the whole-body, head, and foot scanners.

A streamlined procedure was devised for measuring approximately 50 participants a day. The measurements were divided into four manageable groups, based on principles of time and motion efficiency. Dimensions assigned to a given measuring station were those that could most easily be measured in sequence without excessive repositioning of participants and those that required a minimum of instrument handling. Dimensions were also grouped in such a way that the time required to measure all dimensions at each station was approximately equal. Two landmarking stations were similarly established, as were in- and out-processing stations. Figure 1 illustrates the plan for the flow of participants through the process.

In the meantime, NSRDEC and Army personnel made all the necessary arrangements at the Army installations where measuring teams were to work for periods ranging from 3 weeks to 2 months. The itinerary was as follows:

Fort Hood, Texas – October 4, 2010 - November 4, 2010  
Fort Bliss, Texas – November 16, 2010 - February 25, 2011  
Camp Atterbury, Indiana – March 9, 2011 - March 31, 2011  
Fort Drum, New York – April 7, 2011 - May 4, 2011  
Fort McCoy, Wisconsin – May 17, 2011 - June 9, 2011  
Fort Lee, Virginia – June 20, 2011 - July 18, 2011  
Fort Stewart, Georgia – July 25, 2011 - August 16, 2011  
Fort Rucker, Alabama – August 23, 2011 - September 23, 2011  
Fort Bragg, North Carolina – October 3, 2011 - October 27, 2011  
Fort Gordon, Georgia – November 3, 2011 - December 15, 2011  
Fort Huachuca, Arizona – January 12, 2012 - February 4, 2012  
Camp Shelby, Mississippi – February 15, 2012- April 5, 2012

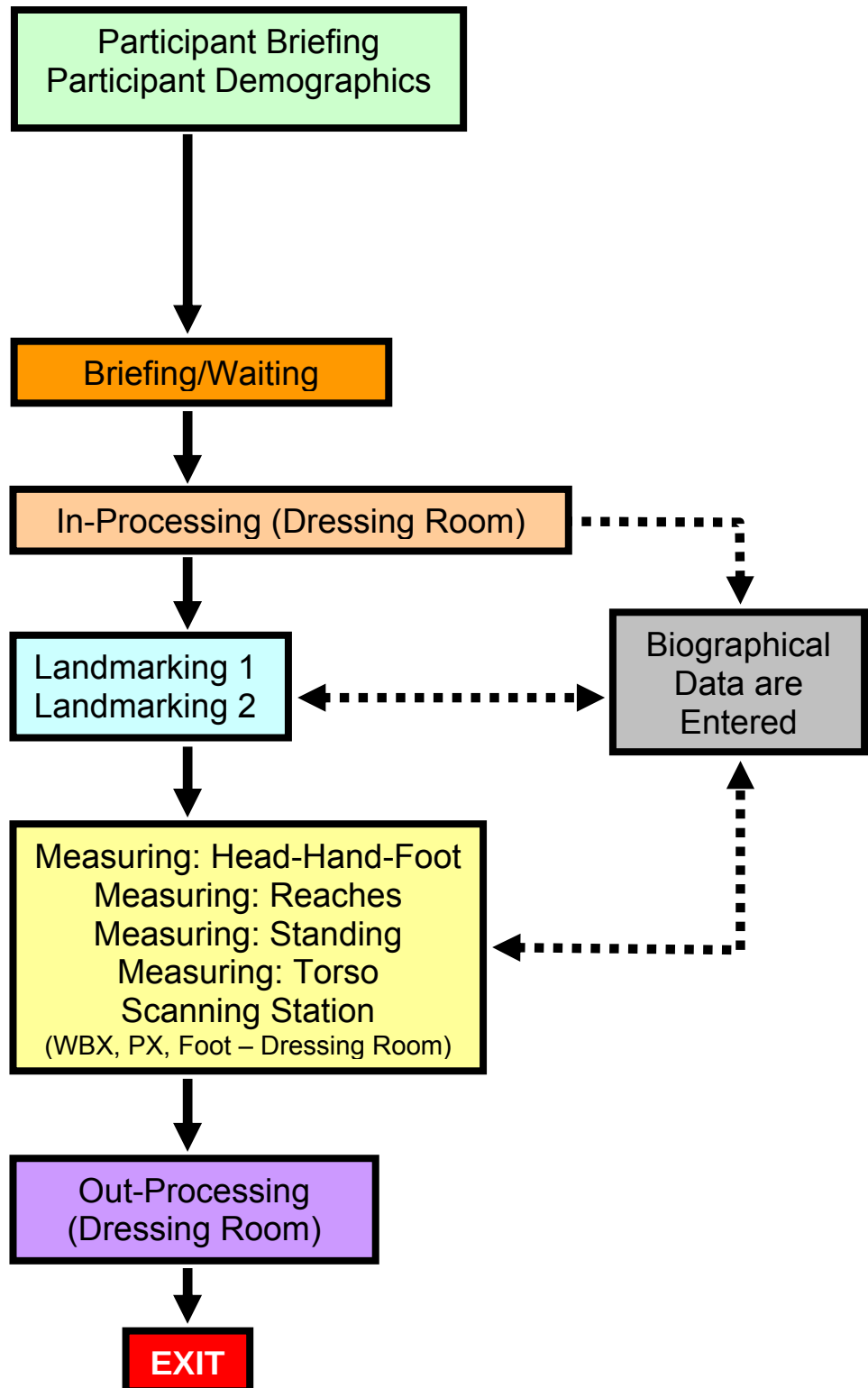


FIGURE 1

Participant Flow

This anthropometric survey was conducted immediately following the Marine Corps anthropometric survey (MC-ANSUR). Therefore, the measuring team assembled for MC-ANSUR was used for the ANSUR II data collection effort. In April 2010, the initial MC-ANSUR measuring team of 21 people began an intensive 4-week training period prior to their deployment in the field. Early in the training period, team members were assigned to one of the stations—landmarking, measuring, scanning, and demography—at which they would work. Thus, each team member, under the instruction of professional anthropometrists, concentrated for about 3 weeks on learning to locate and draw the landmarks or measure the dimensions for which he or she would be subsequently responsible. During and following MC-ANSUR, some personnel were replaced. The new personnel were trained for 1 week specifically for the station where they would work.

Two people were assigned to each measuring station: one to serve as a measurer and one as a recorder; pairs of team members alternated these functions throughout each day. Two women were permanently assigned to two of the measuring stations, Reaches and Standing, and two men were permanently assigned to the Head, Hand and Foot measuring station. Depending on whether participants were men or women, a male team alternated with a female team at the remaining station, Torso, where most dimensions between the waist and knees were measured. These same teams alternated assignments to the out-processing station. Male and female marking personnel at the landmarking stations also changed from day to day, depending on whether the participants were men or women. They alternated as in-processors when members of the opposite sex were being marked.

When participants arrived at the measuring site, they were briefed on the general purposes of the survey by a Government representative and filled out machine-readable forms giving demographic and biographical information about them (see Appendix H). After the participants completed the biographical forms, an Anthrotech employee briefed the Soldiers on the specific landmarking, measurement, and scanning procedures to be conducted. Following the briefing, all Soldiers were given nylon tricot track shorts (see photos in Chapter IV) in which they were measured. Men were measured bare-chested. Women were measured in their own bras, unless they requested a jog bra—a cotton spandex sports bra with racer back design. Both were issued tank tops to wear while moving around between measuring stations and at stations where upper body exposure was not required. When participants reached the whole-body scanning station, they changed again into mid-thigh-length nylon spandex compression shorts (see Figure 26 in Section 6.1). Women who had been wearing their own bras changed into the cotton spandex sports bras.

While the Soldiers were changing into the track shorts prior to beginning the measuring process, the demographic forms were run through a form reader, and the scanned data were transferred to the demographic station. As the Soldiers moved through each of the measuring stations, one stop was the demographic station where an Anthrotech employee verified the entered information. Typically this occurred while the participant was waiting for an available measuring or scanning station. After

demographic data verification, the forms were shredded to protect the participants' privacy.

## 2.2 DATA MANAGEMENT PROCEDURES

One feature that distinguishes this survey from its predecessors is the use of networked laptops for data entry in the field. Networked computers were used for three reasons:

- Entering the data onto electronic media allowed the data to be ready for analysis quickly and eliminated transferring handwritten data as a source of error. The network made it possible for the data from each station to be assembled and sent daily to Anthrotech, from which they were forwarded to a NSRDEC server.

- The computers were equipped with proprietary software that reviewed data values as they were entered (see Section 2.3). If a questionable value was identified by the software, the measurers could check it while the participant was still present. Thus, the data coming in from the field contained fewer errors of measurement or entry and fewer questionable values about which the data editors had to make decisions.

- A final field data check was carried out at the out-processing station, where input dimensions from all stations were available for use in calculating regression estimates.

Barcodes representing participant numbers were pre-printed on each demographic form. This eliminated the possibility of duplicate participant numbers. As each Soldier completed his or her demographic form, that barcode was scanned at the in-processing station, entering that participant into the data management system with an associated participant number but no personally identifiable information. At that time, the in-processing station printed out measurement forms for each of the four measuring stations. These forms—unique to each Soldier—were also imprinted with each participant's bar-coded participant number.

Laptop computers were used at each measuring station. When a Soldier arrived at a measuring station, the barcode was scanned into that laptop so that the participant's data could be associated with his or her data from each of the other stations. As each participant was measured, the recorder entered the data into the station's computer. The recorder also manually recorded the measurements on the data forms as a back-up. At the scanning station, the operators also scanned the barcode on the demographic form. The participant number was then incorporated into the image file name generated by each of the scanners. After the participant was measured and scanned, a team member at the out-processing station checked to verify that the participant had been processed at each of the previous stations. The barcode was scanned a final time to remove the participant from the list of "in-process" participants.

## 2.3 DATA EDITING ROUTINES

The editing routines in the software were based on procedures that had been used successfully by the contractor in a number of previous military surveys. The approach is essentially two-phased. A value is first checked against the highest value and the lowest value measured for that variable. If the measured value is higher than the highest value to date, or lower than the lowest value to date, a notification is given that instructs the measurer to take the measurement again. The software does not allow the measurer to continue until the measurement has been re-taken or an explanation is given as to why that value is correct (e.g., short torso, very long legs). This approach is very effective in screening out wildly aberrant values resulting from misassembling an instrument, misreading an instrument, transposing digits, or mis-entering a value by 100 or 1000.

After all dimensions at a given station were measured, the second phase of data editing began. The software contained a series of multiple regression equations in which the value for each dimension was predicted from the values of two other dimensions at that station. The measured value for a given participant, for a given dimension, was compared to the predicted value. If the measured and the predicted value differed by more than a preset amount, the measurer was asked to re-measure that dimension, as well as the associated dimensions from the regression. In that way, values which were not aberrant for the population as a whole but were disproportionate for that individual were identified and checked. The original version of the data entry and editing system, including program source code listing, is completely described in Churchill and coworkers (1988).

## 2.4 ANTHROPOMETRIC AND LANDMARKING INSTRUMENTS

The instruments used for measuring the body in this survey were:

|                                  |                       |
|----------------------------------|-----------------------|
| Anthropometer                    | Poech sliding caliper |
| Beam caliper                     | Pupillometer          |
| Foot scanner                     | Scale (weighing)      |
| Head scanner                     | Sliding caliper       |
| Holtain caliper                  | Spreading caliper     |
| Modified beam caliper with dowel | Steel tape            |
| Modified Brannock device         | Wall chart            |
| Modified height gauge            | Whole-body scanner    |
| Modified steel tape              |                       |

Standard anthropometric instruments are made by GPM, Switzerland and by Holtain LTD, Great Britain. Seritex, Inc., 1 Madison Street, East Rutherford NJ 07073 ([www.seritex.com](http://www.seritex.com)) is the U.S. distributor for both companies. The steel tape measure is a Lufkin Executive Diameter metric tape measure (W606PM) manufactured by Cooper Hand Tools and available from online retailers at [www.grainger.com](http://www.grainger.com). These instruments are illustrated below in Figures 2 through 8.

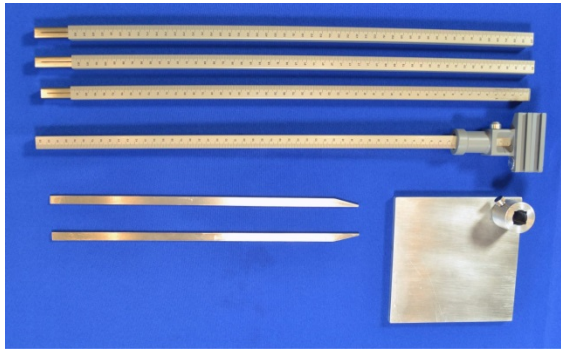


FIGURE 2

Anthropometer: Assembled and in Parts

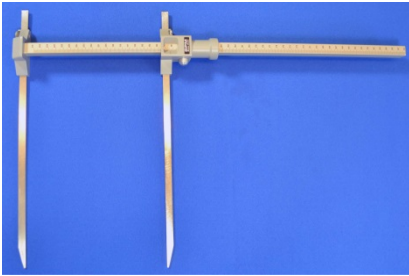


FIGURE 3

Beam Caliper

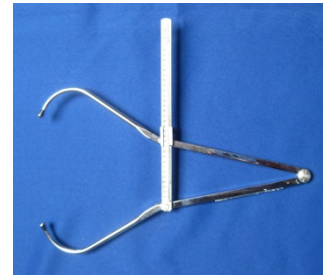


FIGURE 4

Spreading Caliper



FIGURE 5

Sliding Caliper



FIGURE 6

Holtain Caliper

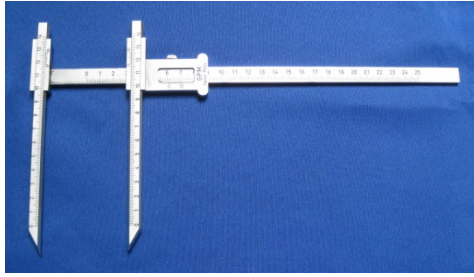


FIGURE 7

Poech Sliding Caliper



FIGURE 8

Steel Tape

The anthropometer is the basic tool of the anthropometrist and is used to measure all linear dimensions. The bottom portion of the anthropometer is detachable for use in measuring heights from a standing surface to the lower parts of the body, or from a sitting surface to the head or upper body parts of a seated participant. The detached upper half forms a beam caliper to measure breadths, depths, and body segment lengths. The smaller sliding, spreading, Holtain, and Poech sliding calipers were used primarily for measuring dimensions of the head, face, and hands. The steel tape was used to measure body circumferences and arcs.

A battery-operated digital scale, manufactured by Seca, was used for measuring body weight (Figure 9). It is widely available through a number of online retailers.



FIGURE 9

Scale

A digital read-out Hoya pupillometer, using the corneal reflection/hairline alignment method, was used to measure interpupillary distance (Figure 10). This pupillometer can be ordered online from [www.GetOptic.com](http://www.GetOptic.com).

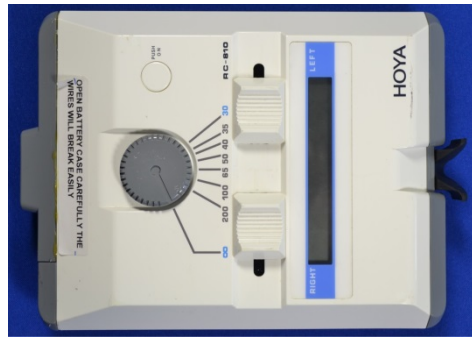


FIGURE 10

### Pupillometer

Measuring instruments that were modified or created for the survey included: foot measuring devices, a modified Vernier height gauge, a wall chart, a modified steel tape, and a beam caliper modified to include a dowel on the fixed blade.

The foot measuring devices were a Men's Brannock Device® size 4-16/ width 3A-3E (used for both men and women) and a Pro Series Brannock Device® size 10-25 (used for large sizes); both were modified with a Kreg Model KMS729 L-R reading metric measuring tape (Figure 11). These materials can be obtained from The Brannock Device Company, Inc., 116 Luther Avenue, Liverpool NY 13088 ([www.brannock.com](http://www.brannock.com)) and Kreg Tool Company, 201 Campus Drive, Huxley IA 50124 ([www.kregtool.com](http://www.kregtool.com)). The Brannock Device® facilitates positioning and measuring of the foot.

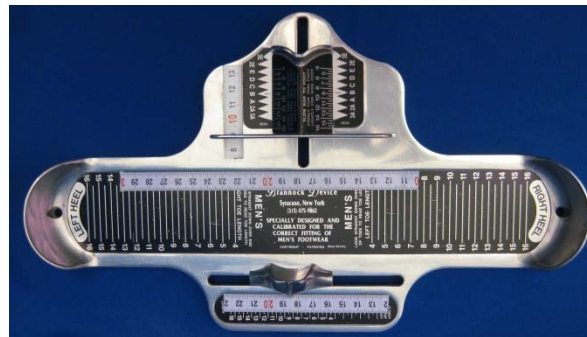


FIGURE 11

### Modified Brannock Device®

A standard metric Vernier height gauge was modified (Figure 12) for use in measuring Lateral Malleolus Height and Acromion-Wall Depth. The metal base was replaced with a wooden base and its carbide tip was blunted. A similar model (Series H04, Id: 161-103k) can be obtained at the Tresna on-line-store ([www.tresnainstrument.com](http://www.tresnainstrument.com)).

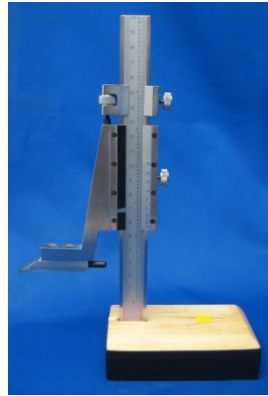


FIGURE 12

#### Modified Height Gauge

A wall chart made of drafting mm graph paper sealed in Mylar<sup>®</sup> sheeting (Figure 13) was used to measure Thumbtip Reach and Span. The graph paper is marked at 5 cm and 10 cm intervals. This graph is 230 cm wide. It is placed 50 cm from an adjacent wall, which serves as the back plane for the measurements.

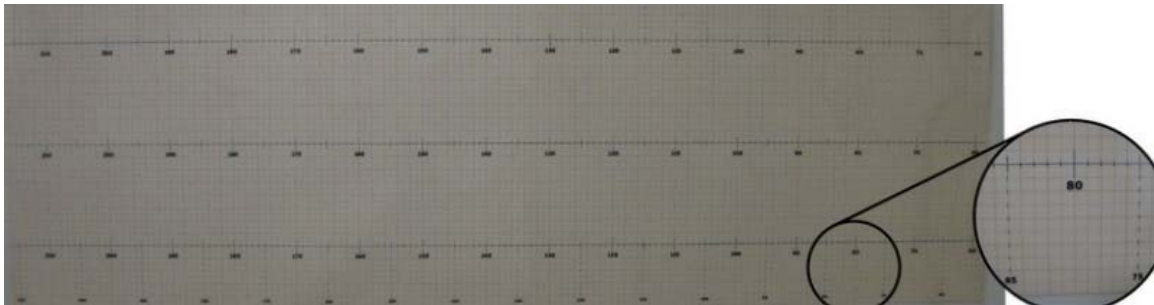


FIGURE 13

#### Wall Chart

The modified steel tape, used for Crotch Length, Posterior (Omphalion), was made by attaching a dowel (5 inches long by  $\frac{1}{4}$  inch in diameter) to the zero end of the standard steel tape as a hand hold (Figure 14). A 2-cm triangular plastic pennant was affixed at the 0 mark of the tape.

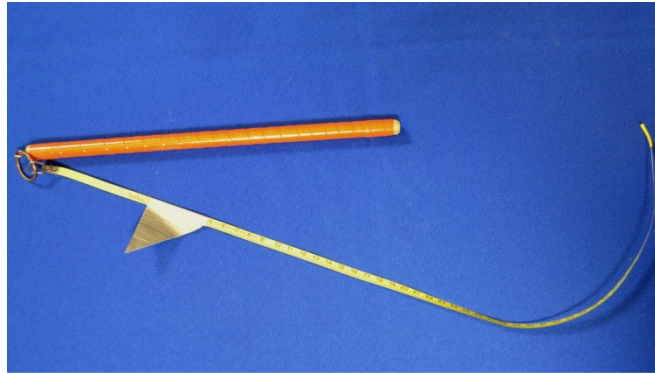


FIGURE 14

#### Modified Steel Tape

A beam caliper was modified with a  $1\frac{1}{4}$  inch diameter wooden dowel and was used for measuring Forearm-Center of Grip Length (Figure 15). The measuring blade was inserted into the dowel so that the calibrated edge was located in the center of the dowel.

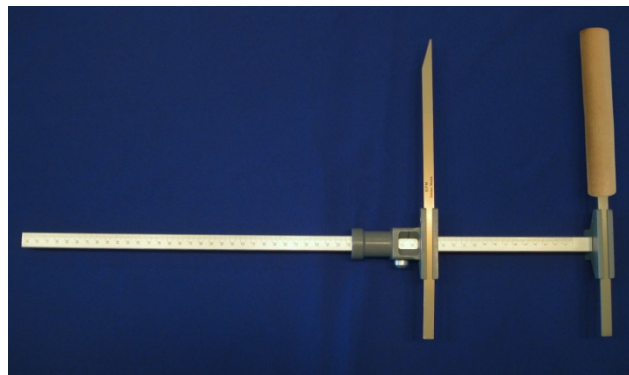


FIGURE 15

#### Modified Beam Caliper with Dowel

A number of marking aids were used in this study, including a landmark transfer rod (Figure 16) and a scye marking aid (Figure 17). The base of the landmark transfer rod has five casters on the bottom to permit the device to be easily rolled around the participant. A slide that can be moved up and down is mounted on the vertical rod. The device is used to transfer landmarks from one side of the body to the same level on the other side. The dimensions of the landmark transfer rod are as follows:

Total height = 184 cm

Pentagonal base measuring 21 cm on each of the five sides

Arm length = 34 cm

Arm end width = 35 cm

Rod diameter = 1.85 cm  
Wheel circumference = 15.8 cm  
Ground to base height (bottom) = 6.2 cm  
Ground to base height (top) = 6.8 cm  
Base thickness = 1.9 cm  
Square base on pentagonal base = 20 cm x 20 cm



FIGURE 16

#### Landmark Transfer Rod

The scye marking aid is a rigid Plexiglas straight edge 480 mm long, 35 mm wide, and 3 mm thick. A line level was epoxied to the lower left margin of the straight edge. This device is used to establish the anterior and posterior scye marks.

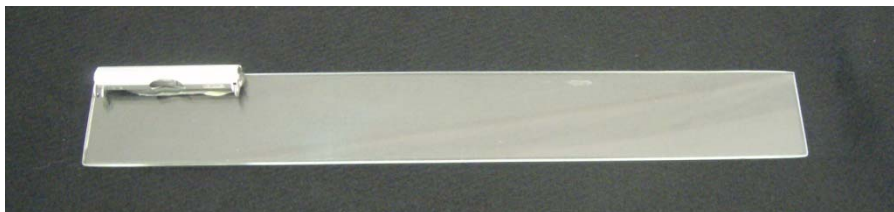


FIGURE 17

#### Scye Marking Aid

## 2.5 THREE-DIMENSIONAL SCANNERS

The whole-body scanner (WBX), head scanner (PX), and foot scanner are low-power laser systems (Figures 18, 19, and 20, respectively) that are completely safe for human use. The WBX and PX were government furnished property obtained from Cyberware, Inc., 2110 Del Monte Avenue, Monterey, California 93940. Before ANSUR II data collection began, Cyberware ceased operations, so these scanners are no longer available for purchase. The INFOOT foot scanner is available from I-Ware Laboratory, MINOH Furures Bldg. 5F, 1-10-9, Senba-Higashi, MINOH-City, Osaka 562-0035 Japan. Each of these scanners records surface images of the body to capture the overall morphology of the participants. Scanning in each of the scanners takes approximately 15-20 s to complete. The software for participant scanning, CyScan for the whole-body and head scanners and INFOOT for the foot scanner, runs on the Windows XP operating system. Each scanner had a separate computer attached that was solely responsible for collecting that scanner's data. CyScan software on the WBX ran in conjunction with the Enhanced Anthropometric Rating System (EARS) Program. EARS, developed by Arizona State University under contract to NSRDEC, was used as an evaluation step to assist the operator in gathering high quality scans. Scan data files from each scanner were transferred over a local network via Ethernet data cable connection to the system server. In addition to the daily uploads of all survey data to the NSRDEC server, the scan data and traditional measurement data were backed up daily onto a DVD. Detailed instructions for operating each of these scanners can be found in the Measurer's Handbook (Hotzman et al., 2011).

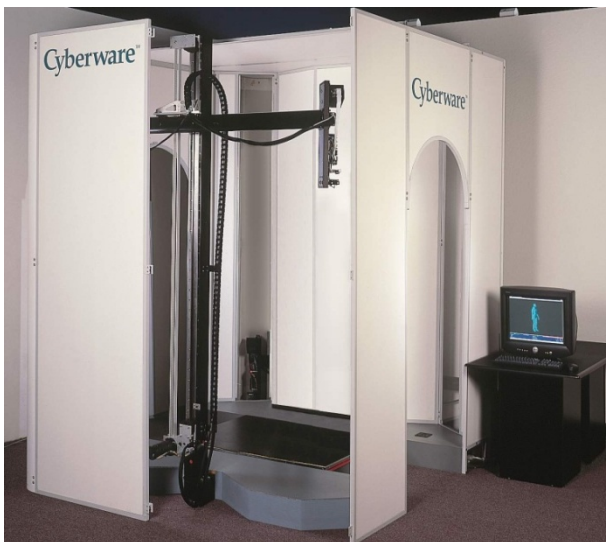


FIGURE 18  
WBX Scanner



FIGURE 19  
PX Scanner



FIGURE 20

Foot Scanner

## 2.6 THE LANDMARKS

Dimensions are measured from one point on the body (or a fixed surface such as the floor) to another or, in the case of circumferences, around a part of the body at a specified level. To ensure that each dimension is measured accurately and consistently from participant to participant, dimensions are defined in terms of body landmarks, which serve as the origin, termination, or level of measurement of a dimension.

Two men and two women were trained in locating the points to be marked by palpation or by sight, and in placing actual drawn marks on the bodies of all participants in this survey. Measurers were also trained to recognize other easily located landmarks such as Dactylion III, the tip of the middle finger, for which marking was not necessary.

The landmarks used to define the measurements in the survey are listed and briefly described on the following pages. Detailed instructions for locating these landmarks can be found in the Measurer's Handbook (Hotzman et al., 2011). The definition of some of these landmarks has changed from the previous survey of U.S. Army personnel (ANSUR) (Gordon et al., 1989) on which the current survey was modeled, although the names remain the same. These changes are summarized below.

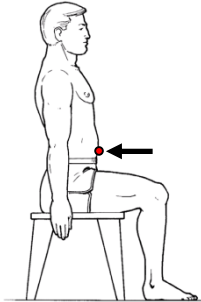
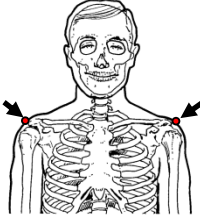
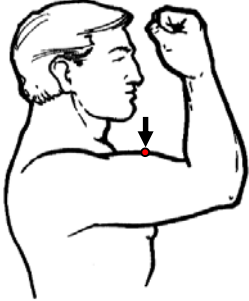
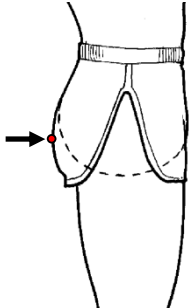
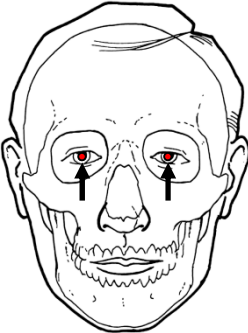
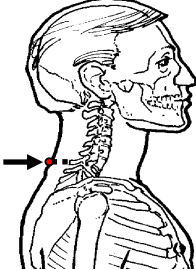
A total of four landmarks from the original ANSUR survey were modified in the ANSUR II survey. The cervicale landmark was located at the "superior palpable point" of the spine of the seventh cervical vertebra in the ANSUR survey. This was changed to "most prominent point" in the current survey in order to bring the definition into compliance with standard anatomical usage (Martin, 1914) and international practice (ISO 7250-1). Typically the distance between the two landmarks is not more than 1 or 2 mm, with the new definition usually producing the lower mark.

A second modification occurred in the use of an ANSUR II landmark called chest point, anterior. In ANSUR this landmark was named bustpoint/thelion, and it referred to

the most anterior point on the bust for females and the center of the nipple (thelion) for males. The male landmark was used for ANSUR Chest Height and Chest Depth, while ANSUR Chest Circumference was measured at the fullest part of the chest. The definition of this landmark remains unchanged in the current survey for female participants, although the name has been changed to chest point, anterior. Now, chest point, anterior is used for both males and females. The change from thelion to chest point, anterior was made to ensure that measurements were made at the largest portion of the chest (regardless of nipple location) for all chest dimensions, which is required for determining clearance as well as for clothing and protective gear. For some males—those with relatively flat chests—there is no practical difference between the two landmarks. For those with heavier chest development, the new landmark will produce a larger Chest Circumference and Chest Depth, and produce a higher Chest Height.

Deltoid point, right and left, is used to establish the level at which Shoulder Circumference is measured. On heavier participants, the previous ANSUR definition at the “lateral point of the deltoid muscle” results in a Shoulder Circumference measurement that is too low to be useful for clothing design. The definition for the deltoid landmarks were thus changed to the midpoint of the right and left deltoid muscles. For most individuals, there will be no change in Shoulder Circumference as a result of the landmark change. For heavier individuals, Shoulder Circumference will be somewhat smaller and higher.

The final modification was a name change for orbitale. This landmark was previously termed “infraorbitale” in ANSUR. The change to orbitale was made to bring the nomenclature into compliance with traditional anatomical usage (Martin, 1914) and standard international practice (ISO 7250-1).

| LANDMARKS                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Abdominal point, anterior:</b> The most protruding point of the relaxed abdomen on a sitting participant.</p>                     | <p><b>Acromion, right and left:</b><br/>         The point of intersection of the lateral border of the acromial process and a line running down the middle of the shoulder from the neck to the tip of the shoulder.</p>  |
| <p><b>Acropodion:</b><br/>         The tip of the first or second toe of the right foot, whichever is longer.</p>                      | <p><b>Axillary fold, posterior: right and left:</b> The highest points of the right and left axillary folds on the back.</p>                                                                                              |
| <p><b>Biceps point:</b> The highest point of the right flexed biceps brachii muscle as viewed from the participant's right side.</p>  | <p><b>Buttock point, posterior:</b> The point of maximum protrusion of the right buttock of a standing participant.</p>                                                                                                  |
| <p><b>Center of pupil, right and left:</b> The center of the pupil of the eye.</p>                                                    | <p><b>Cervicale*:</b> The most prominent palpable point of the spine of the seventh cervical vertebra.</p>                                                                                                               |

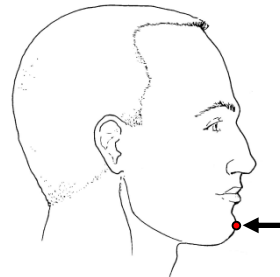
\* Change from ANSUR. See page 18 for details.

## LANDMARKS Continued

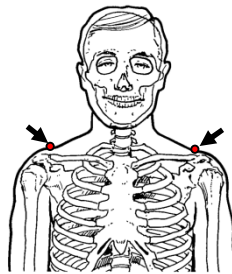
**Chest point, anterior\*:**  
 The most anterior right point on the chest.



**Chin:** The most protruding point on the bottom edge of the chin, along the jaw line.



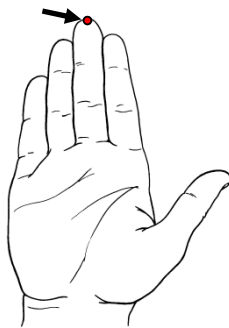
**Clavicle, right and left:** The superior points of the lateral ends of the clavicles (collar bones).



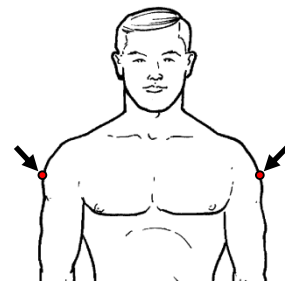
**Crotch:** The point at the level of the lower edge of the pubis bone of the os coxa.



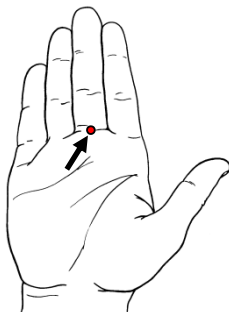
**Dactylion III, right and left:** The tip of the middle finger.



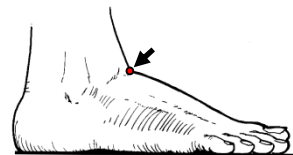
**Deltoid point\*, right and left:** The midpoint of the left and right deltoid muscles.



**Digit III, base:** The center of the crease at the base of the middle finger.



**Dorsal juncture of the foot and leg:** The top of a skin crease between the foot and the front of the ankle when the knees and ankles are flexed about 30°.



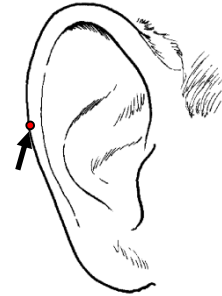
\* Change from ANSUR. See page 18-19 for details.

## LANDMARKS Continued

**Ear, bottom:** The lowest point of the right ear on its long axis.



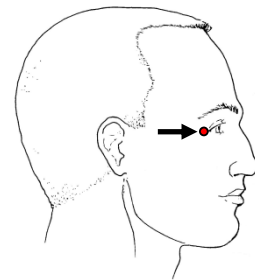
**Ear point:** The lateral point (farthest from the head) of the right ear.



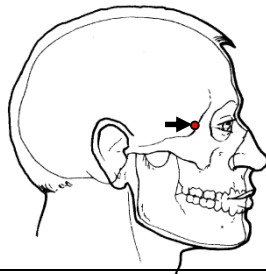
**Ear, top:** The highest point of the right ear on its long axis.



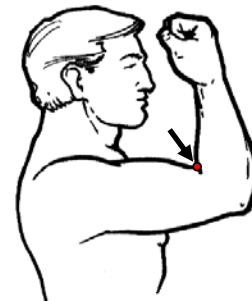
**Ectocanthus:** The outside corner of the right eye formed by the meeting of the upper and lower eyelids.



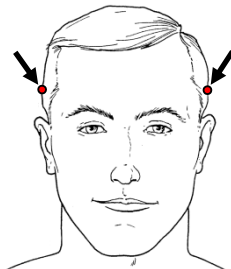
**Ectoorbitale, right and left:** The posterior point on the frontal process of the zygomatic bone at the level of the outer corner of the eye.



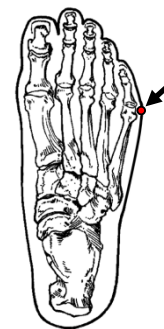
**Elbow Crease:** The skin crease on the inside of the elbow joint when the elbow is flexed 90°.



**Euryon, right and left:** The most lateral point in the region above the plane of attachment of the ear.

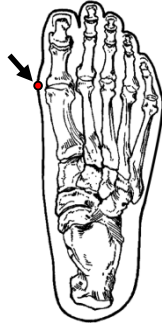


**Fifth metatarsophalangeal protrusion:** The most lateral protrusion of the right foot in the region of the fifth metatarsophalangeal joint.

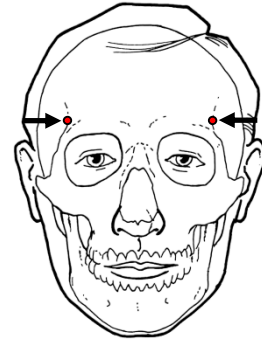


## LANDMARKS Continued

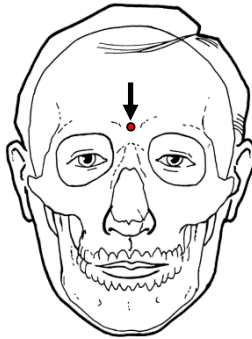
**First metatarsophalangeal protrusion:** The most medial protrusion of the right foot in the region of the first metatarsophalangeal joint.



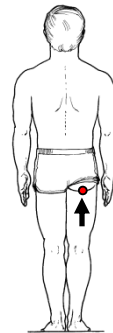
**Frontotemporale, right and left:** The point of deepest indentation of the temporal crest of the frontal bone above the browridges.



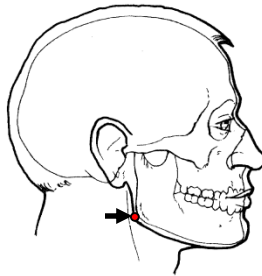
**Glabella:** The most anterior point on the frontal bone midway between the bony browridges.



**Gluteal furrow point:** The lowest point of the lowest furrow or crease at the juncture of the right buttock and the thigh.



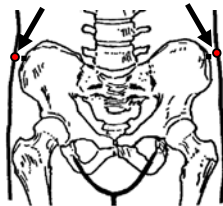
**Gonion, right and left:** The most lateral point on the posterior angle of the mandible (lower jawbone).



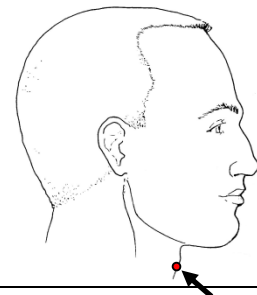
**Heel point, lateral and medial:** The lateral and medial points of the right heel located at or behind the most protruding point of the lateral malleolus (outside ankle bone).

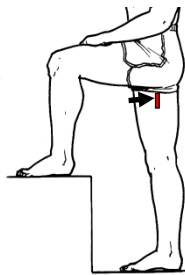
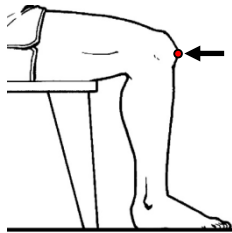
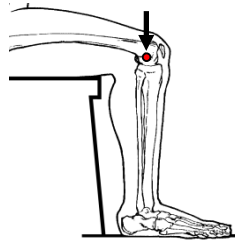
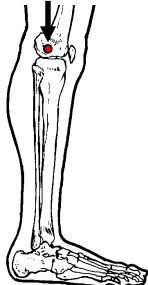
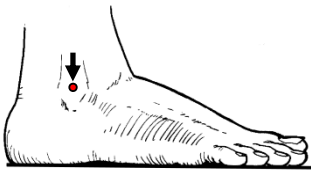
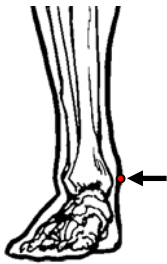
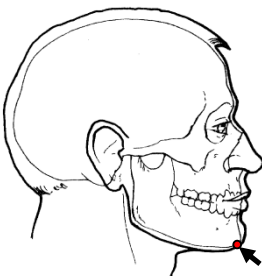
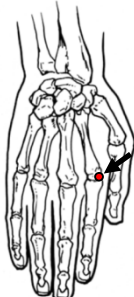


**Iliocristale, right and left:** The highest palpable point of the right and left iliac crests of the pelvis, one-half the distance between the anterior superior iliac and posterior superior iliac spines.



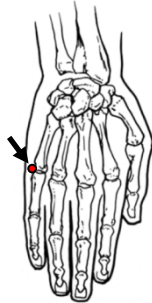
**Infrathyroid:** The inferior point of the thyroid cartilage (Adam's apple) in the midsagittal plane.



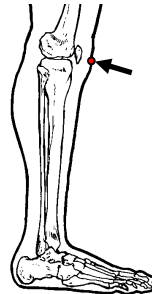
| LANDMARKS Continued                                                                                                                                                                                                                                |                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Inner thigh:</b> A vertical line halfway between the front and back of the right inner thigh, extending downward from the level of the gluteal furrow.</p>  | <p><b>Knee point, anterior:</b> The most protruding point of the right kneecap of a sitting participant.</p>                                          |
| <p><b>Lateral femoral epicondyle, sitting:</b> The lateral point of the right femoral epicondyle (knee pivot point) of a sitting participant.</p>                | <p><b>Lateral femoral epicondyle, standing:</b> The lateral point of the right femoral epicondyle (knee pivot point) of a standing participant.</p>  |
| <p><b>Lateral malleolus:</b> The most lateral point of the right lateral malleolus (the ankle bone on the outside of the foot).</p>                             | <p><b>Medial malleolus:</b> The medial point of the medial malleolus (inside ankle bone).</p>                                                       |
| <p><b>Menton:</b> The inferior point of the mandible in the midsagittal plane (bottom of the chin).</p>                                                         | <p><b>Metacarpale II:</b> The most lateral point of the right metacarpophalangeal joint II (at the base of the index finger).</p>                   |

## LANDMARKS Continued

**Metacarpale V:** The most medial point of the right metacarpophalangeal joint V (at the base of the little finger).



**Midpatella:** The anterior point halfway between the top and bottom of the patella (the kneecap).



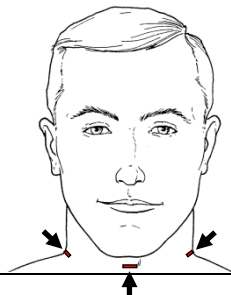
**Midshoulder:** The point on top of the right shoulder midway between the neck (trapezius point, right) and the tip of the shoulder (acromion, right).



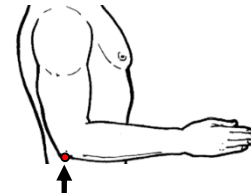
**Midspine:** A line down the center of the back.



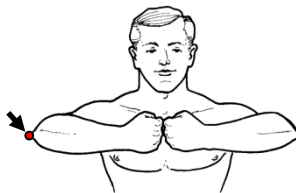
**Neck, anterior, right and left lateral:** The anterior and lateral points at the base of the neck.



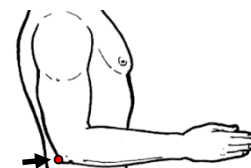
**Olecranon, bottom:** The lowest point of the elbow with the elbow flexed 90°.



**Olecranon, center:** A point on the center of the curvature of the right olecranon process with the elbow flexed about 115°.

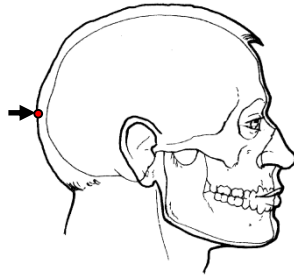


**Olecranon, rear:** The rearmost point of the elbow with the elbow flexed 90°.

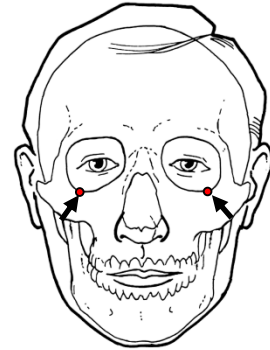


## LANDMARKS Continued

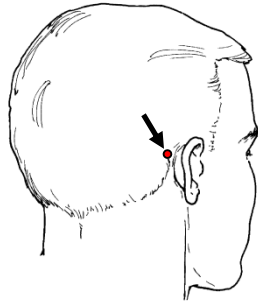
**Opisthocranium:**  
 The posterior point on the back of the head.



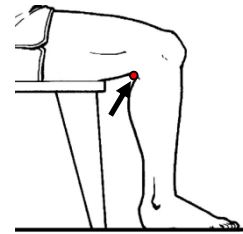
**Orbitale\*, right and left:** The lowest point on the anterior border of the bony eye socket.



**Otobasion, superior:** The anterior superior point of the juncture between the right ear and the head.



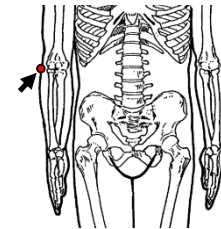
**Popliteal fossa at the dorsal juncture of the calf and thigh:** The bottom surface of the thigh just behind the knee.



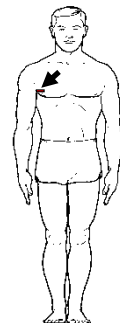
**Pternion:**  
 The posterior point on the heel of the foot.

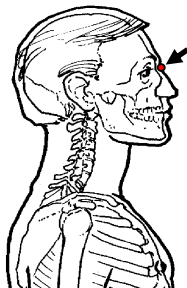
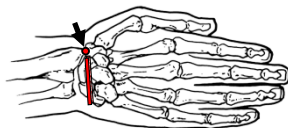
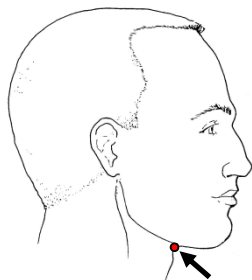
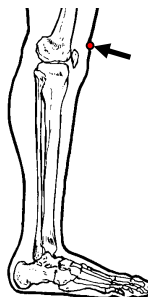
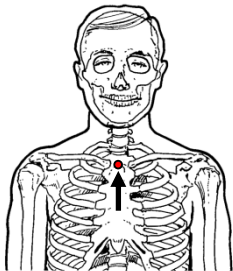
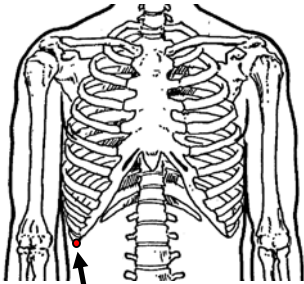
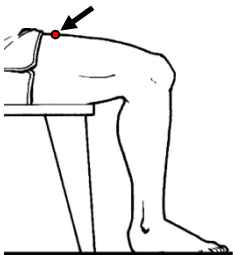
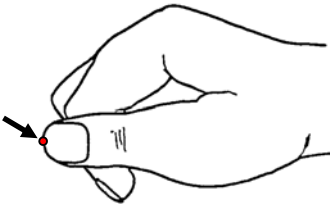


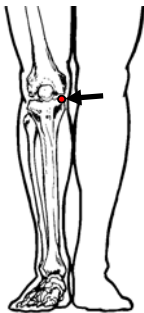
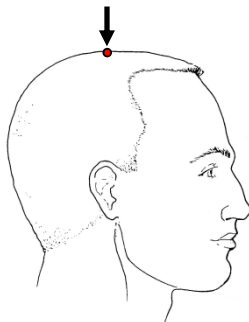
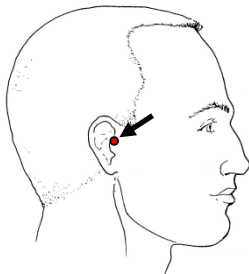
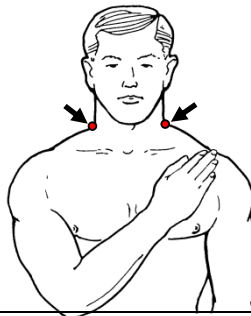
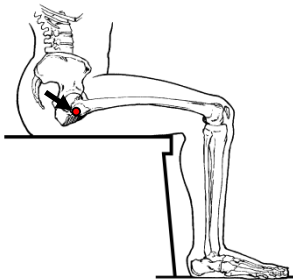
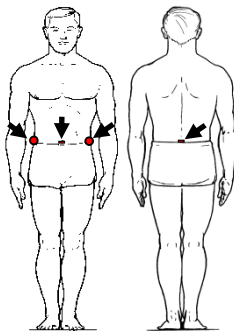
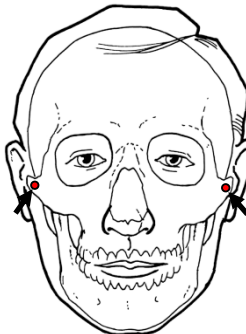
**Radiale:** The superior palpable point on the outside edge of the radius.



\* Change from ANSUR. See page 19 for details.

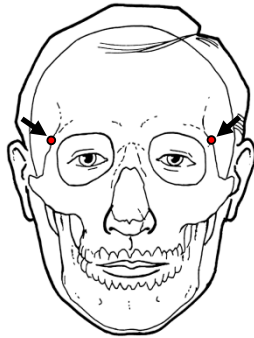
| LANDMARKS Continued                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Scye:</b> Landmarks on the upper arm and torso associated with the armhole of a garment.</p>                                                                                                                                       | <p><b>Anterior scye on the torso:</b> A short horizontal line on the torso originating at the apex of the right anterior axillary fold.</p>                                        |
| <p><b>Midsbye, right and left:</b> A short horizontal line bisecting the posterior diagonal scye landmark.</p>                                         | <p><b>Posterior diagonal scye, right and left:</b> A diagonal line connecting the apex of the posterior axillary fold with the acromion landmark on the tip of the shoulder.</p>  |
| <p><b>Posterior horizontal scye, right and left:</b> A short horizontal line on the back originating at the apex of the posterior axillary fold.</p>  | <p><b>Posterior vertical scye, right and left:</b> A short vertical line on the back originating at the apex of the posterior axillary fold.</p>                                 |

| LANDMARKS Continued                                                                                                                                                                              |                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Sellion:</b> The point of the deepest depression of the nasal bones at the top of the nose.</p>           | <p><b>Stylin, dorsal stylin, and ventral stylin:</b> The inferior point of the bottom of the radius and the extension of this landmark on the dorsal and ventral sides of the wrist.</p>  |
| <p><b>Submandibular:</b> The juncture, in the midsagittal plane, of the lower jaw and the neck.</p>            | <p><b>Suprapatella:</b> The superior point of the patella (kneecap).</p>                                                                                                                 |
| <p><b>Suprasternale:</b> The inferior point of the jugular notch of the sternum (top of the breastbone).</p>  | <p><b>Tenth rib:</b> The inferior point of the right tenth rib (bottom of the rib cage).</p>                                                                                            |
| <p><b>Thigh point, top:</b> The highest point of the top of the right thigh of a sitting participant.</p>     | <p><b>Thumbtip:</b> The tip of the thumb.</p>                                                                                                                                           |

| LANDMARKS Continued                                                                                                                                                                                                                     |                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Tibiale:</b> The superior palpable point on the medial condyle of the right tibia.</p>                                                           |  <p><b>Top of head (vertex):</b> The highest point on the head when the head is in the Frankfurt plane.</p>                                  |
| <p><b>Tragion, right and left:</b> The superior point on the juncture of the cartilaginous flap (tragus) of the ear with the head.</p>                | <p><b>Trapezius, right and left:</b> The point at which the anterior border of the trapezius muscle crosses the neck lateral landmark.</p>  |
| <p><b>Trochanter:</b> A point at the center of the lateral surface of the right greater trochanter of the right femur of a sitting participant.</p>  | <p><b>Trochanterion:</b> The superior point of the greater trochanter of the right femur of a standing participant.</p>                    |
| <p><b>Waist (Omphalion), right, left, anterior, and posterior:</b> The level at the center of the navel.</p>                                         | <p><b>Zygion, right and left:</b> The most lateral point on the zygomatic arch.</p>                                                        |

## LANDMARKS Continued

**Zygofrontale, right and left:** The most lateral point of the frontal bone on its zygomatic process.



## CHAPTER III

### THE SAMPLE

Anthropometric data for design are most useful when the data are representative of the overall population for which the designs will be created. It is relatively easy, after the fact, to determine whether a particular sample is representative of the target population. It is a far greater challenge to collect a representative sample in real time, particularly when a large proportion of the target population is deployed in military operations.

Previous research (Bradt Miller et al., 1985; ISO 15535) has shown that age, racial/ethnic background, and gender are the key drivers of anthropometric variability. Thus a plan to achieve representativeness in any anthropometric database survey sample must take these characteristics into account. The sampling plan for this survey was based on age and racial/ethnic group, with males and females treated separately.

In addition to demographic sampling requirements, it is desirable to have a cross section of occupations in an anthropometric database. Previous Army research using the 1988 ANSUR database has shown that, with the exception of occupations that have explicit anthropometric requirements (such as aviators and military police), anthropometric differences among Army occupational groups are primarily due to differences in their demographic distributions (Greiner et al., 1995). Thus, sampling every MOS (Military Occupational Specialty) in addition to sampling by age/race/sex is unnecessary. That said, it is still desirable to have survey participants representing Combat Arms, Combat Support, and Combat Service Support occupations in approximately the same proportion as the Army as a whole. This was achieved by visiting posts with a cross section of combat divisions and by requesting a cross section of functional units.

Army component (Active, Reserve, Guard) is another consideration that is quite important for a representative Army database. Previous research using data from the ANSUR II pilot study showed relatively small but statistically significant differences among Army components for 9 of 12 body dimensions reported (Gordon et al., 2008). Post hoc tests on body dimensions with significant differences showed that the largest differences were between Active Duty and National Guard, with Reserve means always intermediate in magnitude but significantly different from the other components in only two of nine dimensions. Because Army Reservists are relatively few in number and quite geographically dispersed, only Active Duty and National Guard units were explicitly sampled in this study. However, Army Reserve Soldiers affiliated with units participating in ANSUR II went through the same demographic selection and measuring processes as the Active Duty and National Guard Soldiers.

A sample must not only be representative, it must also be large enough to accurately reflect body size variability in the target population it is intended to represent. A power analysis is typically used to calculate the overall number of participants who

should be measured to achieve reasonable confidence in the resulting statistics. A power analysis was done in this case, and the results showed that, ideally, the target sample should include at least 2500 participants for each sex (male, female) and component (Active, Guard) subgroup. A complete description and discussion of the ANSUR II power analysis appears in Appendix B.

Site selection is a critical part of sampling plan implementation because Soldiers are not randomly distributed across Army posts. Active Duty Soldiers are most numerous at posts housing major Army Divisions. National Guard Soldiers are most numerous at training and deployment centers. Female Soldiers in all components are less numerous in traditional combat units and more concentrated in TRADOC schools of occupations that attract large numbers of females. In this study, an EXORD tasking to support the survey was given to FORSCOM and TRADOC, and site selection, measuring dates, and participation of specific units were determined by FORSCOM and TRADOC tasking offices in collaboration with NSRDEC ANSUR II personnel familiar with the sampling requirements. Table 4 shows the measuring sites for ANSUR II and the counts of Soldiers measured at each site.

TABLE 4

ANSUR II Measuring Sites and Total Count at Each Site

| Site               | Active Duty |           | National Guard |           | Reserve   |           | Total |
|--------------------|-------------|-----------|----------------|-----------|-----------|-----------|-------|
|                    | Males       | Females   | Males          | Females   | Males     | Females   |       |
|                    | Frequency   | Frequency | Frequency      | Frequency | Frequency | Frequency |       |
| Fort Hood, TX      | 792         | 168       | 0              | 0         | 0         | 0         | 960   |
| Fort Bliss, TX     | 1073        | 332       | 224            | 33        | 56        | 53        | 1771  |
| Camp Atterbury, IN | 3           | 0         | 480            | 52        | 44        | 6         | 585   |
| Fort Drum, NY      | 642         | 187       | 0              | 0         | 1         | 0         | 830   |
| Fort McCoy, WI     | 1           | 2         | 479            | 136       | 28        | 3         | 649   |
| Fort Lee, VA       | 0           | 640       | 0              | 158       | 0         | 24        | 822   |
| Fort Stewart, GA   | 478         | 241       | 36             | 40        | 1         | 0         | 796   |
| Fort Rucker, AL    | 728         | 33        | 207            | 7         | 35        | 1         | 1011  |
| Fort Bragg, NC     | 618         | 271       | 0              | 0         | 0         | 0         | 889   |
| Fort Gordon, GA    | 226         | 660       | 244            | 147       | 0         | 56        | 1333  |
| Fort Huachuca, AZ  | 455         | 132       | 97             | 27        | 13        | 10        | 734   |
| Camp Shelby, MS    | 0           | 0         | 1155           | 421       | 4         | 1         | 1581  |
| Total Measured     | 5016        | 2666      | 2922           | 1021      | 182       | 154       | 11961 |

As can be seen in Table 4, ideal sampling objectives ( $n > 2500$ ) for Active Duty and National Guard were exceeded in all but the Female National Guard subgroup. The sample size of 1021 female National Guard personnel will not support the same level of confidence and precision in National Guard female statistics and hypothesis testing for the most variable body dimensions (such as waist circumference), but it is sufficient for most Army design and sizing applications because these are based on Total Army parameter estimates that will also include Active Duty females.

Because demographic (age and racial/ethnic) minorities were oversampled for hypothesis testing and statistical modeling purposes (see Appendix B), the totality of ANSUR II participants was not representative of the Army population – or any user group for that matter. Representative samples for Army acquisition requirements and public release were created using stratified random sampling, with sampling fractions calculated from Defense Manpower Data Center (DMDC) census data (DMDC, 2012) for 30 September 2011, a date midpoint in the ANSUR II data collection period. Representative male and female databases were created independently, with age, racial/ethnic, and component subgroups of each database closely matching the frequency distributions of the Total Army. Army Reserve Soldiers were pooled with Army National Guard Soldiers in this process.

Five candidate databases were created for each sex using stratified random sampling, and their means, standard deviations, minimum values, and maximum values for five important body dimensions (height, weight, sitting height, chest circumference, and waist circumference) were compared to each other and to parameter estimates calculated using all the ANSUR II survey data, but with participants statistically weighted to match DMDC (2012) census distributions. For each sex, the database that was closest to the weighted parameter estimates was chosen as the ANSUR II “working database”. These databases and their statistical summaries, which are reported in this volume, should be the primary reference for Army design and acquisition applications requiring information about anthropometric distributions of Total Army personnel.

Tables 5 through 8 present the demographic distributions of the ANSUR II working databases compared to U.S. Army census data for 30 September 2011 (DMDC, 2012). As expected when stratified random sampling is used to create a representative database, the distributions of component, age, and race in the working databases are very close to those of the Total Army at the time of the survey.

It should be noted that the DMDC data on race/ethnicity at the time of this study did not include information on soldiers whose heritage included more than one racial/ethnic group. This is, however, an increasingly common occurrence in the U.S. Army and in the U.S. population as a whole. For that reason, the ANSUR II databases contain a second racial/ethnic variable that allowed Soldiers to report more than one subgroup. Some 10.2% of males and 11.3% of females in ANSUR II reported more than one racial/ethnic group, compared to 2% for both males and females in ANSUR 1988. See Table 8.

The birthplaces of ANSUR II participants are reported in Table 9 (50 U.S. states) and Table 10 (international locations, including U.S. territories). Overall, 3683 of 4082 (90.2%) of ANSUR II males and 1725 of 1986 (86.9%) of females were born in one of the US states. An additional 399 (9.8%) of ANSUR II males and 261 (13.1%) of females were born outside the United States compared to 6.6% of males and 5.9% of females born outside the United States in ANSUR 1988. The most common ANSUR II U.S. birthplaces were California, New York, and Texas; the most common international birthplaces were Puerto Rico (U.S. territory), Philippines, Mexico, Jamaica, and

Germany. As in ANSUR 1988, it is likely that many German-born Soldiers were born to U.S. military families stationed in Germany.

TABLE 5

ANSUR II Database Sex and Component Distributions

| Component       | Males     |         |           |         | Females   |         |           |         |
|-----------------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
|                 | ANSUR II  |         | Army      |         | ANSUR II  |         | Army      |         |
|                 | Frequency | Percent | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| Active Duty     | 2120      | 51.94   | 485422    | 51.01   | 1020      | 51.36   | 76015     | 43.16   |
| Guard & Reserve | 1962      | 48.06   | 466256    | 48.99   | 966       | 48.64   | 100103    | 56.84   |
| Total           | 4082      | 100.00  | 951678    | 100.00  | 1986      | 100.00  | 176118    | 100.00  |

TABLE 6

ANSUR II Database Sex and Age Group Distributions

| Age Group | Males     |         |           |         | Females   |         |           |         |
|-----------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
|           | ANSUR II  |         | Army      |         | ANSUR II  |         | Army      |         |
|           | Frequency | Percent | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| 17-20     | 422       | 10.34   | 97273     | 10.22   | 258       | 12.99   | 22316     | 12.67   |
| 21-25     | 1145      | 28.05   | 264467    | 27.79   | 611       | 30.77   | 53029     | 30.11   |
| 26-30     | 874       | 21.41   | 203255    | 21.36   | 429       | 21.60   | 37869     | 21.50   |
| 31-40     | 1001      | 24.52   | 236105    | 24.81   | 429       | 21.60   | 38175     | 21.68   |
| ≥41       | 640       | 15.68   | 150578    | 15.82   | 259       | 13.04   | 24729     | 14.04   |
| Total     | 4082      | 100.00  | 951678    | 100.00  | 1986      | 100.00  | 176118    | 100.00  |

TABLE 7

ANSUR II Database Sex and DOD Racial/Ethnic Distributions

| Race/Ethnicity   | Males     |         |           |         | Females   |         |           |         |
|------------------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|
|                  | ANSUR II  |         | Army      |         | ANSUR II  |         | Army      |         |
|                  | Frequency | Percent | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| White            | 2817      | 69.01   | 647506    | 68.04   | 975       | 49.09   | 85650     | 48.63   |
| Black            | 642       | 15.73   | 147393    | 15.49   | 656       | 33.03   | 56505     | 32.08   |
| Hispanic         | 440       | 10.78   | 101156    | 10.63   | 239       | 12.03   | 20551     | 11.67   |
| Asian            | 117       | 2.87    | 27074     | 2.84    | 71        | 3.58    | 6223      | 3.53    |
| Native American  | 29        | 0.71    | 6478      | 0.68    | 20        | 1.01    | 1755      | 1.00    |
| Pacific Islander | 34        | 0.83    | 7500      | 0.79    | 25        | 1.26    | 2229      | 1.27    |
| Other            | 3         | 0.07    | 1356      | 0.14    | 0         | 0.00    | 279       | 0.16    |
| Unknown          | NA        | NA      | 13215     | 1.39    | NA        | NA      | 2926      | 1.66    |
| Total            | 4082      | 100.00  | 951678    | 100.00  | 1986      | 100.00  | 176118    | 100.00  |

TABLE 8

Population Subgroups in the ANSUR II Databases

| Population Subgroup                   | Males     |         | Females   |         |  |
|---------------------------------------|-----------|---------|-----------|---------|--|
|                                       | Frequency | Percent | Frequency | Percent |  |
| <b>White, Not of Hispanic Descent</b> | 2647      | 64.85   | 914       | 46.00   |  |
| <b>Black, Not of Hispanic Descent</b> | 502       | 12.30   | 524       | 26.37   |  |
| <b>Hispanic</b>                       | 346       | 8.48    | 194       | 9.76    |  |
| Mexican                               | 138       |         | 97        |         |  |
| Puerto Rican                          | 99        |         | 40        |         |  |
| Dominican                             | 17        |         | 9         |         |  |
| Colombian                             | 10        |         | 4         |         |  |
| Other Hispanic Groups                 | 39        |         | 27        |         |  |
| Two or more Hispanic Groups           | 43        |         | 17        |         |  |
| <b>Asian</b>                          | 66        | 1.62    | 43        | 2.16    |  |
| Korean                                | 20        |         | 15        |         |  |
| Chinese                               | 11        |         | 10        |         |  |
| Vietnamese                            | 10        |         | 7         |         |  |
| Other Asian Groups                    | 18        |         | 9         |         |  |
| Two or more Asian Groups              | 7         |         | 2         |         |  |
| <b>Pacific Islander</b>               | 36        | 0.88    | 25        | 1.26    |  |
| Filipino                              | 25        |         | 14        |         |  |
| Samoan                                | 4         |         | 6         |         |  |
| Micronesian                           | 4         |         | 2         |         |  |
| Other Pacific Islander Groups         | 1         |         | 1         |         |  |
| Two or more Pacific Islander Groups   | 2         |         | 2         |         |  |
| <b>Native American/Alaskan Native</b> | 7         | 0.17    | 11        | 0.55    |  |
| Navajo                                | 0         |         | 3         |         |  |
| Sioux                                 | 2         |         | 1         |         |  |
| Other Tribes                          | 4         |         | 2         |         |  |
| Two or more Tribes                    | 1         |         | 4         |         |  |
| Eskimo                                | 0         |         | 1         |         |  |
| <b>Other</b>                          | 64        | 1.57    | 52        | 2.62    |  |
| Caribbean Islander                    | 47        |         | 46        |         |  |
| Asian Indian                          | 6         |         | 3         |         |  |
| Arab or Middle Eastern                | 5         |         | 3         |         |  |
| All Other                             | 6         |         | 0         |         |  |
| <b>Two Population Subgroups</b>       | 382       | 9.36    | 190       | 9.56    |  |
| White & Hispanic                      | 123       |         | 37        |         |  |
| White & Native American               | 88        |         | 38        |         |  |
| White & Asian                         | 34        |         | 12        |         |  |
| White & Black                         | 31        |         | 29        |         |  |
| Black & Hispanic                      | 19        |         | 15        |         |  |
| White & Pacific Islander              | 18        |         | 15        |         |  |
| Other Two Group Combinations          | 69        |         | 44        | 0.00    |  |
| <b>More than Two Subgroups</b>        | 32        | 0.78    | 33        | 1.71    |  |
| <b>Total</b>                          | 4082      | 100.00  | 1986      | 100.00  |  |

TABLE 9

U.S. Birthplaces of ANSUR II Participants

| Birthplace           | Males     |          | Females   |          |
|----------------------|-----------|----------|-----------|----------|
|                      | Frequency | Percent* | Frequency | Percent* |
| Alabama              | 92        | 2.25     | 72        | 3.63     |
| Alaska               | 7         | 0.17     | 1         | 0.05     |
| Arizona              | 56        | 1.37     | 28        | 1.41     |
| Arkansas             | 46        | 1.13     | 8         | 0.40     |
| California           | 292       | 7.15     | 154       | 7.75     |
| Colorado             | 54        | 1.32     | 27        | 1.36     |
| Connecticut          | 28        | 0.69     | 8         | 0.40     |
| Delaware             | 11        | 0.27     | 6         | 0.30     |
| District of Columbia | 11        | 0.27     | 8         | 0.40     |
| Florida              | 135       | 3.31     | 75        | 3.78     |
| Georgia              | 92        | 2.25     | 78        | 3.93     |
| Hawaii               | 16        | 0.39     | 13        | 0.65     |
| Idaho                | 16        | 0.39     | 4         | 0.20     |
| Illinois             | 141       | 3.45     | 75        | 3.78     |
| Indiana              | 215       | 5.27     | 51        | 2.57     |
| Iowa                 | 42        | 1.03     | 13        | 0.65     |
| Kansas               | 48        | 1.18     | 15        | 0.76     |
| Kentucky             | 53        | 1.30     | 16        | 0.81     |
| Louisiana            | 96        | 2.35     | 41        | 2.06     |
| Maine                | 10        | 0.24     | 8         | 0.40     |
| Maryland             | 63        | 1.54     | 17        | 0.86     |
| Massachusetts        | 87        | 2.13     | 25        | 1.26     |
| Michigan             | 128       | 3.14     | 68        | 3.42     |
| Minnesota            | 125       | 3.06     | 75        | 3.78     |
| Mississippi          | 117       | 2.87     | 77        | 3.88     |
| Missouri             | 67        | 1.64     | 17        | 0.86     |
| Montana              | 9         | 0.22     | 3         | 0.15     |
| Nebraska             | 22        | 0.54     | 9         | 0.45     |
| Nevada               | 14        | 0.34     | 10        | 0.50     |
| New Hampshire        | 10        | 0.24     | 4         | 0.20     |
| New Jersey           | 59        | 1.45     | 30        | 1.51     |
| New Mexico           | 13        | 0.32     | 4         | 0.20     |
| New York             | 314       | 7.69     | 106       | 5.34     |
| North Carolina       | 96        | 2.35     | 53        | 2.67     |
| North Dakota         | 11        | 0.27     | 7         | 0.35     |
| Ohio                 | 101       | 2.47     | 41        | 2.06     |
| Oklahoma             | 182       | 4.46     | 39        | 1.96     |
| Oregon               | 32        | 0.78     | 10        | 0.50     |
| Pennsylvania         | 80        | 1.96     | 52        | 2.62     |
| Rhode Island         | 18        | 0.44     | 1         | 0.05     |
| South Carolina       | 103       | 2.52     | 58        | 2.92     |
| South Dakota         | 41        | 1.00     | 15        | 0.76     |
| Tennessee            | 50        | 1.22     | 24        | 1.21     |
| Texas                | 268       | 6.57     | 129       | 6.50     |

\*Percent of total ANSUR II birthplaces - not percent of U.S. birthplaces.

TABLE 9 Continued

U.S. Birthplaces of ANSUR II Participants

| Birthplace       | Males     |         | Females   |         |
|------------------|-----------|---------|-----------|---------|
|                  | Frequency | Percent | Frequency | Percent |
| Utah             | 21        | 0.51    | 7         | 0.35    |
| Vermont          | 9         | 0.22    | 4         | 0.20    |
| Virginia         | 64        | 1.57    | 54        | 2.72    |
| Washington       | 42        | 1.03    | 24        | 1.21    |
| West Virginia    | 15        | 0.37    | 11        | 0.55    |
| Wisconsin        | 57        | 1.40    | 45        | 2.27    |
| Wyoming          | 4         | 0.10    | 3         | 0.15    |
| U.S. unspecified | 0         | 0.00    | 2         | 0.10    |
| Total U.S. Born  | 3683      | 90.23   | 1725      | 86.86   |

TABLE 10

International Birthplaces of ANSUR II Participants

| Most Frequent Locations  | Males     |          | Females   |          |
|--------------------------|-----------|----------|-----------|----------|
|                          | Frequency | Percent* | Frequency | Percent* |
| Canada                   | 8         | 0.20     | 1         | 0.05     |
| Colombia                 | 8         | 0.20     | 5         | 0.25     |
| Dominican Republic       | 11        | 0.27     | 6         | 0.30     |
| Germany                  | 54        | 1.32     | 38        | 1.91     |
| Guam                     | 6         | 0.15     | 4         | 0.20     |
| Haiti                    | 6         | 0.15     | 6         | 0.30     |
| Jamaica                  | 14        | 0.34     | 21        | 1.06     |
| Japan                    | 6         | 0.15     | 5         | 0.25     |
| Mexico                   | 22        | 0.54     | 17        | 0.86     |
| Panama                   | 5         | 0.12     | 5         | 0.25     |
| Philippines              | 28        | 0.69     | 18        | 0.91     |
| Puerto Rico              | 69        | 1.69     | 19        | 0.96     |
| South Korea              | 15        | 0.37     | 16        | 0.81     |
| United Kingdom           | 4         | 0.10     | 7         | 0.35     |
| Vietnam                  | 9         | 0.22     | 4         | 0.20     |
| <b>Other Locations</b>   |           |          |           |          |
| Africa                   | 32        | 0.78     | 12        | 0.60     |
| Asia                     | 23        | 0.56     | 19        | 0.96     |
| Caribbean Islands        | 22        | 0.54     | 17        | 0.86     |
| Central America          | 11        | 0.27     | 3         | 0.15     |
| Europe                   | 20        | 0.49     | 18        | 0.91     |
| Middle East              | 7         | 0.17     | 3         | 0.15     |
| Oceania                  | 7         | 0.17     | 8         | 0.40     |
| South America            | 12        | 0.29     | 9         | 0.45     |
| Total International Born | 399       | 9.77     | 261       | 13.14    |

\* Percent of total ANSUR II birthplaces - not percent of international birthplaces.

The age distribution of ANSUR II participants ranged from 17 to 58 for both males and females. The full distribution is reported in Table 11.

TABLE 11

Ages of ANSUR II Participants

| Age   | Males     |         |                    | Females   |         |                    |
|-------|-----------|---------|--------------------|-----------|---------|--------------------|
|       | Frequency | Percent | Cumulative Percent | Frequency | Percent | Cumulative Percent |
| 17    | 1         | 0.02    | 0.02               | 1         | 0.05    | 0.05               |
| 18    | 49        | 1.20    | 1.22               | 63        | 3.17    | 3.22               |
| 19    | 157       | 3.85    | 5.07               | 89        | 4.48    | 7.70               |
| 20    | 215       | 5.27    | 10.34              | 105       | 5.29    | 12.99              |
| 21    | 254       | 6.22    | 16.56              | 129       | 6.50    | 19.49              |
| 22    | 245       | 6.00    | 22.56              | 127       | 6.39    | 25.88              |
| 23    | 234       | 5.73    | 28.29              | 120       | 6.04    | 31.92              |
| 24    | 203       | 4.97    | 33.27              | 133       | 6.70    | 38.62              |
| 25    | 209       | 5.12    | 38.39              | 102       | 5.14    | 43.76              |
| 26    | 214       | 5.24    | 43.63              | 97        | 4.88    | 48.64              |
| 27    | 168       | 4.12    | 47.75              | 104       | 5.24    | 53.88              |
| 28    | 186       | 4.56    | 52.30              | 92        | 4.63    | 58.51              |
| 29    | 154       | 3.77    | 56.08              | 73        | 3.68    | 62.19              |
| 30    | 152       | 3.72    | 59.80              | 63        | 3.17    | 65.36              |
| 31    | 162       | 3.97    | 63.77              | 71        | 3.58    | 68.93              |
| 32    | 106       | 2.60    | 66.36              | 48        | 2.42    | 71.35              |
| 33    | 105       | 2.57    | 68.94              | 51        | 2.57    | 73.92              |
| 34    | 85        | 2.08    | 71.02              | 31        | 1.56    | 75.48              |
| 35    | 87        | 2.13    | 73.15              | 39        | 1.96    | 77.44              |
| 36    | 80        | 1.96    | 75.11              | 35        | 1.76    | 79.20              |
| 37    | 89        | 2.18    | 77.29              | 38        | 1.91    | 81.12              |
| 38    | 96        | 2.35    | 79.64              | 39        | 1.96    | 83.08              |
| 39    | 97        | 2.38    | 82.02              | 30        | 1.51    | 84.59              |
| 40    | 94        | 2.30    | 84.32              | 47        | 2.37    | 86.96              |
| 41    | 96        | 2.35    | 86.67              | 51        | 2.57    | 89.53              |
| 42    | 93        | 2.28    | 88.95              | 48        | 2.42    | 91.94              |
| 43    | 63        | 1.54    | 90.49              | 22        | 1.11    | 93.05              |
| 44    | 62        | 1.52    | 92.01              | 32        | 1.61    | 94.66              |
| 45    | 47        | 1.15    | 93.17              | 28        | 1.41    | 96.07              |
| 46    | 42        | 1.03    | 94.19              | 16        | 0.81    | 96.88              |
| 47    | 48        | 1.18    | 95.37              | 8         | 0.40    | 97.28              |
| 48    | 39        | 0.96    | 96.33              | 11        | 0.55    | 97.83              |
| 49    | 31        | 0.76    | 97.08              | 8         | 0.40    | 98.24              |
| 50    | 32        | 0.78    | 97.87              | 8         | 0.40    | 98.64              |
| 51    | 25        | 0.61    | 98.48              | 6         | 0.30    | 98.94              |
| 52    | 11        | 0.27    | 98.75              | 6         | 0.30    | 99.24              |
| 53    | 17        | 0.42    | 99.17              | 6         | 0.30    | 99.55              |
| 54    | 9         | 0.22    | 99.39              | 4         | 0.20    | 99.75              |
| 55    | 7         | 0.17    | 99.56              | 2         | 0.10    | 99.85              |
| 56    | 10        | 0.24    | 99.80              | 2         | 0.10    | 99.95              |
| 57    | 4         | 0.10    | 99.90              | 0         | 0.00    | 99.95              |
| 58    | 4         | 0.10    | 100.00             | 1         | 0.05    | 100.00             |
| Total | 4082      | 100.00  | 100.00             | 1986      | 100.00  | 100.00             |

The grades and ranks of ANSUR II participants are presented in Table 12. All ranks except General Officer are represented in the database. As expected in most military samples, grade and rank are closely related to age (Table 13).

TABLE 12

Grades and Ranks of ANSUR II Participants

| Grade | Rank                   | Males     |         | Females   |         |
|-------|------------------------|-----------|---------|-----------|---------|
|       |                        | Frequency | Percent | Frequency | Percent |
| E-1   | Private (E-1)          | 88        | 2.16    | 125       | 6.29    |
| E-2   | Private (E-2)          | 196       | 4.80    | 133       | 6.70    |
| E-3   | Private First Class    | 545       | 13.35   | 272       | 13.70   |
| E-4   | Corporal               | 45        | 1.10    | 11        | 0.55    |
| E-4   | Specialist             | 1328      | 32.53   | 521       | 26.23   |
| E-5   | Sergeant               | 692       | 16.95   | 299       | 15.06   |
| E-6   | Staff Sergeant         | 449       | 11.00   | 191       | 9.62    |
| E-7   | Sergeant First Class   | 178       | 4.36    | 104       | 5.24    |
| E-8   | First Sergeant         | 22        | 0.54    | 4         | 0.20    |
| E-8   | Master Sergeant        | 162       | 3.97    | 38        | 1.91    |
| E-9   | Command Sergeant Major | 5         | 0.12    | 1         | 0.05    |
| E-9   | Sergeant Major         | 43        | 1.05    | 13        | 0.65    |
| O-1   | Second Lieutenant      | 90        | 2.20    | 67        | 3.37    |
| O-2   | First Lieutenant       | 61        | 1.49    | 50        | 2.52    |
| O-3   | Captain                | 87        | 2.13    | 94        | 4.73    |
| O-4   | Major                  | 23        | 0.56    | 20        | 1.01    |
| O-5   | Lieutenant Colonel     | 7         | 0.17    | 9         | 0.45    |
| O-6   | Colonel                | 2         | 0.05    | 2         | 0.10    |
| WO1   | Warrant Officer        | 14        | 0.34    | 11        | 0.55    |
| CW2   | Chief Warrant Officer  | 22        | 0.54    | 11        | 0.55    |
| CW3   | Chief Warrant Officer  | 11        | 0.27    | 6         | 0.30    |
| CW4   | Chief Warrant Officer  | 9         | 0.22    | 3         | 0.15    |
| CW5   | Chief Warrant Officer  | 3         | 0.07    | 1         | 0.05    |
| Total |                        | 4082      | 100.00  | 1986      | 100.00  |

TABLE 13

Age Group and Grade of ANSUR II Participants

| Grade | Age Group |       |       |       |     | Totals |
|-------|-----------|-------|-------|-------|-----|--------|
|       | 17-20     | 21-25 | 26-30 | 31-40 | ≥41 |        |
| E-1   | 120       | 72    | 13    | 6     | 2   | 213    |
| E-2   | 155       | 133   | 31    | 10    | 0   | 329    |
| E-3   | 278       | 340   | 120   | 70    | 9   | 817    |
| E-4   | 126       | 880   | 489   | 313   | 97  | 1905   |
| E-5   | 1         | 193   | 310   | 319   | 168 | 991    |
| E-6   | 0         | 21    | 154   | 298   | 167 | 640    |
| E-7   | 0         | 0     | 19    | 135   | 128 | 282    |
| E-8   | 0         | 0     | 0     | 78    | 148 | 226    |
| E-9   | 0         | 0     | 0     | 8     | 54  | 62     |
| O-1   | 0         | 77    | 48    | 28    | 4   | 157    |
| O-2   | 0         | 34    | 43    | 33    | 1   | 111    |
| O-3   | 0         | 6     | 65    | 73    | 37  | 181    |
| O-4   | 0         | 0     | 0     | 21    | 22  | 43     |
| O-5   | 0         | 0     | 0     | 0     | 16  | 16     |
| O-6   | 0         | 0     | 0     | 0     | 4   | 4      |
| WO1   | 0         | 0     | 10    | 13    | 2   | 25     |
| CW2   | 0         | 0     | 1     | 18    | 14  | 33     |
| CW3   | 0         | 0     | 0     | 5     | 12  | 17     |
| CW4   | 0         | 0     | 0     | 2     | 10  | 12     |
| CW5   | 0         | 0     | 0     | 0     | 4   | 4      |
| Total | 680       | 1756  | 1303  | 1430  | 899 | 6068   |

Table 14 details the military occupations of ANSUR II participants using groupings based on the first two digits of their MOS. The MOS classification systems for officers and enlisted personnel have evolved over time, and some codes were modified during the course of the ANSUR II survey. As a result, some ANSUR II participants reported their MOS using an “old code” that is not currently recognized. Fortunately both current and historical MOS codes are detailed in the Personnel Authorizations Module (PAM XXI, 2012) published by the Army Deputy Chief of Staff for Personnel (G-1). This document enabled conversion of older MOS codes and correct association of comparable enlisted, officer, and warrant officer occupational groups. Note that the nomenclature for comparable enlisted/officer occupational groups may differ slightly for some MOS groups. In those cases both titles are listed in Table 14 using an “officer/enlisted” nomenclature format.

TABLE 14

Military Occupations of ANSUR II Participants

| MOS Group                                                | Males     |         | Females   |         |
|----------------------------------------------------------|-----------|---------|-----------|---------|
|                                                          | Frequency | Percent | Frequency | Percent |
| 92_Quartermaster/Supply and Services                     | 321       | 7.86    | 534       | 26.89   |
| 25_Signal Corps/Communication and Information Systems    | 504       | 12.35   | 305       | 15.36   |
| 11_Infantry                                              | 784       | 19.21   | 0         | 0.00    |
| 91_Ordnance/Mechanical Maintenance                       | 372       | 9.11    | 158       | 7.96    |
| 35_Military Intelligence                                 | 356       | 8.72    | 159       | 8.01    |
| 88_Transportation                                        | 239       | 5.85    | 129       | 6.50    |
| 12_Engineers                                             | 311       | 7.62    | 38        | 1.91    |
| 68_Medical CMF*                                          | 135       | 3.31    | 194       | 9.77    |
| 13_Field Artillery                                       | 275       | 6.74    | 0         | 0.00    |
| 42_Adjutant General (Human Resources)                    | 77        | 1.89    | 144       | 7.25    |
| 31_Military Police                                       | 148       | 3.63    | 68        | 3.42    |
| 19_Armor                                                 | 191       | 4.68    | 0         | 0.00    |
| 74_Chemical, Biological, Radiological and Nuclear (CBRN) | 74        | 1.81    | 58        | 2.92    |
| 94_Electronic Maintenance                                | 64        | 1.57    | 28        | 1.41    |
| 15_Aviation                                              | 63        | 1.54    | 16        | 0.81    |
| 14_Air Defense Artillery                                 | 38        | 0.93    | 20        | 1.01    |
| 89_Ammunition                                            | 24        | 0.59    | 11        | 0.55    |
| 36_Financial Management                                  | 17        | 0.42    | 16        | 0.81    |
| 90_Logistics                                             | 7         | 0.17    | 24        | 1.21    |
| 27_Judge Advocate General/Paralegal                      | 9         | 0.22    | 17        | 0.86    |
| 56_Chaplain/Religious Support                            | 20        | 0.49    | 6         | 0.30    |
| 70_Health Services FA**                                  | 8         | 0.20    | 13        | 0.65    |
| 66_Army Nurse Corps                                      | 0         | 0.00    | 17        | 0.86    |
| All other MOS Groups (22 additional groups)              | 45        | 1.10    | 30        | 1.56    |
| MOS unknown                                              | 0         | 0.00    | 1         | 0.05    |
| Total                                                    | 4082      | 100.00  | 1986      | 100.00  |

\*The Medical CMF is an enlisted-only designation that comprises medical technician specialties.

\*\*The Health Services FA is an officer-only designation that comprises healthcare administrative specialties.

Although a wide variety of occupations is represented in the ANSUR II male and female databases, the most frequent MOS groups for ANSUR II males were 11\_Infantry, 25\_Signal/Communications, 91\_Ordnance/Mechanical Maintenance, and 35\_Military Intelligence. The most frequent MOS groups for ANSUR II females were 92\_Quartermaster/Supply, 25\_Signal, 68\_Medical, and 35\_Military Intelligence.

Because the ANSUR II survey was conducted while the Army had significant military commitments in Iraq and Afghanistan, questions regarding deployment experience were included in the biographical portion of the survey. Table 15

summarizes the most recent deployment experience of ANSUR II participants, Table 16 shows the relationship between deployment experience and age, and Table 17 shows locations for the most recent deployments. Deployment information was missing for 10 male and 10 female participants.

As can be seen in Table 15, 62.9% of male ANSUR II participants, and 44.7% of female participants had been deployed outside the United States sometime in their careers, many within 12 months of their participation in ANSUR II. Lack of deployment experience was most frequent in the two youngest age groups (Table 16). Of those with deployment experience (Table 17), Soldiers had been most frequently deployed to Iraq or Afghanistan (58.3% and 32.1%, respectively, for males and 63.5% and 21.6%, respectively, for females).

TABLE 15

Time Elapsed Since Last Deployment for ANSUR II Participants

| Returned from Deployment | Males     |         | Females   |         |
|--------------------------|-----------|---------|-----------|---------|
|                          | Frequency | Percent | Frequency | Percent |
| Never deployed           | 1509      | 37.06   | 1093      | 55.31   |
| < 1 month ago            | 339       | 8.33    | 56        | 2.83    |
| 1-3 months ago           | 98        | 2.41    | 51        | 2.58    |
| 4-6 months ago           | 217       | 5.33    | 57        | 2.88    |
| 7-12 months ago          | 446       | 10.95   | 154       | 7.79    |
| > 1 year ago             | 1463      | 35.93   | 565       | 28.59   |
| Total                    | 4072      | 100.00  | 1976      | 100.00  |

TABLE 16

Relationship of Age to Deployment Experience among ANSUR II Participants

| Returned from Deployment | Age Group |       |       |       |     | Total |
|--------------------------|-----------|-------|-------|-------|-----|-------|
|                          | 17-20     | 21-25 | 26-30 | 31-40 | ≥41 |       |
| Never deployed           | 607       | 1029  | 428   | 349   | 189 | 2602  |
| < 1 month ago            | 14        | 46    | 38    | 35    | 16  | 149   |
| 1-3 months ago           | 14        | 88    | 69    | 78    | 25  | 274   |
| 4-6 months ago           | 12        | 168   | 157   | 181   | 82  | 600   |
| 7-12 months ago          | 27        | 147   | 94    | 91    | 36  | 395   |
| > 1 year ago             | 5         | 275   | 510   | 690   | 548 | 2028  |
| Total                    | 679       | 1753  | 1296  | 1424  | 896 | 6048  |

TABLE 17

Last Deployment Location for ANSUR II Participants

| Last Deployment Location | Males     |         | Females   |         |
|--------------------------|-----------|---------|-----------|---------|
|                          | Frequency | Percent | Frequency | Percent |
| Iraq                     | 1495      | 58.33   | 561       | 63.53   |
| Afghanistan              | 823       | 32.11   | 191       | 21.63   |
| Other Persian Gulf       | 132       | 5.15    | 80        | 9.06    |
| All Other Deployments    | 113       | 4.41    | 51        | 5.78    |
| Total                    | 2563      | 100.00  | 883       | 100.00  |

Table 18 reports future deployment plans of ANSUR II participants. Some 24.7% of ANSUR II males and 22.4% of ANSUR II females were scheduled for deployment within 6 months of the date they were measured. Another 15.4% of males and 10.0% of females were scheduled to deploy, but more than 6 months after the date they were measured. The majority of ANSUR II participants either were not yet scheduled to deploy or they did not know whether they were scheduled to deploy.

TABLE 18

Future Deployments Scheduled for ANSUR II Participants

| Next Deployment         | Males     |         | Females   |         |
|-------------------------|-----------|---------|-----------|---------|
|                         | Frequency | Percent | Frequency | Percent |
| Less than 6 months      | 1008      | 24.69   | 445       | 22.41   |
| More than 6 months      | 628       | 15.38   | 199       | 10.02   |
| Not currently scheduled | 1224      | 29.99   | 665       | 33.48   |
| Do not know             | 1222      | 29.94   | 677       | 34.09   |
| Total                   | 4082      | 100.00  | 1986      | 100.00  |

Table 19 reports the deployment plans for ANSUR II participants who had not yet been deployed in their Army careers. Of the ANSUR II participants not previously deployed, 51.3% of males and 37.1% of females reported that they were scheduled for future deployment.

TABLE 19

Deployments Scheduled for Previously Not-Deployed ANSUR II Participants

| Deployment Scheduled in: | Males     |         | Female    |         |
|--------------------------|-----------|---------|-----------|---------|
|                          | Frequency | Percent | Frequency | Percent |
| Less than 6 months       | 569       | 37.71   | 316       | 28.91   |
| More than 6 months       | 206       | 13.65   | 90        | 8.23    |
| Not currently scheduled  | 304       | 20.15   | 273       | 24.98   |
| Do not know              | 430       | 28.50   | 414       | 37.88   |
| Total                    | 1509      | 100.00  | 1093      | 100.00  |

## CHAPTER IV

### THE BODY MEASUREMENTS

Ninety-four directly measured dimensions were obtained in this survey, using traditional measuring instruments and methods. Where there was a choice of right or left, all measurements were taken on the right side unless otherwise specified or in the rare cases where an injury or anatomical abnormality made it necessary to measure on the left side. All measurements were taken to the nearest millimeter. Weight was taken to the nearest 0.1 kilogram. Detailed illustrated instructions for making these measurements can be found in the Measurer's Handbook (Hotzman et al., 2011).

A visual index, designed to assist the reader in locating particular dimensions whose names may be unfamiliar, appears in Appendix C. The numbers on the visual index correspond to the dimension numbers. The following pages include brief dimension descriptions, summary statistics, and percentile and frequency tables for the male and female participants. Users of these data will note 0.00 standard error values for some means and standard deviations. This occurs because values in these tables are not listed beyond two decimal places.

Only 93 of the 94 measured dimensions are reported here. Acromion-Wall Depth was highly variable, and it was poorly correlated with other dimensions. The variability was attributed to the posterior contour of many participants, which affected their positioning against the wall. Thus, the variability seen in the dimension comprised not only the variability of Acromion-Wall Depth itself, but also the depth of the buttock, the shape of the shoulders, the thickness of the calves, and sometimes other body shape characteristics.

Four head dimensions are not strictly equivalent to 1988 ANSUR dimensions for some females. Female Soldiers with hair in French braids or buns were asked to take down the hair style prior to measuring. Female Soldiers who had braids or cornrows in their hair were measured in the four dimensions with the braids or cornrows included because they were unable to alter the hair style so that the measurer could get the calipers or tape in contact with the scalp, as would normally be done. The rationale for this was that helmets and other protective equipment worn on the head need to accommodate the hair as well as the head itself. To determine whether including these women's measurements in the database would adversely affect the resulting statistics, the mean values of the sample were compared with these Soldiers' measurements both included and excluded. There was no difference in the means (significance test at the 0.05 level). The affected dimensions were:

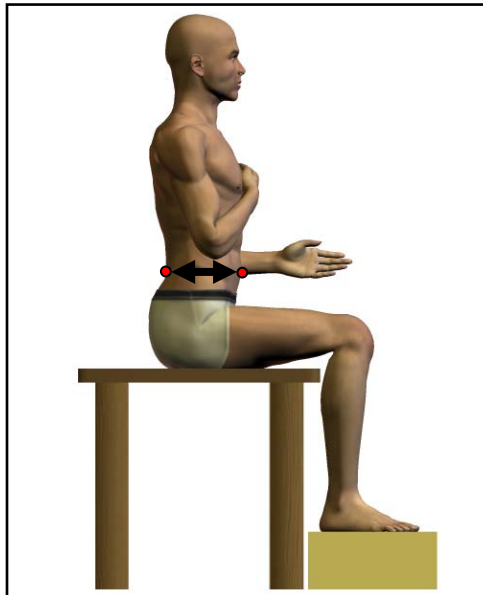
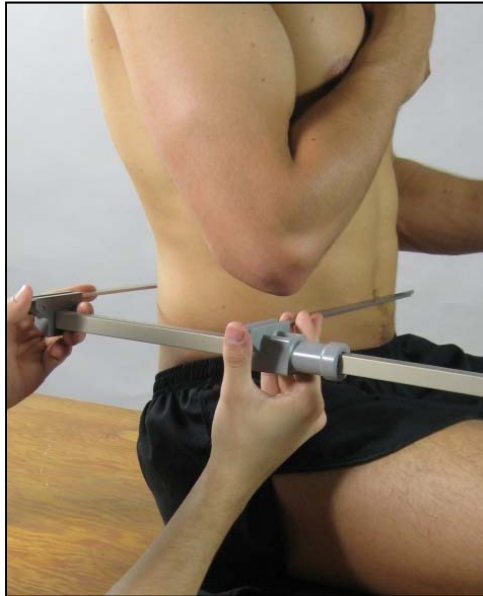
Head Breadth  
Head Circumference

Head Length  
Tragion-Top Of Head

Note that the issue did not arise for Stature, measured to the top of the head, as it was always possible to place the anthropometer blade between the cornrows or braids and make contact with the skull in the usual way.

### (1) ABDOMINAL EXTENSION DEPTH, SITTING

The horizontal distance between the abdominal point anterior and the back at the same level is measured with a beam caliper. The participant sits erect, looking straight ahead. The measurement is taken at the maximum point of quiet respiration.

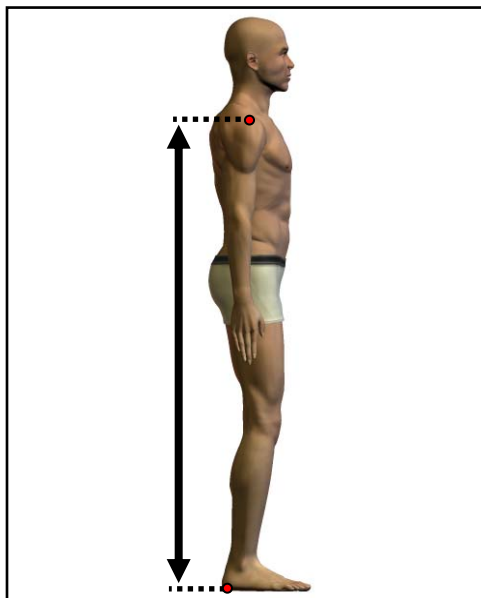


| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 17.00       | 6.69  | 1ST  | 18.50 | 7.28  |
| 17.60       | 6.93  | 2ND  | 19.00 | 7.48  |
| 17.90       | 7.05  | 3RD  | 19.40 | 7.64  |
| 18.40       | 7.24  | 5TH  | 20.00 | 7.87  |
| 19.20       | 7.56  | 10TH | 20.90 | 8.23  |
| 19.70       | 7.76  | 15TH | 21.60 | 8.50  |
| 20.30       | 7.99  | 20TH | 22.20 | 8.74  |
| 20.70       | 8.15  | 25TH | 22.70 | 8.94  |
| 21.10       | 8.31  | 30TH | 23.20 | 9.13  |
| 21.50       | 8.46  | 35TH | 23.70 | 9.33  |
| 21.80       | 8.58  | 40TH | 24.10 | 9.49  |
| 22.20       | 8.74  | 45TH | 24.60 | 9.69  |
| 22.70       | 8.94  | 50TH | 25.10 | 9.88  |
| 23.00       | 9.06  | 55TH | 25.60 | 10.08 |
| 23.50       | 9.25  | 60TH | 26.10 | 10.28 |
| 23.90       | 9.41  | 65TH | 26.70 | 10.51 |
| 24.30       | 9.57  | 70TH | 27.30 | 10.75 |
| 24.90       | 9.80  | 75TH | 27.90 | 10.98 |
| 25.50       | 10.04 | 80TH | 28.70 | 11.30 |
| 26.40       | 10.39 | 85TH | 29.40 | 11.57 |
| 27.20       | 10.71 | 90TH | 30.50 | 12.01 |
| 28.50       | 11.22 | 95TH | 32.00 | 12.60 |
| 29.50       | 11.61 | 97TH | 33.20 | 13.07 |
| 30.10       | 11.85 | 98TH | 34.00 | 13.39 |
| 31.00       | 12.20 | 99TH | 35.20 | 13.86 |



## (2) ACROMIAL HEIGHT

The vertical distance between a standing surface and the right acromion landmark is measured with an anthropometer. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 120.10      | 47.28 | 1ST  | 129.60 | 51.02 |
| 121.90      | 47.99 | 2ND  | 131.20 | 51.65 |
| 122.80      | 48.35 | 3RD  | 132.60 | 52.20 |
| 124.20      | 48.90 | 5TH  | 133.90 | 52.72 |
| 126.20      | 49.69 | 10TH | 136.10 | 53.58 |
| 127.60      | 50.24 | 15TH | 137.50 | 54.13 |
| 128.90      | 50.75 | 20TH | 138.80 | 54.65 |
| 129.80      | 51.10 | 25TH | 139.80 | 55.04 |
| 130.60      | 51.42 | 30TH | 140.80 | 55.43 |
| 131.40      | 51.73 | 35TH | 141.60 | 55.75 |
| 131.90      | 51.93 | 40TH | 142.40 | 56.06 |
| 132.50      | 52.17 | 45TH | 143.20 | 56.38 |
| 133.20      | 52.44 | 50TH | 143.90 | 56.65 |
| 133.90      | 52.72 | 55TH | 144.70 | 56.97 |
| 134.70      | 53.03 | 60TH | 145.60 | 57.32 |
| 135.60      | 53.39 | 65TH | 146.40 | 57.64 |
| 136.40      | 53.70 | 70TH | 147.30 | 57.99 |
| 137.40      | 54.09 | 75TH | 148.10 | 58.31 |
| 138.30      | 54.45 | 80TH | 149.30 | 58.78 |
| 139.50      | 54.92 | 85TH | 150.50 | 59.25 |
| 141.10      | 55.55 | 90TH | 152.10 | 59.88 |
| 143.40      | 56.46 | 95TH | 154.60 | 60.87 |
| 145.00      | 57.09 | 97TH | 156.50 | 61.61 |
| 145.90      | 57.44 | 98TH | 157.80 | 62.13 |
| 147.30      | 57.99 | 99TH | 159.70 | 62.87 |

## (2) ACROMIAL HEIGHT

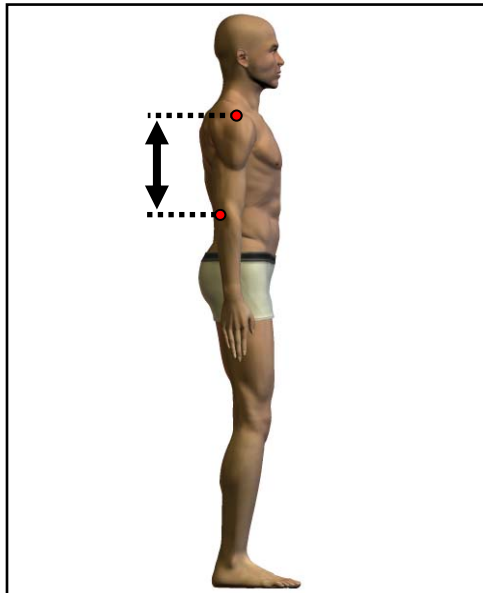
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 133.51                   | MEAN                | 52.56 |
| 0.13                     | STD ERROR (MEAN)    | 0.05  |
| 5.81                     | STANDARD DEVIATION  | 2.29  |
| 0.09                     | STD ERROR (STD DEV) | 0.04  |
| 111.50                   | MINIMUM             | 43.90 |
| 153.60                   | MAXIMUM             | 60.47 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.10  |
| COEFFICIENT OF VARIATION |                     | 4.4%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 144.07                   | MEAN                | 56.72 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 6.33                     | STANDARD DEVIATION  | 2.49  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 119.40                   | MINIMUM             | 47.01 |
| 168.30                   | MAXIMUM             | 66.26 |
| SKEWNESS                 |                     | 0.12  |
| KURTOSIS                 |                     | 3.12  |
| COEFFICIENT OF VARIATION |                     | 4.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |       |      |         |        |   |        |  |       |       |      |         |
|-----------------|-------|------|---------|--------|---|--------|--|-------|-------|------|---------|
| FEMALES         |       |      |         |        |   |        |  | MALES |       |      |         |
| F               | FPct  | CumF | CumFPct | CM     |   |        |  | F     | FPct  | CumF | CumFPct |
| 1               | 0.05  | 1    | 0.05    | 111.25 | - | 112.75 |  |       |       |      |         |
| 0               | 0.00  | 1    | 0.05    | 112.75 | - | 114.25 |  |       |       |      |         |
| 1               | 0.05  | 2    | 0.10    | 114.25 | - | 115.75 |  |       |       |      |         |
| 3               | 0.15  | 5    | 0.25    | 115.75 | - | 117.25 |  |       |       |      |         |
| 3               | 0.15  | 8    | 0.40    | 117.25 | - | 118.75 |  |       |       |      |         |
| 13              | 0.65  | 21   | 1.06    | 118.75 | - | 120.25 |  | 1     | 0.02  | 1    | 0.02    |
| 17              | 0.86  | 38   | 1.91    | 120.25 | - | 121.75 |  | 0     | 0.00  | 1    | 0.02    |
| 33              | 1.66  | 71   | 3.58    | 121.75 | - | 123.25 |  | 0     | 0.00  | 1    | 0.02    |
| 59              | 2.97  | 130  | 6.55    | 123.25 | - | 124.75 |  | 1     | 0.02  | 2    | 0.05    |
| 73              | 3.68  | 203  | 10.22   | 124.75 | - | 126.25 |  | 3     | 0.07  | 5    | 0.12    |
| 103             | 5.19  | 306  | 15.41   | 126.25 | - | 127.75 |  | 10    | 0.24  | 15   | 0.37    |
| 122             | 6.14  | 428  | 21.55   | 127.75 | - | 129.25 |  | 15    | 0.37  | 30   | 0.73    |
| 188             | 9.47  | 616  | 31.02   | 129.25 | - | 130.75 |  | 42    | 1.03  | 72   | 1.76    |
| 238             | 11.98 | 854  | 43.00   | 130.75 | - | 132.25 |  | 38    | 0.93  | 110  | 2.69    |
| 221             | 11.13 | 1075 | 54.13   | 132.25 | - | 133.75 |  | 81    | 1.98  | 191  | 4.68    |
| 179             | 9.01  | 1254 | 63.14   | 133.75 | - | 135.25 |  | 133   | 3.26  | 324  | 7.94    |
| 165             | 8.31  | 1419 | 71.45   | 135.25 | - | 136.75 |  | 177   | 4.34  | 501  | 12.27   |
| 157             | 7.91  | 1576 | 79.36   | 136.75 | - | 138.25 |  | 225   | 5.51  | 726  | 17.79   |
| 138             | 6.95  | 1714 | 86.30   | 138.25 | - | 139.75 |  | 278   | 6.81  | 1004 | 24.60   |
| 76              | 3.83  | 1790 | 90.13   | 139.75 | - | 141.25 |  | 316   | 7.74  | 1320 | 32.34   |
| 72              | 3.63  | 1862 | 93.76   | 141.25 | - | 142.75 |  | 411   | 10.07 | 1731 | 42.41   |
| 48              | 2.42  | 1910 | 96.17   | 142.75 | - | 144.25 |  | 390   | 9.55  | 2121 | 51.96   |
| 33              | 1.66  | 1943 | 97.83   | 144.25 | - | 145.75 |  | 379   | 9.28  | 2500 | 61.24   |
| 21              | 1.06  | 1964 | 98.89   | 145.75 | - | 147.25 |  | 356   | 8.72  | 2856 | 69.97   |
| 13              | 0.65  | 1977 | 99.55   | 147.25 | - | 148.75 |  | 314   | 7.69  | 3170 | 77.66   |
| 3               | 0.15  | 1980 | 99.70   | 148.75 | - | 150.25 |  | 257   | 6.30  | 3427 | 83.95   |
| 5               | 0.25  | 1985 | 99.95   | 150.25 | - | 151.75 |  | 209   | 5.12  | 3636 | 89.07   |
| 0               | 0.00  | 1985 | 99.95   | 151.75 | - | 153.25 |  | 145   | 3.55  | 3781 | 92.63   |
| 1               | 0.05  | 1986 | 100.00  | 153.25 | - | 154.75 |  | 104   | 2.55  | 3885 | 95.17   |
|                 |       |      |         | 154.75 | - | 156.25 |  | 66    | 1.62  | 3951 | 96.79   |
|                 |       |      |         | 156.25 | - | 157.75 |  | 49    | 1.20  | 4000 | 97.99   |
|                 |       |      |         | 157.75 | - | 159.25 |  | 33    | 0.81  | 4033 | 98.80   |
|                 |       |      |         | 159.25 | - | 160.75 |  | 18    | 0.44  | 4051 | 99.24   |
|                 |       |      |         | 160.75 | - | 162.25 |  | 15    | 0.37  | 4066 | 99.61   |
|                 |       |      |         | 162.25 | - | 163.75 |  | 10    | 0.24  | 4076 | 99.85   |
|                 |       |      |         | 163.75 | - | 165.25 |  | 3     | 0.07  | 4079 | 99.93   |
|                 |       |      |         | 165.25 | - | 166.75 |  | 2     | 0.05  | 4081 | 99.98   |
|                 |       |      |         | 166.75 | - | 168.25 |  | 0     | 0.00  | 4081 | 99.98   |
|                 |       |      |         | 168.25 | - | 169.75 |  | 1     | 0.02  | 4082 | 100.00  |

### (3) ACROMION-RADIALE LENGTH

The distance between the right acromion landmark and the radiale landmark is measured with a beam caliper held parallel to the long axis of the arm. The participant stands erect. The shoulders and upper extremities are relaxed with the palms facing the thighs.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 27.10       | 10.67 | 1ST  | 29.60 | 11.65 |
| 27.70       | 10.91 | 2ND  | 30.00 | 11.81 |
| 28.00       | 11.02 | 3RD  | 30.30 | 11.93 |
| 28.30       | 11.14 | 5TH  | 30.70 | 12.09 |
| 29.00       | 11.42 | 10TH | 31.30 | 12.32 |
| 29.30       | 11.54 | 15TH | 31.70 | 12.48 |
| 29.70       | 11.69 | 20TH | 32.10 | 12.64 |
| 30.00       | 11.81 | 25TH | 32.40 | 12.76 |
| 30.20       | 11.89 | 30TH | 32.60 | 12.83 |
| 30.50       | 12.01 | 35TH | 32.80 | 12.91 |
| 30.60       | 12.05 | 40TH | 33.10 | 13.03 |
| 30.80       | 12.13 | 45TH | 33.30 | 13.11 |
| 31.10       | 12.24 | 50TH | 33.50 | 13.19 |
| 31.30       | 12.32 | 55TH | 33.70 | 13.27 |
| 31.50       | 12.40 | 60TH | 33.90 | 13.35 |
| 31.70       | 12.48 | 65TH | 34.20 | 13.46 |
| 32.00       | 12.60 | 70TH | 34.40 | 13.54 |
| 32.30       | 12.72 | 75TH | 34.60 | 13.62 |
| 32.60       | 12.83 | 80TH | 35.00 | 13.78 |
| 32.90       | 12.95 | 85TH | 35.30 | 13.90 |
| 33.30       | 13.11 | 90TH | 35.80 | 14.09 |
| 34.00       | 13.39 | 95TH | 36.50 | 14.37 |
| 34.40       | 13.54 | 97TH | 36.90 | 14.53 |
| 34.70       | 13.66 | 98TH | 37.30 | 14.69 |
| 35.40       | 13.94 | 99TH | 37.70 | 14.84 |

### (3) ACROMION-RADIALE LENGTH

| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 31.12                    | MEAN                | 12.25 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 1.72                     | STANDARD DEVIATION  | 0.68  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 24.90                    | MINIMUM             | 9.80  |
| 37.10                    | MAXIMUM             | 14.61 |
| SKEWNESS                 |                     | 0.04  |
| KURTOSIS                 |                     | 3.19  |
| COEFFICIENT OF VARIATION |                     | 5.5%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 33.52                    | MEAN                | 13.20 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.75                     | STANDARD DEVIATION  | 0.69  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 27.00                    | MINIMUM             | 10.63 |
| 39.30                    | MAXIMUM             | 15.47 |
| SKEWNESS                 |                     | 0.10  |
| KURTOSIS                 |                     | 3.09  |
| COEFFICIENT OF VARIATION |                     | 5.2%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10 | 2    | 0.10    | 24.85           | - | 25.20 |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 25.20           | - | 25.55 |  |       |      |      |         |
| 2       | 0.10 | 5    | 0.25    | 25.55           | - | 25.90 |  |       |      |      |         |
| 2       | 0.10 | 7    | 0.35    | 25.90           | - | 26.25 |  |       |      |      |         |
| 3       | 0.15 | 10   | 0.50    | 26.25           | - | 26.60 |  |       |      |      |         |
| 8       | 0.40 | 18   | 0.91    | 26.60           | - | 26.95 |  |       |      |      |         |
| 6       | 0.30 | 24   | 1.21    | 26.95           | - | 27.30 |  | 1     | 0.02 | 1    | 0.02    |
| 15      | 0.76 | 39   | 1.96    | 27.30           | - | 27.65 |  | 0     | 0.00 | 1    | 0.02    |
| 17      | 0.86 | 56   | 2.82    | 27.65           | - | 28.00 |  | 1     | 0.02 | 2    | 0.05    |
| 44      | 2.22 | 100  | 5.04    | 28.00           | - | 28.35 |  | 6     | 0.15 | 8    | 0.20    |
| 33      | 1.66 | 133  | 6.70    | 28.35           | - | 28.70 |  | 3     | 0.07 | 11   | 0.27    |
| 88      | 4.43 | 221  | 11.13   | 28.70           | - | 29.05 |  | 8     | 0.20 | 19   | 0.47    |
| 79      | 3.98 | 300  | 15.11   | 29.05           | - | 29.40 |  | 11    | 0.27 | 30   | 0.73    |
| 117     | 5.89 | 417  | 21.00   | 29.40           | - | 29.75 |  | 22    | 0.54 | 52   | 1.27    |
| 89      | 4.48 | 506  | 25.48   | 29.75           | - | 30.10 |  | 38    | 0.93 | 90   | 2.20    |
| 175     | 8.81 | 681  | 34.29   | 30.10           | - | 30.45 |  | 62    | 1.52 | 152  | 3.72    |
| 166     | 8.36 | 847  | 42.65   | 30.45           | - | 30.80 |  | 65    | 1.59 | 217  | 5.32    |
| 189     | 9.52 | 1036 | 52.17   | 30.80           | - | 31.15 |  | 125   | 3.06 | 342  | 8.38    |
| 124     | 6.24 | 1160 | 58.41   | 31.15           | - | 31.50 |  | 142   | 3.48 | 484  | 11.86   |
| 176     | 8.86 | 1336 | 67.27   | 31.50           | - | 31.85 |  | 190   | 4.65 | 674  | 16.51   |
| 101     | 5.09 | 1437 | 72.36   | 31.85           | - | 32.20 |  | 197   | 4.83 | 871  | 21.34   |
| 148     | 7.45 | 1585 | 79.81   | 32.20           | - | 32.55 |  | 301   | 7.37 | 1172 | 28.71   |
| 95      | 4.78 | 1680 | 84.59   | 32.55           | - | 32.90 |  | 265   | 6.49 | 1437 | 35.20   |
| 100     | 5.04 | 1780 | 89.63   | 32.90           | - | 33.25 |  | 350   | 8.57 | 1787 | 43.78   |
| 56      | 2.82 | 1836 | 92.45   | 33.25           | - | 33.60 |  | 314   | 7.69 | 2101 | 51.47   |
| 43      | 2.17 | 1879 | 94.61   | 33.60           | - | 33.95 |  | 370   | 9.06 | 2471 | 60.53   |
| 34      | 1.71 | 1913 | 96.32   | 33.95           | - | 34.30 |  | 272   | 6.66 | 2743 | 67.20   |
| 31      | 1.56 | 1944 | 97.89   | 34.30           | - | 34.65 |  | 323   | 7.91 | 3066 | 75.11   |
| 14      | 0.70 | 1958 | 98.59   | 34.65           | - | 35.00 |  | 192   | 4.70 | 3258 | 79.81   |
| 8       | 0.40 | 1966 | 98.99   | 35.00           | - | 35.35 |  | 244   | 5.98 | 3502 | 85.79   |
| 6       | 0.30 | 1972 | 99.30   | 35.35           | - | 35.70 |  | 128   | 3.14 | 3630 | 88.93   |
| 10      | 0.50 | 1982 | 99.80   | 35.70           | - | 36.05 |  | 129   | 3.16 | 3759 | 92.09   |
| 2       | 0.10 | 1984 | 99.90   | 36.05           | - | 36.40 |  | 84    | 2.06 | 3843 | 94.15   |
| 0       | 0.00 | 1984 | 99.90   | 36.40           | - | 36.75 |  | 83    | 2.03 | 3926 | 96.18   |
| 1       | 0.05 | 1985 | 99.95   | 36.75           | - | 37.10 |  | 48    | 1.18 | 3974 | 97.35   |
| 1       | 0.05 | 1986 | 100.00  | 37.10           | - | 37.45 |  | 41    | 1.00 | 4015 | 98.36   |
|         |      |      |         | 37.45           | - | 37.80 |  | 27    | 0.66 | 4042 | 99.02   |
|         |      |      |         | 37.80           | - | 38.15 |  | 16    | 0.39 | 4058 | 99.41   |
|         |      |      |         | 38.15           | - | 38.50 |  | 6     | 0.15 | 4064 | 99.56   |
|         |      |      |         | 38.50           | - | 38.85 |  | 11    | 0.27 | 4075 | 99.83   |
|         |      |      |         | 38.85           | - | 39.20 |  | 5     | 0.12 | 4080 | 99.95   |
|         |      |      |         | 39.20           | - | 39.55 |  | 2     | 0.05 | 4082 | 100.00  |

#### (4) ANKLE CIRCUMFERENCE

The minimum horizontal circumference of the right ankle is measured with a tape. The participant stands with the feet about 10 cm apart and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 18.50       | 7.28  | 1ST  | 19.80 | 7.80  |
| 18.80       | 7.40  | 2ND  | 20.20 | 7.95  |
| 19.00       | 7.48  | 3RD  | 20.40 | 8.03  |
| 19.30       | 7.60  | 5TH  | 20.60 | 8.11  |
| 19.70       | 7.76  | 10TH | 21.10 | 8.31  |
| 20.00       | 7.87  | 15TH | 21.50 | 8.46  |
| 20.30       | 7.99  | 20TH | 21.70 | 8.54  |
| 20.50       | 8.07  | 25TH | 21.90 | 8.62  |
| 20.70       | 8.15  | 30TH | 22.20 | 8.74  |
| 21.00       | 8.27  | 35TH | 22.30 | 8.78  |
| 21.20       | 8.35  | 40TH | 22.50 | 8.86  |
| 21.30       | 8.39  | 45TH | 22.70 | 8.94  |
| 21.50       | 8.46  | 50TH | 22.80 | 8.98  |
| 21.70       | 8.54  | 55TH | 23.00 | 9.06  |
| 21.80       | 8.58  | 60TH | 23.30 | 9.17  |
| 22.00       | 8.66  | 65TH | 23.40 | 9.21  |
| 22.30       | 8.78  | 70TH | 23.60 | 9.29  |
| 22.50       | 8.86  | 75TH | 23.90 | 9.41  |
| 22.70       | 8.94  | 80TH | 24.20 | 9.53  |
| 23.10       | 9.09  | 85TH | 24.40 | 9.61  |
| 23.50       | 9.25  | 90TH | 24.80 | 9.76  |
| 24.20       | 9.53  | 95TH | 25.40 | 10.00 |
| 24.70       | 9.72  | 97TH | 25.70 | 10.12 |
| 24.80       | 9.76  | 98TH | 26.20 | 10.31 |
| 25.50       | 10.04 | 99TH | 26.80 | 10.55 |

#### (4) ANKLE CIRCUMFERENCE

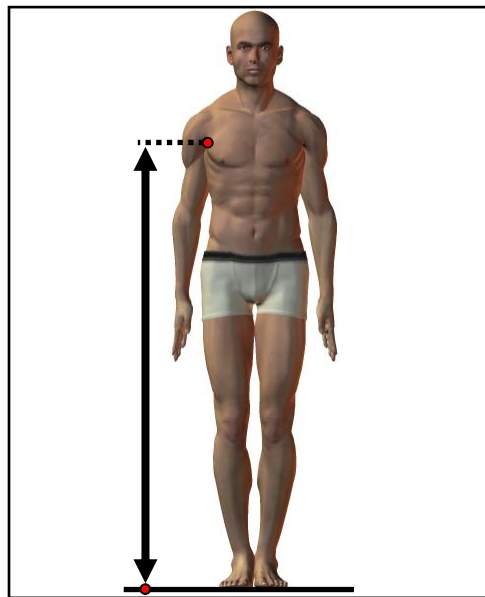
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 21.57                    | MEAN                | 8.49  |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.49                     | STANDARD DEVIATION  | 0.59  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 17.00                    | MINIMUM             | 6.69  |
| 27.50                    | MAXIMUM             | 10.83 |
| SKEWNESS                 |                     | 0.37  |
| KURTOSIS                 |                     | 3.33  |
| COEFFICIENT OF VARIATION |                     | 6.9%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 22.93                    | MEAN                | 9.03  |
| 0.02                     | STD ERROR (MEAN)    | 0.01  |
| 1.46                     | STANDARD DEVIATION  | 0.58  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 15.60                    | MINIMUM             | 6.14  |
| 29.30                    | MAXIMUM             | 11.54 |
| SKEWNESS                 |                     | 0.29  |
| KURTOSIS                 |                     | 3.36  |
| COEFFICIENT OF VARIATION |                     | 6.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   | F     | FPct | CumF | CumFPct |
|         |      |      |         | 15.45           | - | 15.80 | 1    | 0.02 | 0.02    |
|         |      |      |         | 15.80           | - | 16.15 | 0    | 0.00 | 0.02    |
|         |      |      |         | 16.15           | - | 16.50 | 0    | 0.00 | 0.02    |
|         |      |      |         | 16.50           | - | 16.85 | 0    | 0.00 | 0.02    |
|         |      |      |         | 16.85           | - | 17.20 | 0    | 0.00 | 0.02    |
|         |      |      |         | 17.20           | - | 17.55 | 0    | 0.00 | 0.02    |
|         |      |      |         | 17.55           | - | 17.90 | 0    | 0.00 | 0.02    |
|         |      |      |         | 17.90           | - | 18.25 | 0    | 0.00 | 0.02    |
|         |      |      |         | 18.25           | - | 18.60 | 0    | 0.00 | 0.02    |
|         |      |      |         | 18.60           | - | 18.95 | 1    | 0.02 | 0.05    |
|         |      |      |         | 18.95           | - | 19.30 | 7    | 0.17 | 0.22    |
|         |      |      |         | 19.30           | - | 19.65 | 15   | 0.37 | 0.59    |
|         |      |      |         | 19.65           | - | 20.00 | 20   | 0.49 | 1.08    |
|         |      |      |         | 20.00           | - | 20.35 | 75   | 1.84 | 2.92    |
|         |      |      |         | 20.35           | - | 20.70 | 92   | 2.25 | 5.17    |
|         |      |      |         | 20.70           | - | 21.05 | 163  | 3.99 | 9.16    |
|         |      |      |         | 21.05           | - | 21.40 | 189  | 4.63 | 13.79   |
|         |      |      |         | 21.40           | - | 21.75 | 312  | 7.64 | 21.44   |
|         |      |      |         | 21.75           | - | 22.10 | 279  | 6.83 | 28.27   |
|         |      |      |         | 22.10           | - | 22.45 | 407  | 9.97 | 38.24   |
|         |      |      |         | 22.45           | - | 22.80 | 395  | 9.68 | 47.92   |
|         |      |      |         | 22.80           | - | 23.15 | 378  | 9.26 | 57.18   |
|         |      |      |         | 23.15           | - | 23.50 | 367  | 8.99 | 66.17   |
|         |      |      |         | 23.50           | - | 23.85 | 358  | 8.77 | 74.94   |
|         |      |      |         | 23.85           | - | 24.20 | 194  | 4.75 | 79.69   |
|         |      |      |         | 24.20           | - | 24.55 | 284  | 6.96 | 86.65   |
|         |      |      |         | 24.55           | - | 24.90 | 159  | 3.90 | 90.54   |
|         |      |      |         | 24.90           | - | 25.25 | 122  | 2.99 | 93.53   |
|         |      |      |         | 25.25           | - | 25.60 | 96   | 2.35 | 95.88   |
|         |      |      |         | 25.60           | - | 25.95 | 65   | 1.59 | 97.48   |
|         |      |      |         | 25.95           | - | 26.30 | 29   | 0.71 | 98.19   |
|         |      |      |         | 26.30           | - | 26.65 | 17   | 0.42 | 98.60   |
|         |      |      |         | 26.65           | - | 27.00 | 23   | 0.56 | 99.17   |
|         |      |      |         | 27.00           | - | 27.35 | 15   | 0.37 | 99.53   |
|         |      |      |         | 27.35           | - | 27.70 | 6    | 0.15 | 99.68   |
|         |      |      |         | 27.70           | - | 28.05 | 8    | 0.20 | 99.88   |
|         |      |      |         | 28.05           | - | 28.40 | 3    | 0.07 | 99.95   |
|         |      |      |         | 28.40           | - | 28.75 | 0    | 0.00 | 99.95   |
|         |      |      |         | 28.75           | - | 29.10 | 1    | 0.02 | 99.98   |
|         |      |      |         | 29.10           | - | 29.45 | 1    | 0.02 | 100.00  |

## (5) AXILLA HEIGHT

The vertical distance between a standing surface and the anterior-scye-on-the-torso landmark is measured with an anthropometer. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed with the palms facing the thighs. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 111.20      | 43.78 | 1ST  | 119.60 | 47.09 |
| 112.70      | 44.37 | 2ND  | 120.90 | 47.60 |
| 113.70      | 44.76 | 3RD  | 121.90 | 47.99 |
| 114.90      | 45.24 | 5TH  | 123.40 | 48.58 |
| 116.90      | 46.02 | 10TH | 125.40 | 49.37 |
| 118.30      | 46.57 | 15TH | 126.70 | 49.88 |
| 119.40      | 47.01 | 20TH | 127.90 | 50.35 |
| 120.20      | 47.32 | 25TH | 128.90 | 50.75 |
| 121.00      | 47.64 | 30TH | 129.80 | 51.10 |
| 121.70      | 47.91 | 35TH | 130.60 | 51.42 |
| 122.30      | 48.15 | 40TH | 131.30 | 51.69 |
| 122.90      | 48.39 | 45TH | 132.10 | 52.01 |
| 123.60      | 48.66 | 50TH | 132.80 | 52.28 |
| 124.30      | 48.94 | 55TH | 133.50 | 52.56 |
| 125.10      | 49.25 | 60TH | 134.40 | 52.91 |
| 125.90      | 49.57 | 65TH | 135.00 | 53.15 |
| 126.80      | 49.92 | 70TH | 135.90 | 53.50 |
| 127.70      | 50.28 | 75TH | 136.70 | 53.82 |
| 128.50      | 50.59 | 80TH | 137.80 | 54.25 |
| 129.70      | 51.06 | 85TH | 139.00 | 54.72 |
| 131.30      | 51.69 | 90TH | 140.40 | 55.28 |
| 133.30      | 52.48 | 95TH | 142.70 | 56.18 |
| 134.80      | 53.07 | 97TH | 144.50 | 56.89 |
| 136.10      | 53.58 | 98TH | 145.70 | 57.36 |
| 136.90      | 53.90 | 99TH | 147.70 | 58.15 |

## (5) AXILLA HEIGHT

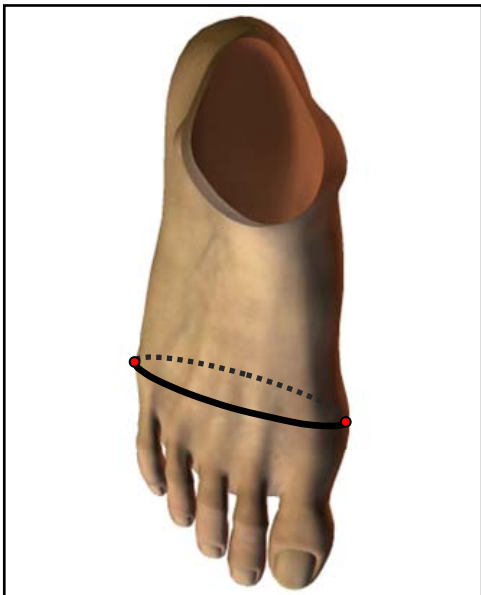
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 123.90                   | MEAN                | 48.78 |
| 0.13                     | STD ERROR (MEAN)    | 0.05  |
| 5.58                     | STANDARD DEVIATION  | 2.20  |
| 0.09                     | STD ERROR (STD DEV) | 0.03  |
| 103.80                   | MINIMUM             | 40.87 |
| 141.90                   | MAXIMUM             | 55.87 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.01  |
| COEFFICIENT OF VARIATION |                     | 4.5%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 132.91                   | MEAN                | 52.33 |
| 0.09                     | STD ERROR (MEAN)    | 0.04  |
| 5.95                     | STANDARD DEVIATION  | 2.34  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 110.60                   | MINIMUM             | 43.54 |
| 155.30                   | MAXIMUM             | 61.14 |
| SKEWNESS                 |                     | 0.13  |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 4.5%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |        |   |        |  |       |      |      |         |
|-----------------|------|------|---------|--------|---|--------|--|-------|------|------|---------|
| FEMALES         |      |      |         |        |   |        |  | MALES |      |      |         |
| F               | FPct | CumF | CumFPct | CM     |   |        |  | F     | FPct | CumF | CumFPct |
| 1               | 0.05 | 1    | 0.05    | 103.55 | - | 104.55 |  |       |      |      |         |
| 0               | 0.00 | 1    | 0.05    | 104.55 | - | 105.55 |  |       |      |      |         |
| 1               | 0.05 | 2    | 0.10    | 105.55 | - | 106.55 |  |       |      |      |         |
| 2               | 0.10 | 4    | 0.20    | 106.55 | - | 107.55 |  |       |      |      |         |
| 2               | 0.10 | 6    | 0.30    | 107.55 | - | 108.55 |  |       |      |      |         |
| 3               | 0.15 | 9    | 0.45    | 108.55 | - | 109.55 |  |       |      |      |         |
| 4               | 0.20 | 13   | 0.65    | 109.55 | - | 110.55 |  |       |      |      |         |
| 9               | 0.45 | 22   | 1.11    | 110.55 | - | 111.55 |  | 1     | 0.02 | 1    | 0.02    |
| 13              | 0.65 | 35   | 1.76    | 111.55 | - | 112.55 |  | 0     | 0.00 | 1    | 0.02    |
| 24              | 1.21 | 59   | 2.97    | 112.55 | - | 113.55 |  | 0     | 0.00 | 1    | 0.02    |
| 28              | 1.41 | 87   | 4.38    | 113.55 | - | 114.55 |  | 0     | 0.00 | 1    | 0.02    |
| 41              | 2.06 | 128  | 6.45    | 114.55 | - | 115.55 |  | 4     | 0.10 | 5    | 0.12    |
| 50              | 2.52 | 178  | 8.96    | 115.55 | - | 116.55 |  | 3     | 0.07 | 8    | 0.20    |
| 70              | 3.52 | 248  | 12.49   | 116.55 | - | 117.55 |  | 7     | 0.17 | 15   | 0.37    |
| 69              | 3.47 | 317  | 15.96   | 117.55 | - | 118.55 |  | 11    | 0.27 | 26   | 0.64    |
| 97              | 4.88 | 414  | 20.85   | 118.55 | - | 119.55 |  | 14    | 0.34 | 40   | 0.98    |
| 121             | 6.09 | 535  | 26.94   | 119.55 | - | 120.55 |  | 31    | 0.76 | 71   | 1.74    |
| 137             | 6.90 | 672  | 33.84   | 120.55 | - | 121.55 |  | 38    | 0.93 | 109  | 2.67    |
| 167             | 8.41 | 839  | 42.25   | 121.55 | - | 122.55 |  | 40    | 0.98 | 149  | 3.65    |
| 148             | 7.45 | 987  | 49.70   | 122.55 | - | 123.55 |  | 68    | 1.67 | 217  | 5.32    |
| 132             | 6.65 | 1119 | 56.34   | 123.55 | - | 124.55 |  | 91    | 2.23 | 308  | 7.55    |
| 143             | 7.20 | 1262 | 63.54   | 124.55 | - | 125.55 |  | 123   | 3.01 | 431  | 10.56   |
| 98              | 4.93 | 1360 | 68.48   | 125.55 | - | 126.55 |  | 158   | 3.87 | 589  | 14.43   |
| 116             | 5.84 | 1476 | 74.32   | 126.55 | - | 127.55 |  | 168   | 4.12 | 757  | 18.54   |
| 121             | 6.09 | 1597 | 80.41   | 127.55 | - | 128.55 |  | 181   | 4.43 | 938  | 22.98   |
| 79              | 3.98 | 1676 | 84.39   | 128.55 | - | 129.55 |  | 241   | 5.90 | 1179 | 28.88   |
| 65              | 3.27 | 1741 | 87.66   | 129.55 | - | 130.55 |  | 242   | 5.93 | 1421 | 34.81   |
| 60              | 3.02 | 1801 | 90.68   | 130.55 | - | 131.55 |  | 275   | 6.74 | 1696 | 41.55   |
| 48              | 2.42 | 1849 | 93.10   | 131.55 | - | 132.55 |  | 272   | 6.66 | 1968 | 48.21   |
| 43              | 2.17 | 1892 | 95.27   | 132.55 | - | 133.55 |  | 286   | 7.01 | 2254 | 55.22   |
| 28              | 1.41 | 1920 | 96.68   | 133.55 | - | 134.55 |  | 266   | 6.52 | 2520 | 61.73   |
| 16              | 0.81 | 1936 | 97.48   | 134.55 | - | 135.55 |  | 246   | 6.03 | 2766 | 67.76   |
| 24              | 1.21 | 1960 | 98.69   | 135.55 | - | 136.55 |  | 255   | 6.25 | 3021 | 74.01   |
| 14              | 0.70 | 1974 | 99.40   | 136.55 | - | 137.55 |  | 201   | 4.92 | 3222 | 78.93   |
| 6               | 0.30 | 1980 | 99.70   | 137.55 | - | 138.55 |  | 174   | 4.26 | 3396 | 83.19   |
| 1               | 0.05 | 1981 | 99.75   | 138.55 | - | 139.55 |  | 148   | 3.63 | 3544 | 86.82   |
| 1               | 0.05 | 1982 | 99.80   | 139.55 | - | 140.55 |  | 147   | 3.60 | 3691 | 90.42   |
| 3               | 0.15 | 1985 | 99.95   | 140.55 | - | 141.55 |  | 103   | 2.52 | 3794 | 92.94   |
| 1               | 0.05 | 1986 | 100.00  | 141.55 | - | 142.55 |  | 70    | 1.71 | 3864 | 94.66   |
|                 |      |      |         | 142.55 | - | 143.55 |  | 49    | 1.20 | 3913 | 95.86   |
|                 |      |      |         | 143.55 | - | 144.55 |  | 48    | 1.18 | 3961 | 97.04   |
|                 |      |      |         | 144.55 | - | 145.55 |  | 36    | 0.88 | 3997 | 97.92   |
|                 |      |      |         | 145.55 | - | 146.55 |  | 19    | 0.47 | 4016 | 98.38   |
|                 |      |      |         | 146.55 | - | 147.55 |  | 20    | 0.49 | 4036 | 98.87   |
|                 |      |      |         | 147.55 | - | 148.55 |  | 13    | 0.32 | 4049 | 99.19   |
|                 |      |      |         | 148.55 | - | 149.55 |  | 9     | 0.22 | 4058 | 99.41   |
|                 |      |      |         | 149.55 | - | 150.55 |  | 12    | 0.29 | 4070 | 99.71   |
|                 |      |      |         | 150.55 | - | 151.55 |  | 5     | 0.12 | 4075 | 99.83   |
|                 |      |      |         | 151.55 | - | 152.55 |  | 2     | 0.05 | 4077 | 99.88   |
|                 |      |      |         | 152.55 | - | 153.55 |  | 4     | 0.10 | 4081 | 99.98   |
|                 |      |      |         | 153.55 | - | 154.55 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 154.55 | - | 155.55 |  | 1     | 0.02 | 4082 | 100.00  |

## (6) BALL OF FOOT CIRCUMFERENCE

The circumference of the foot at the first and fifth metatarsophalangeal landmarks is measured with a tape. The participant stands with the feet about 10 cm apart and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 20.30       | 7.99  | 1ST  | 22.40 | 8.82  |
| 20.50       | 8.07  | 2ND  | 22.70 | 8.94  |
| 20.70       | 8.15  | 3RD  | 22.80 | 8.98  |
| 20.90       | 8.23  | 5TH  | 23.20 | 9.13  |
| 21.40       | 8.43  | 10TH | 23.60 | 9.29  |
| 21.60       | 8.50  | 15TH | 23.90 | 9.41  |
| 21.80       | 8.58  | 20TH | 24.10 | 9.49  |
| 22.00       | 8.66  | 25TH | 24.30 | 9.57  |
| 22.20       | 8.74  | 30TH | 24.50 | 9.65  |
| 22.30       | 8.78  | 35TH | 24.70 | 9.72  |
| 22.50       | 8.86  | 40TH | 24.80 | 9.76  |
| 22.60       | 8.90  | 45TH | 25.00 | 9.84  |
| 22.70       | 8.94  | 50TH | 25.20 | 9.92  |
| 22.90       | 9.02  | 55TH | 25.30 | 9.96  |
| 23.10       | 9.09  | 60TH | 25.50 | 10.04 |
| 23.20       | 9.13  | 65TH | 25.70 | 10.12 |
| 23.40       | 9.21  | 70TH | 25.80 | 10.16 |
| 23.60       | 9.29  | 75TH | 26.10 | 10.28 |
| 23.80       | 9.37  | 80TH | 26.30 | 10.35 |
| 24.00       | 9.45  | 85TH | 26.60 | 10.47 |
| 24.40       | 9.61  | 90TH | 26.90 | 10.59 |
| 24.80       | 9.76  | 95TH | 27.30 | 10.75 |
| 25.20       | 9.92  | 97TH | 27.70 | 10.91 |
| 25.40       | 10.00 | 98TH | 28.00 | 11.02 |
| 25.70       | 10.12 | 99TH | 28.40 | 11.18 |

## (6) BALL OF FOOT CIRCUMFERENCE

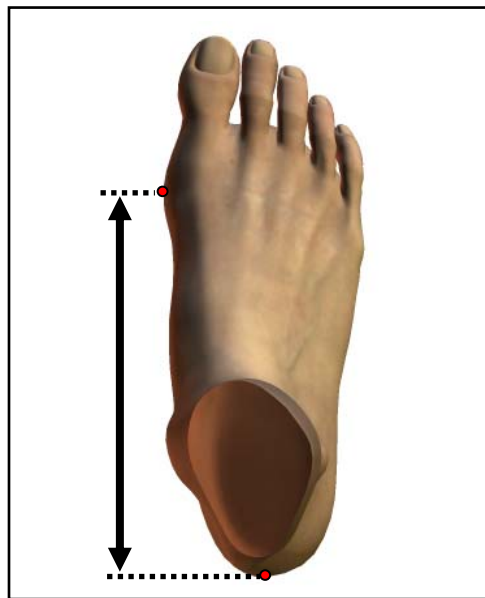
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 22.81                    |                     | 8.98  |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.18                     | STANDARD DEVIATION  | 0.46  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 19.40                    | MINIMUM             | 7.64  |
| 27.00                    | MAXIMUM             | 10.63 |
| SKEWNESS                 |                     | 0.20  |
| KURTOSIS                 |                     | 3.01  |
| COEFFICIENT OF VARIATION |                     | 5.2%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 25.20                    |                     | 9.92  |
| 0.02                     | STD ERROR (MEAN)    | 0.01  |
| 1.29                     | STANDARD DEVIATION  | 0.51  |
| 0.01                     | STD ERROR (STD DEV) | 0.01  |
| 18.60                    | MINIMUM             | 7.32  |
| 30.60                    | MAXIMUM             | 12.05 |
| SKEWNESS                 |                     | 0.18  |
| KURTOSIS                 |                     | 3.30  |
| COEFFICIENT OF VARIATION |                     | 5.1%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |    |       |  | MALES |       |      |         |
|---------|-------|------|---------|-----------------|----|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct |                 | CM |       |  | F     | FPct  | CumF | CumFPct |
|         |       |      |         | 18.60           | -  | 18.85 |  | 1     | 0.02  | 1    | 0.02    |
|         |       |      |         | 18.85           | -  | 19.10 |  | 0     | 0.00  | 1    | 0.02    |
|         |       |      |         | 19.10           | -  | 19.35 |  | 0     | 0.00  | 1    | 0.02    |
| 3       | 0.15  | 3    | 0.15    | 19.35           | -  | 19.60 |  | 0     | 0.00  | 1    | 0.02    |
| 4       | 0.20  | 7    | 0.35    | 19.60           | -  | 19.85 |  | 0     | 0.00  | 1    | 0.02    |
| 4       | 0.20  | 11   | 0.55    | 19.85           | -  | 20.10 |  | 0     | 0.00  | 1    | 0.02    |
| 14      | 0.70  | 25   | 1.26    | 20.10           | -  | 20.35 |  | 0     | 0.00  | 1    | 0.02    |
| 15      | 0.76  | 40   | 2.01    | 20.35           | -  | 20.60 |  | 0     | 0.00  | 1    | 0.02    |
| 48      | 2.42  | 88   | 4.43    | 20.60           | -  | 20.85 |  | 1     | 0.02  | 2    | 0.05    |
| 30      | 1.51  | 118  | 5.94    | 20.85           | -  | 21.10 |  | 1     | 0.02  | 3    | 0.07    |
| 76      | 3.83  | 194  | 9.77    | 21.10           | -  | 21.35 |  | 1     | 0.02  | 4    | 0.10    |
| 74      | 3.73  | 268  | 13.49   | 21.35           | -  | 21.60 |  | 2     | 0.05  | 6    | 0.15    |
| 168     | 8.46  | 436  | 21.95   | 21.60           | -  | 21.85 |  | 7     | 0.17  | 13   | 0.32    |
| 104     | 5.24  | 540  | 27.19   | 21.85           | -  | 22.10 |  | 6     | 0.15  | 19   | 0.47    |
| 163     | 8.21  | 703  | 35.40   | 22.10           | -  | 22.35 |  | 14    | 0.34  | 33   | 0.81    |
| 134     | 6.75  | 837  | 42.15   | 22.35           | -  | 22.60 |  | 19    | 0.47  | 52   | 1.27    |
| 230     | 11.58 | 1067 | 53.73   | 22.60           | -  | 22.85 |  | 71    | 1.74  | 123  | 3.01    |
| 111     | 5.59  | 1178 | 59.32   | 22.85           | -  | 23.10 |  | 50    | 1.22  | 173  | 4.24    |
| 178     | 8.96  | 1356 | 68.28   | 23.10           | -  | 23.35 |  | 122   | 2.99  | 295  | 7.23    |
| 99      | 4.98  | 1455 | 73.26   | 23.35           | -  | 23.60 |  | 105   | 2.57  | 400  | 9.80    |
| 179     | 9.01  | 1634 | 82.28   | 23.60           | -  | 23.85 |  | 204   | 5.00  | 604  | 14.80   |
| 79      | 3.98  | 1713 | 86.25   | 23.85           | -  | 24.10 |  | 144   | 3.53  | 748  | 18.32   |
| 73      | 3.68  | 1786 | 89.93   | 24.10           | -  | 24.35 |  | 293   | 7.18  | 1041 | 25.50   |
| 53      | 2.67  | 1839 | 92.60   | 24.35           | -  | 24.60 |  | 243   | 5.95  | 1284 | 31.46   |
| 51      | 2.57  | 1890 | 95.17   | 24.60           | -  | 24.85 |  | 420   | 10.29 | 1704 | 41.74   |
| 22      | 1.11  | 1912 | 96.27   | 24.85           | -  | 25.10 |  | 212   | 5.19  | 1916 | 46.94   |
| 30      | 1.51  | 1942 | 97.78   | 25.10           | -  | 25.35 |  | 332   | 8.13  | 2248 | 55.07   |
| 13      | 0.65  | 1955 | 98.44   | 25.35           | -  | 25.60 |  | 257   | 6.30  | 2505 | 61.37   |
| 15      | 0.76  | 1970 | 99.19   | 25.60           | -  | 25.85 |  | 387   | 9.48  | 2892 | 70.85   |
| 6       | 0.30  | 1976 | 99.50   | 25.85           | -  | 26.10 |  | 163   | 3.99  | 3055 | 74.84   |
| 6       | 0.30  | 1982 | 99.80   | 26.10           | -  | 26.35 |  | 258   | 6.32  | 3313 | 81.16   |
| 1       | 0.05  | 1983 | 99.85   | 26.35           | -  | 26.60 |  | 143   | 3.50  | 3456 | 84.66   |
| 2       | 0.10  | 1985 | 99.95   | 26.60           | -  | 26.85 |  | 217   | 5.32  | 3673 | 89.98   |
| 1       | 0.05  | 1986 | 100.00  | 26.85           | -  | 27.10 |  | 96    | 2.35  | 3769 | 92.33   |
|         |       |      |         | 27.10           | -  | 27.35 |  | 115   | 2.82  | 3884 | 95.15   |
|         |       |      |         | 27.35           | -  | 27.60 |  | 45    | 1.10  | 3929 | 96.25   |
|         |       |      |         | 27.60           | -  | 27.85 |  | 61    | 1.49  | 3990 | 97.75   |
|         |       |      |         | 27.85           | -  | 28.10 |  | 22    | 0.54  | 4012 | 98.29   |
|         |       |      |         | 28.10           | -  | 28.35 |  | 28    | 0.69  | 4040 | 98.97   |
|         |       |      |         | 28.35           | -  | 28.60 |  | 13    | 0.32  | 4053 | 99.29   |
|         |       |      |         | 28.60           | -  | 28.85 |  | 10    | 0.24  | 4063 | 99.53   |
|         |       |      |         | 28.85           | -  | 29.10 |  | 3     | 0.07  | 4066 | 99.61   |
|         |       |      |         | 29.10           | -  | 29.35 |  | 5     | 0.12  | 4071 | 99.73   |
|         |       |      |         | 29.35           | -  | 29.60 |  | 3     | 0.07  | 4074 | 99.80   |
|         |       |      |         | 29.60           | -  | 29.85 |  | 3     | 0.07  | 4077 | 99.88   |
|         |       |      |         | 29.85           | -  | 30.10 |  | 1     | 0.02  | 4078 | 99.90   |
|         |       |      |         | 30.10           | -  | 30.35 |  | 2     | 0.05  | 4080 | 99.95   |
|         |       |      |         | 30.35           | -  | 30.60 |  | 1     | 0.02  | 4081 | 99.98   |
|         |       |      |         | 30.60           | -  | 30.85 |  | 1     | 0.02  | 4082 | 100.00  |

## (7) BALL OF FOOT LENGTH

The distance from the back of the heel to the landmark at the first metatarsophalangeal protrusion is measured with the Brannock Device®. The participant stands erect with the right foot in the Brannock Device® and the other foot on a board of equal height. The weight is distributed equally on both feet. The medial side of the right foot is parallel with the long axis of the device.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 16.10       | 6.34 | 1ST  | 17.80 | 7.01 |
| 16.30       | 6.42 | 2ND  | 18.00 | 7.09 |
| 16.40       | 6.46 | 3RD  | 18.20 | 7.17 |
| 16.70       | 6.57 | 5TH  | 18.40 | 7.24 |
| 17.00       | 6.69 | 10TH | 18.80 | 7.40 |
| 17.20       | 6.77 | 15TH | 19.00 | 7.48 |
| 17.40       | 6.85 | 20TH | 19.20 | 7.56 |
| 17.50       | 6.89 | 25TH | 19.40 | 7.64 |
| 17.70       | 6.97 | 30TH | 19.50 | 7.68 |
| 17.80       | 7.01 | 35TH | 19.70 | 7.76 |
| 17.90       | 7.05 | 40TH | 19.80 | 7.80 |
| 18.10       | 7.13 | 45TH | 20.00 | 7.87 |
| 18.20       | 7.17 | 50TH | 20.10 | 7.91 |
| 18.30       | 7.20 | 55TH | 20.20 | 7.95 |
| 18.40       | 7.24 | 60TH | 20.30 | 7.99 |
| 18.50       | 7.28 | 65TH | 20.50 | 8.07 |
| 18.70       | 7.36 | 70TH | 20.60 | 8.11 |
| 18.80       | 7.40 | 75TH | 20.80 | 8.19 |
| 19.00       | 7.48 | 80TH | 21.00 | 8.27 |
| 19.30       | 7.60 | 85TH | 21.20 | 8.35 |
| 19.50       | 7.68 | 90TH | 21.50 | 8.46 |
| 19.80       | 7.80 | 95TH | 21.80 | 8.58 |
| 20.10       | 7.91 | 97TH | 22.10 | 8.70 |
| 20.30       | 7.99 | 98TH | 22.30 | 8.78 |
| 20.40       | 8.03 | 99TH | 22.50 | 8.86 |

## (7) BALL OF FOOT LENGTH

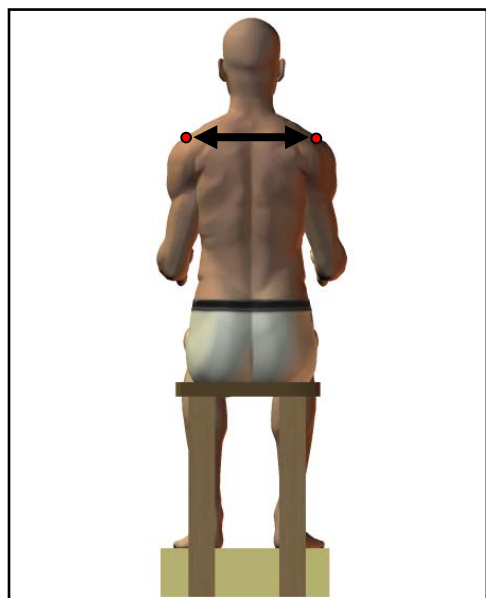
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 18.21                    |                     | 7.17 |
| 0.02                     | STD ERROR (MEAN)    | 0.01 |
| 0.96                     | STANDARD DEVIATION  | 0.38 |
| 0.02                     | STD ERROR (STD DEV) | 0.01 |
| 15.10                    | MINIMUM             | 5.94 |
| 21.60                    | MAXIMUM             | 8.50 |
| SKEWNESS                 |                     | 0.09 |
| KURTOSIS                 |                     | 2.87 |
| COEFFICIENT OF VARIATION |                     | 5.3% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 20.09                    |                     | 7.91 |
| 0.02                     | STD ERROR (MEAN)    | 0.01 |
| 1.05                     | STANDARD DEVIATION  | 0.41 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 15.60                    | MINIMUM             | 6.14 |
| 24.50                    | MAXIMUM             | 9.65 |
| SKEWNESS                 |                     | 0.11 |
| KURTOSIS                 |                     | 3.15 |
| COEFFICIENT OF VARIATION |                     | 5.2% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |      |      |         |       |       |       |     |      |      |         |  |
|-----------------|------|------|---------|-------|-------|-------|-----|------|------|---------|--|
| FEMALES         |      |      |         |       | MALES |       |     |      |      |         |  |
| F               | FPct | CumF | CumFPct | CM    |       |       | F   | FPct | CumF | CumFPct |  |
| 1               | 0.05 | 1    | 0.05    | 14.95 | -     | 15.15 |     |      |      |         |  |
| 1               | 0.05 | 2    | 0.10    | 15.15 | -     | 15.35 |     |      |      |         |  |
| 1               | 0.05 | 3    | 0.15    | 15.35 | -     | 15.55 |     |      |      |         |  |
| 8               | 0.40 | 11   | 0.55    | 15.55 | -     | 15.75 | 1   | 0.02 | 1    | 0.02    |  |
| 4               | 0.20 | 15   | 0.76    | 15.75 | -     | 15.95 | 0   | 0.00 | 1    | 0.02    |  |
| 16              | 0.81 | 31   | 1.56    | 15.95 | -     | 16.15 | 0   | 0.00 | 1    | 0.02    |  |
| 18              | 0.91 | 49   | 2.47    | 16.15 | -     | 16.35 | 0   | 0.00 | 1    | 0.02    |  |
| 30              | 1.51 | 79   | 3.98    | 16.35 | -     | 16.55 | 0   | 0.00 | 1    | 0.02    |  |
| 34              | 1.71 | 113  | 5.69    | 16.55 | -     | 16.75 | 1   | 0.02 | 2    | 0.05    |  |
| 53              | 2.67 | 166  | 8.36    | 16.75 | -     | 16.95 | 1   | 0.02 | 3    | 0.07    |  |
| 99              | 4.98 | 265  | 13.34   | 16.95 | -     | 17.15 | 7   | 0.17 | 10   | 0.24    |  |
| 114             | 5.74 | 379  | 19.08   | 17.15 | -     | 17.35 | 1   | 0.02 | 11   | 0.27    |  |
| 133             | 6.70 | 512  | 25.78   | 17.35 | -     | 17.55 | 15  | 0.37 | 26   | 0.64    |  |
| 141             | 7.10 | 653  | 32.88   | 17.55 | -     | 17.75 | 13  | 0.32 | 39   | 0.96    |  |
| 146             | 7.35 | 799  | 40.23   | 17.75 | -     | 17.95 | 29  | 0.71 | 68   | 1.67    |  |
| 173             | 8.71 | 972  | 48.94   | 17.95 | -     | 18.15 | 52  | 1.27 | 120  | 2.94    |  |
| 160             | 8.06 | 1132 | 57.00   | 18.15 | -     | 18.35 | 70  | 1.71 | 190  | 4.65    |  |
| 159             | 8.01 | 1291 | 65.01   | 18.35 | -     | 18.55 | 91  | 2.23 | 281  | 6.88    |  |
| 127             | 6.39 | 1418 | 71.40   | 18.55 | -     | 18.75 | 117 | 2.87 | 398  | 9.75    |  |
| 125             | 6.29 | 1543 | 77.69   | 18.75 | -     | 18.95 | 148 | 3.63 | 546  | 13.38   |  |
| 111             | 5.59 | 1654 | 83.28   | 18.95 | -     | 19.15 | 212 | 5.19 | 758  | 18.57   |  |
| 82              | 4.13 | 1736 | 87.41   | 19.15 | -     | 19.35 | 224 | 5.49 | 982  | 24.06   |  |
| 79              | 3.98 | 1815 | 91.39   | 19.35 | -     | 19.55 | 252 | 6.17 | 1234 | 30.23   |  |
| 50              | 2.52 | 1865 | 93.91   | 19.55 | -     | 19.75 | 264 | 6.47 | 1498 | 36.70   |  |
| 41              | 2.06 | 1906 | 95.97   | 19.75 | -     | 19.95 | 309 | 7.57 | 1807 | 44.27   |  |
| 31              | 1.56 | 1937 | 97.53   | 19.95 | -     | 20.15 | 380 | 9.31 | 2187 | 53.58   |  |
| 19              | 0.96 | 1956 | 98.49   | 20.15 | -     | 20.35 | 272 | 6.66 | 2459 | 60.24   |  |
| 17              | 0.86 | 1973 | 99.35   | 20.35 | -     | 20.55 | 329 | 8.06 | 2788 | 68.30   |  |
| 7               | 0.35 | 1980 | 99.70   | 20.55 | -     | 20.75 | 249 | 6.10 | 3037 | 74.40   |  |
| 4               | 0.20 | 1984 | 99.90   | 20.75 | -     | 20.95 | 222 | 5.44 | 3259 | 79.84   |  |
| 1               | 0.05 | 1985 | 99.95   | 20.95 | -     | 21.15 | 182 | 4.46 | 3441 | 84.30   |  |
| 0               | 0.00 | 1985 | 99.95   | 21.15 | -     | 21.35 | 167 | 4.09 | 3608 | 88.39   |  |
| 0               | 0.00 | 1985 | 99.95   | 21.35 | -     | 21.55 | 143 | 3.50 | 3751 | 91.89   |  |
| 1               | 0.05 | 1986 | 100.00  | 21.55 | -     | 21.75 | 92  | 2.25 | 3843 | 94.15   |  |
|                 |      |      |         | 21.75 | -     | 21.95 | 63  | 1.54 | 3906 | 95.69   |  |
|                 |      |      |         | 21.95 | -     | 22.15 | 65  | 1.59 | 3971 | 97.28   |  |
|                 |      |      |         | 22.15 | -     | 22.35 | 36  | 0.88 | 4007 | 98.16   |  |
|                 |      |      |         | 22.35 | -     | 22.55 | 35  | 0.86 | 4042 | 99.02   |  |
|                 |      |      |         | 22.55 | -     | 22.75 | 7   | 0.17 | 4049 | 99.19   |  |
|                 |      |      |         | 22.75 | -     | 22.95 | 12  | 0.29 | 4061 | 99.49   |  |
|                 |      |      |         | 22.95 | -     | 23.15 | 8   | 0.20 | 4069 | 99.68   |  |
|                 |      |      |         | 23.15 | -     | 23.35 | 7   | 0.17 | 4076 | 99.85   |  |
|                 |      |      |         | 23.35 | -     | 23.55 | 2   | 0.05 | 4078 | 99.90   |  |
|                 |      |      |         | 23.55 | -     | 23.75 | 1   | 0.02 | 4079 | 99.93   |  |
|                 |      |      |         | 23.75 | -     | 23.95 | 0   | 0.00 | 4079 | 99.93   |  |
|                 |      |      |         | 23.95 | -     | 24.15 | 0   | 0.00 | 4079 | 99.93   |  |
|                 |      |      |         | 24.15 | -     | 24.35 | 2   | 0.05 | 4081 | 99.98   |  |
|                 |      |      |         | 24.35 | -     | 24.55 | 1   | 0.02 | 4082 | 100.00  |  |

## (8) BIACROMIAL BREADTH

The distance between the right and left acromion landmarks is measured with a beam caliper. The participant sits erect. The shoulders and upper arms are relaxed, and the forearms and hands are extended forward horizontally with the palms facing each other. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 32.20       | 12.68 | 1ST  | 37.10 | 14.61 |
| 32.90       | 12.95 | 2ND  | 37.70 | 14.84 |
| 33.20       | 13.07 | 3RD  | 38.00 | 14.96 |
| 33.50       | 13.19 | 5TH  | 38.40 | 15.12 |
| 34.20       | 13.46 | 10TH | 39.20 | 15.43 |
| 34.70       | 13.66 | 15TH | 39.60 | 15.59 |
| 35.00       | 13.78 | 20TH | 40.00 | 15.75 |
| 35.30       | 13.90 | 25TH | 40.30 | 15.87 |
| 35.60       | 14.02 | 30TH | 40.60 | 15.98 |
| 35.90       | 14.13 | 35TH | 40.80 | 16.06 |
| 36.10       | 14.21 | 40TH | 41.10 | 16.18 |
| 36.30       | 14.29 | 45TH | 41.30 | 16.26 |
| 36.50       | 14.37 | 50TH | 41.50 | 16.34 |
| 36.80       | 14.49 | 55TH | 41.70 | 16.42 |
| 37.00       | 14.57 | 60TH | 42.00 | 16.54 |
| 37.20       | 14.65 | 65TH | 42.20 | 16.61 |
| 37.50       | 14.76 | 70TH | 42.50 | 16.73 |
| 37.80       | 14.88 | 75TH | 42.80 | 16.85 |
| 38.00       | 14.96 | 80TH | 43.10 | 16.97 |
| 38.40       | 15.12 | 85TH | 43.50 | 17.13 |
| 38.90       | 15.31 | 90TH | 44.10 | 17.36 |
| 39.60       | 15.59 | 95TH | 44.70 | 17.60 |
| 40.00       | 15.75 | 97TH | 45.30 | 17.83 |
| 40.30       | 15.87 | 98TH | 45.70 | 17.99 |
| 40.60       | 15.98 | 99TH | 46.30 | 18.23 |

## (8) BIACROMIAL BREADTH

| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 36.53                    |                     | 14.38 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 1.83                     | STANDARD DEVIATION  | 0.72  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 28.30                    | MINIMUM             | 11.14 |
| 42.20                    | MAXIMUM             | 16.61 |
| SKEWNESS                 |                     | -0.05 |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 5.0%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 41.57                    |                     | 16.37 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.92                     | STANDARD DEVIATION  | 0.75  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 33.70                    | MINIMUM             | 13.27 |
| 48.90                    | MAXIMUM             | 19.25 |
| SKEWNESS                 |                     | 0.08  |
| KURTOSIS                 |                     | 3.30  |
| COEFFICIENT OF VARIATION |                     | 4.6%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |       |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 28.25           | - | 28.75 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 28.75           | - | 29.25 |  |       |       |      |         |
| 1       | 0.05  | 2    | 0.10    | 29.25           | - | 29.75 |  |       |       |      |         |
| 0       | 0.00  | 2    | 0.10    | 29.75           | - | 30.25 |  |       |       |      |         |
| 0       | 0.00  | 2    | 0.10    | 30.25           | - | 30.75 |  |       |       |      |         |
| 3       | 0.15  | 5    | 0.25    | 30.75           | - | 31.25 |  |       |       |      |         |
| 6       | 0.30  | 11   | 0.55    | 31.25           | - | 31.75 |  |       |       |      |         |
| 12      | 0.60  | 23   | 1.16    | 31.75           | - | 32.25 |  |       |       |      |         |
| 11      | 0.55  | 34   | 1.71    | 32.25           | - | 32.75 |  |       |       |      |         |
| 37      | 1.86  | 71   | 3.58    | 32.75           | - | 33.25 |  |       |       |      |         |
| 58      | 2.92  | 129  | 6.50    | 33.25           | - | 33.75 |  | 1     | 0.02  | 1    | 0.02    |
| 79      | 3.98  | 208  | 10.47   | 33.75           | - | 34.25 |  | 0     | 0.00  | 1    | 0.02    |
| 105     | 5.29  | 313  | 15.76   | 34.25           | - | 34.75 |  | 1     | 0.02  | 2    | 0.05    |
| 157     | 7.91  | 470  | 23.67   | 34.75           | - | 35.25 |  | 2     | 0.05  | 4    | 0.10    |
| 191     | 9.62  | 661  | 33.28   | 35.25           | - | 35.75 |  | 4     | 0.10  | 8    | 0.20    |
| 212     | 10.67 | 873  | 43.96   | 35.75           | - | 36.25 |  | 4     | 0.10  | 12   | 0.29    |
| 218     | 10.98 | 1091 | 54.93   | 36.25           | - | 36.75 |  | 14    | 0.34  | 26   | 0.64    |
| 214     | 10.78 | 1305 | 65.71   | 36.75           | - | 37.25 |  | 23    | 0.56  | 49   | 1.20    |
| 183     | 9.21  | 1488 | 74.92   | 37.25           | - | 37.75 |  | 41    | 1.00  | 90   | 2.20    |
| 149     | 7.50  | 1637 | 82.43   | 37.75           | - | 38.25 |  | 85    | 2.08  | 175  | 4.29    |
| 125     | 6.29  | 1762 | 88.72   | 38.25           | - | 38.75 |  | 97    | 2.38  | 272  | 6.66    |
| 81      | 4.08  | 1843 | 92.80   | 38.75           | - | 39.25 |  | 138   | 3.38  | 410  | 10.04   |
| 60      | 3.02  | 1903 | 95.82   | 39.25           | - | 39.75 |  | 251   | 6.15  | 661  | 16.19   |
| 40      | 2.01  | 1943 | 97.83   | 39.75           | - | 40.25 |  | 317   | 7.77  | 978  | 23.96   |
| 25      | 1.26  | 1968 | 99.09   | 40.25           | - | 40.75 |  | 369   | 9.04  | 1347 | 33.00   |
| 8       | 0.40  | 1976 | 99.50   | 40.75           | - | 41.25 |  | 454   | 11.12 | 1801 | 44.12   |
| 4       | 0.20  | 1980 | 99.70   | 41.25           | - | 41.75 |  | 463   | 11.34 | 2264 | 55.46   |
| 6       | 0.30  | 1986 | 100.00  | 41.75           | - | 42.25 |  | 397   | 9.73  | 2661 | 65.19   |
|         |       |      |         | 42.25           | - | 42.75 |  | 385   | 9.43  | 3046 | 74.62   |
|         |       |      |         | 42.75           | - | 43.25 |  | 290   | 7.10  | 3336 | 81.72   |
|         |       |      |         | 43.25           | - | 43.75 |  | 221   | 5.41  | 3557 | 87.14   |
|         |       |      |         | 43.75           | - | 44.25 |  | 174   | 4.26  | 3731 | 91.40   |
|         |       |      |         | 44.25           | - | 44.75 |  | 149   | 3.65  | 3880 | 95.05   |
|         |       |      |         | 44.75           | - | 45.25 |  | 79    | 1.94  | 3959 | 96.99   |
|         |       |      |         | 45.25           | - | 45.75 |  | 48    | 1.18  | 4007 | 98.16   |
|         |       |      |         | 45.75           | - | 46.25 |  | 33    | 0.81  | 4040 | 98.97   |
|         |       |      |         | 46.25           | - | 46.75 |  | 18    | 0.44  | 4058 | 99.41   |
|         |       |      |         | 46.75           | - | 47.25 |  | 14    | 0.34  | 4072 | 99.76   |
|         |       |      |         | 47.25           | - | 47.75 |  | 3     | 0.07  | 4075 | 99.83   |
|         |       |      |         | 47.75           | - | 48.25 |  | 4     | 0.10  | 4079 | 99.93   |
|         |       |      |         | 48.25           | - | 48.75 |  | 2     | 0.05  | 4081 | 99.98   |
|         |       |      |         | 48.75           | - | 49.25 |  | 1     | 0.02  | 4082 | 100.00  |

## (9) BICEPS CIRCUMFERENCE, FLEXED

The circumference of the right upper arm around the flexed biceps brachii muscle at the biceps point landmark is measured with a tape held perpendicular to the long axis of the upper arm. The participant stands with the upper arm extended horizontally and the elbow flexed 90°. The fist is clenched and held facing the head, and the participant exerts maximum effort in contracting the biceps brachii muscle.

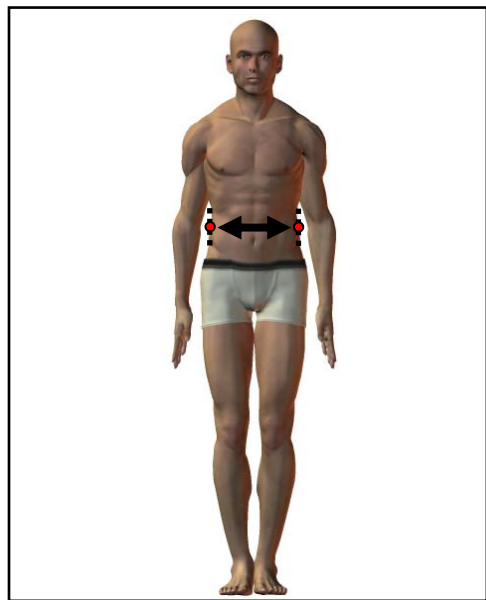
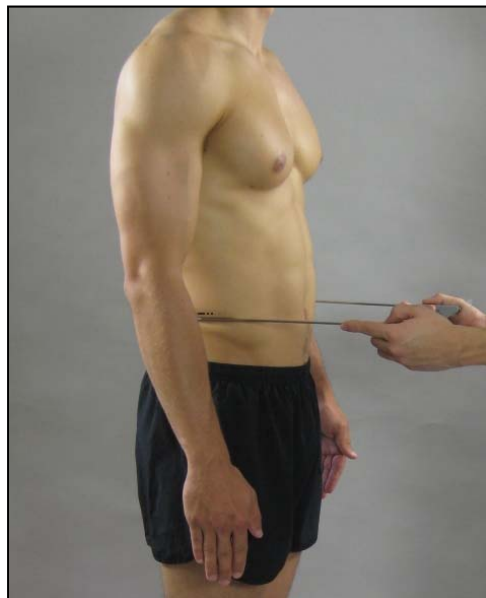


| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 24.40       | 9.61  | 1ST  | 28.00 | 11.02 |
| 25.00       | 9.84  | 2ND  | 29.00 | 11.42 |
| 25.40       | 10.00 | 3RD  | 29.50 | 11.61 |
| 25.90       | 10.20 | 5TH  | 30.30 | 11.93 |
| 26.80       | 10.55 | 10TH | 31.50 | 12.40 |
| 27.40       | 10.79 | 15TH | 32.30 | 12.72 |
| 28.00       | 11.02 | 20TH | 32.90 | 12.95 |
| 28.50       | 11.22 | 25TH | 33.50 | 13.19 |
| 28.80       | 11.34 | 30TH | 34.00 | 13.39 |
| 29.30       | 11.54 | 35TH | 34.40 | 13.54 |
| 29.60       | 11.65 | 40TH | 34.80 | 13.70 |
| 30.00       | 11.81 | 45TH | 35.30 | 13.90 |
| 30.40       | 11.97 | 50TH | 35.70 | 14.06 |
| 30.70       | 12.09 | 55TH | 36.20 | 14.25 |
| 31.10       | 12.24 | 60TH | 36.60 | 14.41 |
| 31.50       | 12.40 | 65TH | 37.00 | 14.57 |
| 31.90       | 12.56 | 70TH | 37.50 | 14.76 |
| 32.40       | 12.76 | 75TH | 38.00 | 14.96 |
| 32.90       | 12.95 | 80TH | 38.60 | 15.20 |
| 33.70       | 13.27 | 85TH | 39.30 | 15.47 |
| 34.70       | 13.66 | 90TH | 40.20 | 15.83 |
| 36.00       | 14.17 | 95TH | 41.80 | 16.46 |
| 37.00       | 14.57 | 97TH | 42.80 | 16.85 |
| 37.70       | 14.84 | 98TH | 43.50 | 17.13 |
| 38.80       | 15.28 | 99TH | 44.80 | 17.64 |



## (10) BICRISTAL BREADTH

The straight-line distance between the right and left iliac crest landmarks is measured with a beam caliper. The participant stands erect, looking straight ahead. The tissue is firmly compressed to ensure the measurement is taken on the bony landmarks.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 22.70       | 8.94  | 1ST  | 23.60 | 9.29  |
| 23.10       | 9.09  | 2ND  | 24.10 | 9.49  |
| 23.30       | 9.17  | 3RD  | 24.30 | 9.57  |
| 23.70       | 9.33  | 5TH  | 24.70 | 9.72  |
| 24.50       | 9.65  | 10TH | 25.30 | 9.96  |
| 25.00       | 9.84  | 15TH | 25.70 | 10.12 |
| 25.50       | 10.04 | 20TH | 26.10 | 10.28 |
| 25.80       | 10.16 | 25TH | 26.30 | 10.35 |
| 26.20       | 10.31 | 30TH | 26.60 | 10.47 |
| 26.50       | 10.43 | 35TH | 26.80 | 10.55 |
| 26.80       | 10.55 | 40TH | 27.00 | 10.63 |
| 27.00       | 10.63 | 45TH | 27.30 | 10.75 |
| 27.30       | 10.75 | 50TH | 27.50 | 10.83 |
| 27.50       | 10.83 | 55TH | 27.70 | 10.91 |
| 27.90       | 10.98 | 60TH | 28.00 | 11.02 |
| 28.20       | 11.10 | 65TH | 28.20 | 11.10 |
| 28.40       | 11.18 | 70TH | 28.50 | 11.22 |
| 28.70       | 11.30 | 75TH | 28.80 | 11.34 |
| 29.20       | 11.50 | 80TH | 29.00 | 11.42 |
| 29.60       | 11.65 | 85TH | 29.40 | 11.57 |
| 30.00       | 11.81 | 90TH | 29.80 | 11.73 |
| 31.00       | 12.20 | 95TH | 30.50 | 12.01 |
| 31.80       | 12.52 | 97TH | 30.80 | 12.13 |
| 32.50       | 12.80 | 98TH | 31.20 | 12.28 |
| 33.20       | 13.07 | 99TH | 31.60 | 12.44 |

## (10) BICRISTAL BREADTH

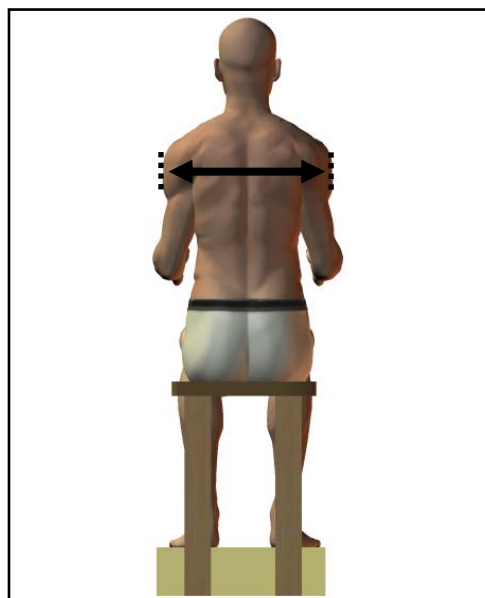
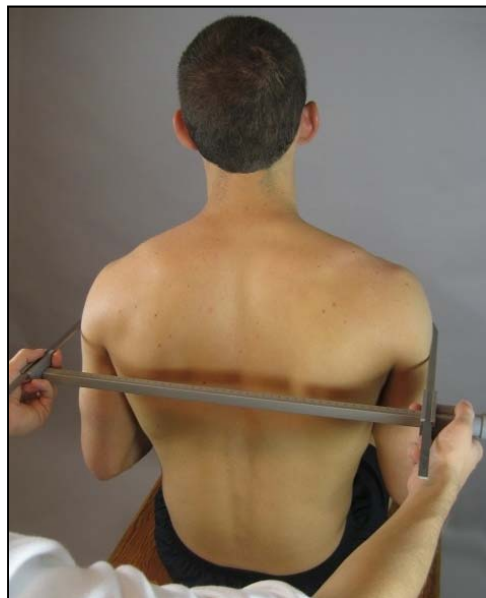
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 27.33                    |                     | 10.76 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 2.23                     | STANDARD DEVIATION  | 0.88  |
| 0.04                     | STD ERROR (STD DEV) | 0.01  |
| 19.70                    | MINIMUM             | 7.76  |
| 36.20                    | MAXIMUM             | 14.25 |
| SKEWNESS                 |                     | 0.20  |
| KURTOSIS                 |                     | 3.26  |
| COEFFICIENT OF VARIATION |                     | 8.1%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 27.54                    |                     | 10.84 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.75                     | STANDARD DEVIATION  | 0.69  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 21.90                    | MINIMUM             | 8.62  |
| 33.40                    | MAXIMUM             | 13.15 |
| SKEWNESS                 |                     | 0.10  |
| KURTOSIS                 |                     | 2.94  |
| COEFFICIENT OF VARIATION |                     | 6.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |       |   |       |      |      |         |        |  |
|-----------------|------|------|---------|-------|---|-------|------|------|---------|--------|--|
| FEMALES         |      |      |         |       |   | MALES |      |      |         |        |  |
| F               | FPct | CumF | CumFPct | CM    |   | F     | FPct | CumF | CumFPct |        |  |
| 1               | 0.05 | 1    | 0.05    | 19.65 | - | 20.00 |      |      |         |        |  |
| 1               | 0.05 | 2    | 0.10    | 20.00 | - | 20.35 |      |      |         |        |  |
| 1               | 0.05 | 3    | 0.15    | 20.35 | - | 20.70 |      |      |         |        |  |
| 1               | 0.05 | 4    | 0.20    | 20.70 | - | 21.05 |      |      |         |        |  |
| 3               | 0.15 | 7    | 0.35    | 21.05 | - | 21.40 |      |      |         |        |  |
| 1               | 0.05 | 8    | 0.40    | 21.40 | - | 21.75 |      |      |         |        |  |
| 1               | 0.05 | 9    | 0.45    | 21.75 | - | 22.10 |      |      |         |        |  |
| 3               | 0.15 | 12   | 0.60    | 22.10 | - | 22.45 | 2    | 0.05 | 2       | 0.05   |  |
| 11              | 0.55 | 23   | 1.16    | 22.45 | - | 22.80 | 4    | 0.10 | 6       | 0.15   |  |
| 21              | 1.06 | 44   | 2.22    | 22.80 | - | 23.15 | 3    | 0.07 | 9       | 0.22   |  |
| 27              | 1.36 | 71   | 3.58    | 23.15 | - | 23.50 | 11   | 0.27 | 20      | 0.49   |  |
| 38              | 1.91 | 109  | 5.49    | 23.50 | - | 23.85 | 12   | 0.29 | 32      | 0.78   |  |
| 41              | 2.06 | 150  | 7.55    | 23.85 | - | 24.20 | 26   | 0.64 | 58      | 1.42   |  |
| 64              | 3.22 | 214  | 10.78   | 24.20 | - | 24.55 | 35   | 0.86 | 93      | 2.28   |  |
| 43              | 2.17 | 257  | 12.94   | 24.55 | - | 24.90 | 63   | 1.54 | 156     | 3.82   |  |
| 92              | 4.63 | 349  | 17.57   | 24.90 | - | 25.25 | 76   | 1.86 | 232     | 5.68   |  |
| 83              | 4.18 | 432  | 21.75   | 25.25 | - | 25.60 | 128  | 3.14 | 360     | 8.82   |  |
| 98              | 4.93 | 530  | 26.69   | 25.60 | - | 25.95 | 144  | 3.53 | 504     | 12.35  |  |
| 96              | 4.83 | 626  | 31.52   | 25.95 | - | 26.30 | 256  | 6.27 | 760     | 18.62  |  |
| 138             | 6.95 | 764  | 38.47   | 26.30 | - | 26.65 | 209  | 5.12 | 969     | 23.74  |  |
| 99              | 4.98 | 863  | 43.45   | 26.65 | - | 27.00 | 326  | 7.99 | 1295    | 31.72  |  |
| 155             | 7.80 | 1018 | 51.26   | 27.00 | - | 27.35 | 264  | 6.47 | 1559    | 38.19  |  |
| 105             | 5.29 | 1123 | 56.55   | 27.35 | - | 27.70 | 348  | 8.53 | 1907    | 46.72  |  |
| 134             | 6.75 | 1257 | 63.29   | 27.70 | - | 28.05 | 270  | 6.61 | 2177    | 53.33  |  |
| 102             | 5.14 | 1359 | 68.43   | 28.05 | - | 28.40 | 309  | 7.57 | 2486    | 60.90  |  |
| 134             | 6.75 | 1493 | 75.18   | 28.40 | - | 28.75 | 276  | 6.76 | 2762    | 67.66  |  |
| 81              | 4.08 | 1574 | 79.25   | 28.75 | - | 29.10 | 293  | 7.18 | 3055    | 74.84  |  |
| 77              | 3.88 | 1651 | 83.13   | 29.10 | - | 29.45 | 211  | 5.17 | 3266    | 80.01  |  |
| 59              | 2.97 | 1710 | 86.10   | 29.45 | - | 29.80 | 254  | 6.22 | 3520    | 86.23  |  |
| 92              | 4.63 | 1802 | 90.74   | 29.80 | - | 30.15 | 132  | 3.23 | 3652    | 89.47  |  |
| 42              | 2.11 | 1844 | 92.85   | 30.15 | - | 30.50 | 137  | 3.36 | 3789    | 92.82  |  |
| 33              | 1.66 | 1877 | 94.51   | 30.50 | - | 30.85 | 83   | 2.03 | 3872    | 94.86  |  |
| 20              | 1.01 | 1897 | 95.52   | 30.85 | - | 31.20 | 88   | 2.16 | 3960    | 97.01  |  |
| 20              | 1.01 | 1917 | 96.53   | 31.20 | - | 31.55 | 37   | 0.91 | 3997    | 97.92  |  |
| 12              | 0.60 | 1929 | 97.13   | 31.55 | - | 31.90 | 42   | 1.03 | 4039    | 98.95  |  |
| 13              | 0.65 | 1942 | 97.78   | 31.90 | - | 32.25 | 12   | 0.29 | 4051    | 99.24  |  |
| 8               | 0.40 | 1950 | 98.19   | 32.25 | - | 32.60 | 8    | 0.20 | 4059    | 99.44  |  |
| 11              | 0.55 | 1961 | 98.74   | 32.60 | - | 32.95 | 6    | 0.15 | 4065    | 99.58  |  |
| 6               | 0.30 | 1967 | 99.04   | 32.95 | - | 33.30 | 10   | 0.24 | 4075    | 99.83  |  |
| 8               | 0.40 | 1975 | 99.45   | 33.30 | - | 33.65 | 5    | 0.12 | 4080    | 99.95  |  |
| 6               | 0.30 | 1981 | 99.75   | 33.65 | - | 34.00 | 2    | 0.05 | 4082    | 100.00 |  |
| 2               | 0.10 | 1983 | 99.85   | 34.00 | - | 34.35 |      |      |         |        |  |
| 0               | 0.00 | 1983 | 99.85   | 34.35 | - | 34.70 |      |      |         |        |  |
| 1               | 0.05 | 1984 | 99.90   | 34.70 | - | 35.05 |      |      |         |        |  |
| 0               | 0.00 | 1984 | 99.90   | 35.05 | - | 35.40 |      |      |         |        |  |
| 1               | 0.05 | 1985 | 99.95   | 35.40 | - | 35.75 |      |      |         |        |  |
| 0               | 0.00 | 1985 | 99.95   | 35.75 | - | 36.10 |      |      |         |        |  |
| 1               | 0.05 | 1986 | 100.00  | 36.10 | - | 36.45 |      |      |         |        |  |

## (11) BIDELOID BREADTH

The maximum horizontal distance between the lateral margins of the upper arms on the deltoid muscles is measured with a beam caliper. The participant sits erect, looking straight ahead. The shoulders and upper arms are relaxed, and the forearms and hands are extended forward horizontally with the palms facing each other. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 38.80       | 15.28 | 1ST  | 43.90 | 17.28 |
| 39.50       | 15.55 | 2ND  | 44.70 | 17.60 |
| 40.00       | 15.75 | 3RD  | 45.20 | 17.80 |
| 40.60       | 15.98 | 5TH  | 45.90 | 18.07 |
| 41.50       | 16.34 | 10TH | 47.00 | 18.50 |
| 42.10       | 16.57 | 15TH | 47.70 | 18.78 |
| 42.60       | 16.77 | 20TH | 48.30 | 19.02 |
| 43.00       | 16.93 | 25TH | 48.90 | 19.25 |
| 43.50       | 17.13 | 30TH | 49.30 | 19.41 |
| 43.90       | 17.28 | 35TH | 49.70 | 19.57 |
| 44.30       | 17.44 | 40TH | 50.20 | 19.76 |
| 44.70       | 17.60 | 45TH | 50.50 | 19.88 |
| 45.00       | 17.72 | 50TH | 50.90 | 20.04 |
| 45.30       | 17.83 | 55TH | 51.30 | 20.20 |
| 45.60       | 17.95 | 60TH | 51.70 | 20.35 |
| 46.00       | 18.11 | 65TH | 52.10 | 20.51 |
| 46.40       | 18.27 | 70TH | 52.60 | 20.71 |
| 46.90       | 18.46 | 75TH | 53.10 | 20.91 |
| 47.40       | 18.66 | 80TH | 53.70 | 21.14 |
| 47.90       | 18.86 | 85TH | 54.40 | 21.42 |
| 48.80       | 19.21 | 90TH | 55.30 | 21.77 |
| 49.90       | 19.65 | 95TH | 56.70 | 22.32 |
| 50.80       | 20.00 | 97TH | 57.50 | 22.64 |
| 51.40       | 20.24 | 98TH | 58.30 | 22.95 |
| 52.20       | 20.55 | 99TH | 59.30 | 23.35 |

## (11) BIDELOID BREADTH

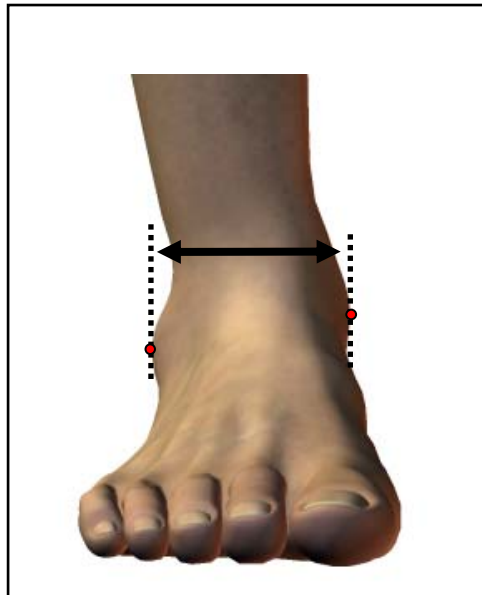
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 45.03                    | MEAN                | 17.73 |
| 0.06                     | STD ERROR (MEAN)    | 0.03  |
| 2.87                     | STANDARD DEVIATION  | 1.13  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 35.70                    | MINIMUM             | 14.06 |
| 55.80                    | MAXIMUM             | 21.97 |
| SKEWNESS                 |                     | 0.22  |
| KURTOSIS                 |                     | 3.18  |
| COEFFICIENT OF VARIATION |                     | 6.4%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 51.04                    | MEAN                | 20.10 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 3.25                     | STANDARD DEVIATION  | 1.28  |
| 0.04                     | STD ERROR (STD DEV) | 0.01  |
| 37.40                    | MINIMUM             | 14.72 |
| 63.70                    | MAXIMUM             | 25.08 |
| SKEWNESS                 |                     | 0.21  |
| KURTOSIS                 |                     | 3.14  |
| COEFFICIENT OF VARIATION |                     | 6.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   | MALES |      |       |         |
|---------|-------|------|---------|-----------------|---|-------|------|-------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   | F     | FPct | CumF  | CumFPct |
| 2       | 0.10  | 2    | 0.10    | 35.25           | - | 36.00 |      |       |         |
| 1       | 0.05  | 3    | 0.15    | 36.00           | - | 36.75 |      |       |         |
| 3       | 0.15  | 6    | 0.30    | 36.75           | - | 37.50 | 1    | 0.02  | 0.02    |
| 6       | 0.30  | 12   | 0.60    | 37.50           | - | 38.25 | 0    | 0.00  | 0.02    |
| 11      | 0.55  | 23   | 1.16    | 38.25           | - | 39.00 | 0    | 0.00  | 0.02    |
| 26      | 1.31  | 49   | 2.47    | 39.00           | - | 39.75 | 0    | 0.00  | 0.02    |
| 44      | 2.22  | 93   | 4.68    | 39.75           | - | 40.50 | 0    | 0.00  | 0.02    |
| 72      | 3.63  | 165  | 8.31    | 40.50           | - | 41.25 | 2    | 0.05  | 0.07    |
| 106     | 5.34  | 271  | 13.65   | 41.25           | - | 42.00 | 3    | 0.07  | 0.15    |
| 174     | 8.76  | 445  | 22.41   | 42.00           | - | 42.75 | 4    | 0.10  | 0.24    |
| 150     | 7.55  | 595  | 29.96   | 42.75           | - | 43.50 | 14   | 0.34  | 0.59    |
| 198     | 9.97  | 793  | 39.93   | 43.50           | - | 44.25 | 29   | 0.71  | 1.30    |
| 192     | 9.67  | 985  | 49.60   | 44.25           | - | 45.00 | 46   | 1.13  | 2.43    |
| 254     | 12.79 | 1239 | 62.39   | 45.00           | - | 45.75 | 88   | 2.16  | 4.58    |
| 158     | 7.96  | 1397 | 70.34   | 45.75           | - | 46.50 | 111  | 2.72  | 7.30    |
| 163     | 8.21  | 1560 | 78.55   | 46.50           | - | 47.25 | 180  | 4.41  | 11.71   |
| 131     | 6.60  | 1691 | 85.15   | 47.25           | - | 48.00 | 202  | 4.95  | 16.66   |
| 94      | 4.73  | 1785 | 89.88   | 48.00           | - | 48.75 | 292  | 7.15  | 23.81   |
| 67      | 3.37  | 1852 | 93.25   | 48.75           | - | 49.50 | 323  | 7.91  | 31.72   |
| 50      | 2.52  | 1902 | 95.77   | 49.50           | - | 50.25 | 399  | 9.77  | 41.50   |
| 34      | 1.71  | 1936 | 97.48   | 50.25           | - | 51.00 | 357  | 8.75  | 50.24   |
| 21      | 1.06  | 1957 | 98.54   | 51.00           | - | 51.75 | 408  | 10.00 | 60.24   |
| 14      | 0.70  | 1971 | 99.24   | 51.75           | - | 52.50 | 349  | 8.55  | 68.79   |
| 7       | 0.35  | 1978 | 99.60   | 52.50           | - | 53.25 | 297  | 7.28  | 76.07   |
| 2       | 0.10  | 1980 | 99.70   | 53.25           | - | 54.00 | 237  | 5.81  | 81.87   |
| 3       | 0.15  | 1983 | 99.85   | 54.00           | - | 54.75 | 211  | 5.17  | 87.04   |
| 1       | 0.05  | 1984 | 99.90   | 54.75           | - | 55.50 | 159  | 3.90  | 90.94   |
| 2       | 0.10  | 1986 | 100.00  | 55.50           | - | 56.25 | 119  | 2.92  | 93.85   |
|         |       |      |         | 56.25           | - | 57.00 | 79   | 1.94  | 95.79   |
|         |       |      |         | 57.00           | - | 57.75 | 65   | 1.59  | 97.38   |
|         |       |      |         | 57.75           | - | 58.50 | 34   | 0.83  | 98.21   |
|         |       |      |         | 58.50           | - | 59.25 | 31   | 0.76  | 98.97   |
|         |       |      |         | 59.25           | - | 60.00 | 18   | 0.44  | 99.41   |
|         |       |      |         | 60.00           | - | 60.75 | 13   | 0.32  | 99.73   |
|         |       |      |         | 60.75           | - | 61.50 | 7    | 0.17  | 99.90   |
|         |       |      |         | 61.50           | - | 62.25 | 2    | 0.05  | 99.95   |
|         |       |      |         | 62.25           | - | 63.00 | 1    | 0.02  | 99.98   |
|         |       |      |         | 63.00           | - | 63.75 | 1    | 0.02  | 100.00  |

## (12) BIMALLEOLAR BREADTH

The horizontal distance between the maximum protrusions of the ankle bones (lateral and medial malleoli) of the right foot is measured with a Holtain caliper. The participant stands with the weight equally distributed on both feet.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 5.90        | 2.32 | 1ST  | 6.60  | 2.60 |
| 6.00        | 2.36 | 2ND  | 6.70  | 2.64 |
| 6.10        | 2.40 | 3RD  | 6.70  | 2.64 |
| 6.10        | 2.40 | 5TH  | 6.80  | 2.68 |
| 6.30        | 2.48 | 10TH | 7.00  | 2.76 |
| 6.40        | 2.52 | 15TH | 7.00  | 2.76 |
| 6.40        | 2.52 | 20TH | 7.10  | 2.80 |
| 6.50        | 2.56 | 25TH | 7.20  | 2.83 |
| 6.50        | 2.56 | 30TH | 7.30  | 2.87 |
| 6.60        | 2.60 | 35TH | 7.30  | 2.87 |
| 6.60        | 2.60 | 40TH | 7.40  | 2.91 |
| 6.60        | 2.60 | 45TH | 7.40  | 2.91 |
| 6.70        | 2.64 | 50TH | 7.50  | 2.95 |
| 6.70        | 2.64 | 55TH | 7.50  | 2.95 |
| 6.80        | 2.68 | 60TH | 7.60  | 2.99 |
| 6.80        | 2.68 | 65TH | 7.60  | 2.99 |
| 6.90        | 2.72 | 70TH | 7.70  | 3.03 |
| 6.90        | 2.72 | 75TH | 7.70  | 3.03 |
| 7.00        | 2.76 | 80TH | 7.80  | 3.07 |
| 7.10        | 2.80 | 85TH | 7.90  | 3.11 |
| 7.10        | 2.80 | 90TH | 8.00  | 3.15 |
| 7.30        | 2.87 | 95TH | 8.10  | 3.19 |
| 7.40        | 2.91 | 97TH | 8.30  | 3.27 |
| 7.50        | 2.95 | 98TH | 8.40  | 3.31 |
| 7.50        | 2.95 | 99TH | 8.50  | 3.35 |

## (12) BIMALLEOLAR BREADTH

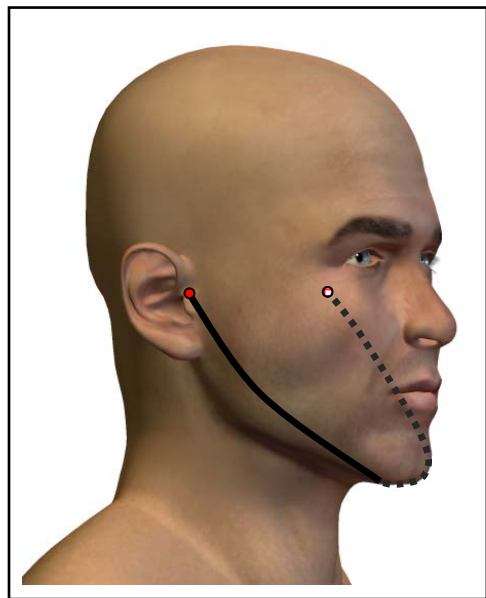
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 6.70                     |                     | 2.64 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.35                     | STANDARD DEVIATION  | 0.14 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 5.50                     | MINIMUM             | 2.17 |
| 8.30                     | MAXIMUM             | 3.27 |
| SKEWNESS                 |                     | 0.18 |
| KURTOSIS                 |                     | 3.42 |
| COEFFICIENT OF VARIATION |                     | 5.2% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 7.48                     |                     | 2.94 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.41                     | STANDARD DEVIATION  | 0.16 |
| 0.00                     | STD ERROR (STD DEV) | 0.00 |
| 5.90                     | MINIMUM             | 2.32 |
| 9.10                     | MAXIMUM             | 3.58 |
| SKEWNESS                 |                     | 0.17 |
| KURTOSIS                 |                     | 3.24 |
| COEFFICIENT OF VARIATION |                     | 5.5% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |       |      |         |      |   |       |      |       |         |        |  |
|-----------------|-------|------|---------|------|---|-------|------|-------|---------|--------|--|
| FEMALES         |       |      |         |      |   | MALES |      |       |         |        |  |
| F               | FPct  | CumF | CumFPct | CM   |   | F     | FPct | CumF  | CumFPct |        |  |
| 1               | 0.05  | 1    | 0.05    | 5.45 | - | 5.55  |      |       |         |        |  |
| 3               | 0.15  | 4    | 0.20    | 5.55 | - | 5.65  |      |       |         |        |  |
| 3               | 0.15  | 7    | 0.35    | 5.65 | - | 5.75  |      |       |         |        |  |
| 5               | 0.25  | 12   | 0.60    | 5.75 | - | 5.85  |      |       |         |        |  |
| 8               | 0.40  | 20   | 1.01    | 5.85 | - | 5.95  |      |       |         |        |  |
| 38              | 1.91  | 58   | 2.92    | 5.95 | - | 6.05  | 1    | 0.02  | 1       | 0.02   |  |
| 54              | 2.72  | 112  | 5.64    | 6.05 | - | 6.15  | 1    | 0.02  | 2       | 0.05   |  |
| 69              | 3.47  | 181  | 9.11    | 6.15 | - | 6.25  | 1    | 0.02  | 3       | 0.07   |  |
| 70              | 3.52  | 251  | 12.64   | 6.25 | - | 6.35  | 3    | 0.07  | 4       | 0.10   |  |
| 193             | 9.72  | 444  | 22.36   | 6.35 | - | 6.45  | 3    | 0.07  | 7       | 0.17   |  |
| 209             | 10.52 | 653  | 32.88   | 6.45 | - | 6.55  | 4    | 0.10  | 11      | 0.27   |  |
| 247             | 12.44 | 900  | 45.32   | 6.55 | - | 6.65  | 25   | 0.61  | 36      | 0.88   |  |
| 247             | 12.44 | 1147 | 57.75   | 6.65 | - | 6.75  | 45   | 1.10  | 81      | 1.98   |  |
| 210             | 10.57 | 1357 | 68.33   | 6.75 | - | 6.85  | 47   | 1.15  | 128     | 3.14   |  |
| 151             | 7.60  | 1508 | 75.93   | 6.85 | - | 6.95  | 104  | 2.55  | 232     | 5.68   |  |
| 170             | 8.56  | 1678 | 84.49   | 6.95 | - | 7.05  | 123  | 3.01  | 355     | 8.70   |  |
| 116             | 5.84  | 1794 | 90.33   | 7.05 | - | 7.15  | 289  | 7.08  | 644     | 15.78  |  |
| 72              | 3.63  | 1866 | 93.96   | 7.15 | - | 7.25  | 277  | 6.79  | 921     | 22.56  |  |
| 30              | 1.51  | 1896 | 95.47   | 7.25 | - | 7.35  | 278  | 6.81  | 1199    | 29.37  |  |
| 49              | 2.47  | 1945 | 97.94   | 7.35 | - | 7.45  | 288  | 7.06  | 1487    | 36.43  |  |
| 23              | 1.16  | 1968 | 99.09   | 7.45 | - | 7.55  | 468  | 11.46 | 1955    | 47.89  |  |
| 9               | 0.45  | 1977 | 99.55   | 7.55 | - | 7.65  | 395  | 9.68  | 2350    | 57.57  |  |
| 5               | 0.25  | 1982 | 99.80   | 7.65 | - | 7.75  | 391  | 9.58  | 2741    | 67.15  |  |
| 1               | 0.05  | 1983 | 99.85   | 7.75 | - | 7.85  | 341  | 8.35  | 3082    | 75.50  |  |
| 1               | 0.05  | 1984 | 99.90   | 7.85 | - | 7.95  | 290  | 7.10  | 3372    | 82.61  |  |
| 0               | 0.00  | 1984 | 99.90   | 7.95 | - | 8.05  | 196  | 4.80  | 3568    | 87.41  |  |
| 0               | 0.00  | 1984 | 99.90   | 8.05 | - | 8.15  | 197  | 4.83  | 3765    | 92.23  |  |
| 1               | 0.05  | 1985 | 99.95   | 8.15 | - | 8.25  | 126  | 3.09  | 3891    | 95.32  |  |
| 1               | 0.05  | 1986 | 100.00  | 8.25 | - | 8.35  | 53   | 1.30  | 3944    | 96.62  |  |
|                 |       |      |         | 8.35 | - | 8.45  | 36   | 0.88  | 3980    | 97.50  |  |
|                 |       |      |         | 8.45 | - | 8.55  | 44   | 1.08  | 4024    | 98.58  |  |
|                 |       |      |         | 8.55 | - | 8.65  | 20   | 0.49  | 4044    | 99.07  |  |
|                 |       |      |         | 8.65 | - | 8.75  | 13   | 0.32  | 4057    | 99.39  |  |
|                 |       |      |         | 8.75 | - | 8.85  | 12   | 0.29  | 4069    | 99.68  |  |
|                 |       |      |         | 8.85 | - | 8.95  | 8    | 0.20  | 4077    | 99.88  |  |
|                 |       |      |         | 8.95 | - | 9.05  | 2    | 0.05  | 4079    | 99.93  |  |
|                 |       |      |         | 9.05 | - | 9.15  | 2    | 0.05  | 4081    | 99.98  |  |
|                 |       |      |         |      |   |       | 1    | 0.02  | 4082    | 100.00 |  |

### (13) BITRAGION CHIN ARC

The surface distance between the right and left tragon landmarks across the chin landmark is measured with a tape. The teeth are lightly occluded.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 28.00       | 11.02 | 1ST  | 29.80 | 11.73 |
| 28.30       | 11.14 | 2ND  | 30.30 | 11.93 |
| 28.50       | 11.22 | 3RD  | 30.60 | 12.05 |
| 28.80       | 11.34 | 5TH  | 30.90 | 12.17 |
| 29.30       | 11.54 | 10TH | 31.40 | 12.36 |
| 29.60       | 11.65 | 15TH | 31.70 | 12.48 |
| 29.80       | 11.73 | 20TH | 32.00 | 12.60 |
| 30.20       | 11.89 | 25TH | 32.20 | 12.68 |
| 30.40       | 11.97 | 30TH | 32.40 | 12.76 |
| 30.50       | 12.01 | 35TH | 32.60 | 12.83 |
| 30.70       | 12.09 | 40TH | 32.80 | 12.91 |
| 30.80       | 12.13 | 45TH | 33.00 | 12.99 |
| 31.10       | 12.24 | 50TH | 33.20 | 13.07 |
| 31.30       | 12.32 | 55TH | 33.30 | 13.11 |
| 31.50       | 12.40 | 60TH | 33.50 | 13.19 |
| 31.60       | 12.44 | 65TH | 33.70 | 13.27 |
| 31.80       | 12.52 | 70TH | 33.90 | 13.35 |
| 32.10       | 12.64 | 75TH | 34.10 | 13.43 |
| 32.30       | 12.72 | 80TH | 34.40 | 13.54 |
| 32.60       | 12.83 | 85TH | 34.60 | 13.62 |
| 32.90       | 12.95 | 90TH | 35.00 | 13.78 |
| 33.50       | 13.19 | 95TH | 35.50 | 13.98 |
| 33.80       | 13.31 | 97TH | 35.70 | 14.06 |
| 34.00       | 13.39 | 98TH | 36.10 | 14.21 |
| 34.40       | 13.54 | 99TH | 36.60 | 14.41 |

### (13) BITRAGON CHIN ARC

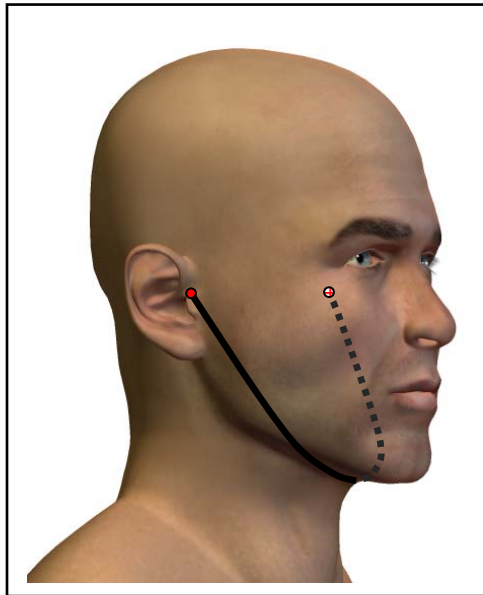
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 31.10                    | MEAN                | 12.24 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.42                     | STANDARD DEVIATION  | 0.56  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 26.70                    | MINIMUM             | 10.51 |
| 37.00                    | MAXIMUM             | 14.57 |
| SKEWNESS                 |                     | 0.14  |
| KURTOSIS                 |                     | 3.08  |
| COEFFICIENT OF VARIATION |                     | 4.6%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 33.17                    | MEAN                | 13.06 |
| 0.02                     | STD ERROR (MEAN)    | 0.01  |
| 1.40                     | STANDARD DEVIATION  | 0.55  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 28.10                    | MINIMUM             | 11.06 |
| 38.50                    | MAXIMUM             | 15.16 |
| SKEWNESS                 |                     | 0.03  |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 4.2%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |       |   |       |  |       |      |      |         |
|-----------------|------|------|---------|-------|---|-------|--|-------|------|------|---------|
| FEMALES         |      |      |         |       |   |       |  | MALES |      |      |         |
| F               | FPct | CumF | CumFPct | CM    |   |       |  | F     | FPct | CumF | CumFPct |
| 3               | 0.15 | 3    | 0.15    | 26.60 | - | 26.85 |  |       |      |      |         |
| 0               | 0.00 | 3    | 0.15    | 26.85 | - | 27.10 |  |       |      |      |         |
| 1               | 0.05 | 4    | 0.20    | 27.10 | - | 27.35 |  |       |      |      |         |
| 2               | 0.10 | 6    | 0.30    | 27.35 | - | 27.60 |  |       |      |      |         |
| 7               | 0.35 | 13   | 0.65    | 27.60 | - | 27.85 |  |       |      |      |         |
| 9               | 0.45 | 22   | 1.11    | 27.85 | - | 28.10 |  |       |      |      |         |
| 20              | 1.01 | 42   | 2.11    | 28.10 | - | 28.35 |  | 1     | 0.02 | 1    | 0.02    |
| 24              | 1.21 | 66   | 3.32    | 28.35 | - | 28.60 |  | 1     | 0.02 | 2    | 0.05    |
| 44              | 2.22 | 110  | 5.54    | 28.60 | - | 28.85 |  | 5     | 0.12 | 7    | 0.17    |
| 30              | 1.51 | 140  | 7.05    | 28.85 | - | 29.10 |  | 3     | 0.07 | 10   | 0.24    |
| 63              | 3.17 | 203  | 10.22   | 29.10 | - | 29.35 |  | 8     | 0.20 | 18   | 0.44    |
| 71              | 3.58 | 274  | 13.80   | 29.35 | - | 29.60 |  | 8     | 0.20 | 26   | 0.64    |
| 126             | 6.34 | 400  | 20.14   | 29.60 | - | 29.85 |  | 15    | 0.37 | 41   | 1.00    |
| 69              | 3.47 | 469  | 23.62   | 29.85 | - | 30.10 |  | 13    | 0.32 | 54   | 1.32    |
| 121             | 6.09 | 590  | 29.71   | 30.10 | - | 30.35 |  | 35    | 0.86 | 89   | 2.18    |
| 118             | 5.94 | 708  | 35.65   | 30.35 | - | 30.60 |  | 32    | 0.78 | 121  | 2.96    |
| 188             | 9.47 | 896  | 45.12   | 30.60 | - | 30.85 |  | 76    | 1.86 | 197  | 4.83    |
| 85              | 4.28 | 981  | 49.40   | 30.85 | - | 31.10 |  | 50    | 1.22 | 247  | 6.05    |
| 142             | 7.15 | 1123 | 56.55   | 31.10 | - | 31.35 |  | 129   | 3.16 | 376  | 9.21    |
| 113             | 5.69 | 1236 | 62.24   | 31.35 | - | 31.60 |  | 122   | 2.99 | 498  | 12.20   |
| 168             | 8.46 | 1404 | 70.69   | 31.60 | - | 31.85 |  | 218   | 5.34 | 716  | 17.54   |
| 82              | 4.13 | 1486 | 74.82   | 31.85 | - | 32.10 |  | 160   | 3.92 | 876  | 21.46   |
| 135             | 6.80 | 1621 | 81.62   | 32.10 | - | 32.35 |  | 252   | 6.17 | 1128 | 27.63   |
| 64              | 3.22 | 1685 | 84.84   | 32.35 | - | 32.60 |  | 214   | 5.24 | 1342 | 32.88   |
| 99              | 4.98 | 1784 | 89.83   | 32.60 | - | 32.85 |  | 340   | 8.33 | 1682 | 41.21   |
| 28              | 1.41 | 1812 | 91.24   | 32.85 | - | 33.10 |  | 247   | 6.05 | 1929 | 47.26   |
| 59              | 2.97 | 1871 | 94.21   | 33.10 | - | 33.35 |  | 321   | 7.86 | 2250 | 55.12   |
| 27              | 1.36 | 1898 | 95.57   | 33.35 | - | 33.60 |  | 240   | 5.88 | 2490 | 61.00   |
| 32              | 1.61 | 1930 | 97.18   | 33.60 | - | 33.85 |  | 364   | 8.92 | 2854 | 69.92   |
| 17              | 0.86 | 1947 | 98.04   | 33.85 | - | 34.10 |  | 165   | 4.04 | 3019 | 73.96   |
| 15              | 0.76 | 1962 | 98.79   | 34.10 | - | 34.35 |  | 219   | 5.37 | 3238 | 79.32   |
| 7               | 0.35 | 1969 | 99.14   | 34.35 | - | 34.60 |  | 181   | 4.43 | 3419 | 83.76   |
| 5               | 0.25 | 1974 | 99.40   | 34.60 | - | 34.85 |  | 218   | 5.34 | 3637 | 89.10   |
| 2               | 0.10 | 1976 | 99.50   | 34.85 | - | 35.10 |  | 91    | 2.23 | 3728 | 91.33   |
| 3               | 0.15 | 1979 | 99.65   | 35.10 | - | 35.35 |  | 102   | 2.50 | 3830 | 93.83   |
| 2               | 0.10 | 1981 | 99.75   | 35.35 | - | 35.60 |  | 84    | 2.06 | 3914 | 95.88   |
| 3               | 0.15 | 1984 | 99.90   | 35.60 | - | 35.85 |  | 59    | 1.45 | 3973 | 97.33   |
| 0               | 0.00 | 1984 | 99.90   | 35.85 | - | 36.10 |  | 25    | 0.61 | 3998 | 97.94   |
| 0               | 0.00 | 1984 | 99.90   | 36.10 | - | 36.35 |  | 23    | 0.56 | 4021 | 98.51   |
| 1               | 0.05 | 1985 | 99.95   | 36.35 | - | 36.60 |  | 19    | 0.47 | 4040 | 98.97   |
| 0               | 0.00 | 1985 | 99.95   | 36.60 | - | 36.85 |  | 14    | 0.34 | 4054 | 99.31   |
| 1               | 0.05 | 1986 | 100.00  | 36.85 | - | 37.10 |  | 9     | 0.22 | 4063 | 99.53   |
|                 |      |      |         | 37.10 | - | 37.35 |  | 10    | 0.24 | 4073 | 99.78   |
|                 |      |      |         | 37.35 | - | 37.60 |  | 3     | 0.07 | 4076 | 99.85   |
|                 |      |      |         | 37.60 | - | 37.85 |  | 5     | 0.12 | 4081 | 99.98   |
|                 |      |      |         | 37.85 | - | 38.10 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 38.10 | - | 38.35 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 38.35 | - | 38.60 |  | 1     | 0.02 | 4082 | 100.00  |

#### (14) BITRAGON SUBMANDIBULAR ARC

The surface distance between the right and left tragon landmarks across the submandibular landmark is measured with a tape. The head is in the Frankfurt plane, and the teeth are lightly occluded.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 25.50       | 10.04 | 1ST  | 27.90 | 10.98 |
| 25.70       | 10.12 | 2ND  | 28.30 | 11.14 |
| 26.10       | 10.28 | 3RD  | 28.60 | 11.26 |
| 26.40       | 10.39 | 5TH  | 28.90 | 11.38 |
| 26.80       | 10.55 | 10TH | 29.50 | 11.61 |
| 27.20       | 10.71 | 15TH | 29.90 | 11.77 |
| 27.50       | 10.83 | 20TH | 30.20 | 11.89 |
| 27.70       | 10.91 | 25TH | 30.50 | 12.01 |
| 28.00       | 11.02 | 30TH | 30.70 | 12.09 |
| 28.20       | 11.10 | 35TH | 31.00 | 12.20 |
| 28.40       | 11.18 | 40TH | 31.10 | 12.24 |
| 28.60       | 11.26 | 45TH | 31.30 | 12.32 |
| 28.70       | 11.30 | 50TH | 31.50 | 12.40 |
| 29.00       | 11.42 | 55TH | 31.70 | 12.48 |
| 29.20       | 11.50 | 60TH | 32.00 | 12.60 |
| 29.30       | 11.54 | 65TH | 32.20 | 12.68 |
| 29.60       | 11.65 | 70TH | 32.40 | 12.76 |
| 29.70       | 11.69 | 75TH | 32.60 | 12.83 |
| 30.10       | 11.85 | 80TH | 33.00 | 12.99 |
| 30.40       | 11.97 | 85TH | 33.30 | 13.11 |
| 30.70       | 12.09 | 90TH | 33.70 | 13.27 |
| 31.30       | 12.32 | 95TH | 34.50 | 13.58 |
| 31.70       | 12.48 | 97TH | 34.80 | 13.70 |
| 32.10       | 12.64 | 98TH | 35.20 | 13.86 |
| 32.40       | 12.76 | 99TH | 35.70 | 14.06 |

## (14) BITRAGON SUBMANDIBULAR ARC

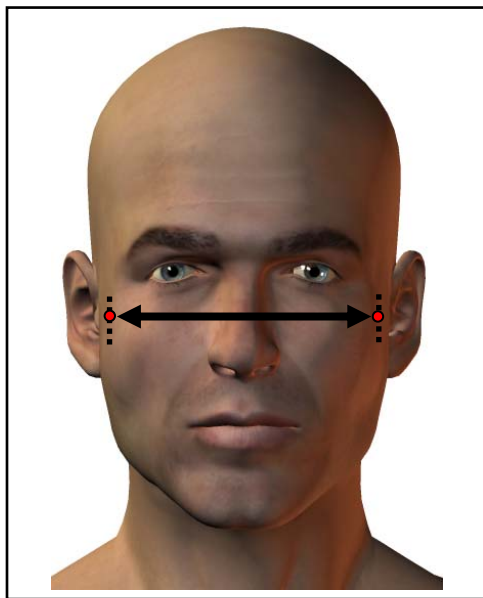
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 28.80                    | MEAN                | 11.34 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.53                     | STANDARD DEVIATION  | 0.60  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 24.50                    | MINIMUM             | 9.65  |
| 37.80                    | MAXIMUM             | 14.88 |
| SKEWNESS                 |                     | 0.25  |
| KURTOSIS                 |                     | 3.49  |
| COEFFICIENT OF VARIATION |                     | 5.3%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 31.57                    | MEAN                | 12.43 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.66                     | STANDARD DEVIATION  | 0.66  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 25.90                    | MINIMUM             | 10.20 |
| 39.00                    | MAXIMUM             | 15.35 |
| SKEWNESS                 |                     | 0.16  |
| KURTOSIS                 |                     | 3.13  |
| COEFFICIENT OF VARIATION |                     | 5.3%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 5       | 0.25  | 5    | 0.25    | 24.45           | - | 24.80 |  |       |      |      |         |
| 3       | 0.15  | 8    | 0.40    | 24.80           | - | 25.15 |  |       |      |      |         |
| 9       | 0.45  | 17   | 0.86    | 25.15           | - | 25.50 |  |       |      |      |         |
| 24      | 1.21  | 41   | 2.06    | 25.50           | - | 25.85 |  |       |      |      |         |
| 34      | 1.71  | 75   | 3.78    | 25.85           | - | 26.20 |  | 1     | 0.02 | 1    | 0.02    |
| 52      | 2.62  | 127  | 6.39    | 26.20           | - | 26.55 |  | 2     | 0.05 | 3    | 0.07    |
| 79      | 3.98  | 206  | 10.37   | 26.55           | - | 26.90 |  | 3     | 0.07 | 6    | 0.15    |
| 103     | 5.19  | 309  | 15.56   | 26.90           | - | 27.25 |  | 8     | 0.20 | 14   | 0.34    |
| 103     | 5.19  | 412  | 20.75   | 27.25           | - | 27.60 |  | 9     | 0.22 | 23   | 0.56    |
| 170     | 8.56  | 582  | 29.31   | 27.60           | - | 27.95 |  | 22    | 0.54 | 45   | 1.10    |
| 145     | 7.30  | 727  | 36.61   | 27.95           | - | 28.30 |  | 31    | 0.76 | 76   | 1.86    |
| 201     | 10.12 | 928  | 46.73   | 28.30           | - | 28.65 |  | 57    | 1.40 | 133  | 3.26    |
| 150     | 7.55  | 1078 | 54.28   | 28.65           | - | 29.00 |  | 86    | 2.11 | 219  | 5.37    |
| 216     | 10.88 | 1294 | 65.16   | 29.00           | - | 29.35 |  | 141   | 3.45 | 360  | 8.82    |
| 156     | 7.85  | 1450 | 73.01   | 29.35           | - | 29.70 |  | 164   | 4.02 | 524  | 12.84   |
| 136     | 6.85  | 1586 | 79.86   | 29.70           | - | 30.05 |  | 207   | 5.07 | 731  | 17.91   |
| 87      | 4.38  | 1673 | 84.24   | 30.05           | - | 30.40 |  | 194   | 4.75 | 925  | 22.66   |
| 119     | 5.99  | 1792 | 90.23   | 30.40           | - | 30.75 |  | 384   | 9.41 | 1309 | 32.07   |
| 41      | 2.06  | 1833 | 92.30   | 30.75           | - | 31.10 |  | 238   | 5.83 | 1547 | 37.90   |
| 60      | 3.02  | 1893 | 95.32   | 31.10           | - | 31.45 |  | 407   | 9.97 | 1954 | 47.87   |
| 35      | 1.76  | 1928 | 97.08   | 31.45           | - | 31.80 |  | 344   | 8.43 | 2298 | 56.30   |
| 22      | 1.11  | 1950 | 98.19   | 31.80           | - | 32.15 |  | 338   | 8.28 | 2636 | 64.58   |
| 17      | 0.86  | 1967 | 99.04   | 32.15           | - | 32.50 |  | 253   | 6.20 | 2889 | 70.77   |
| 9       | 0.45  | 1976 | 99.50   | 32.50           | - | 32.85 |  | 338   | 8.28 | 3227 | 79.05   |
| 3       | 0.15  | 1979 | 99.65   | 32.85           | - | 33.20 |  | 160   | 3.92 | 3387 | 82.97   |
| 2       | 0.10  | 1981 | 99.75   | 33.20           | - | 33.55 |  | 217   | 5.32 | 3604 | 88.29   |
| 2       | 0.10  | 1983 | 99.85   | 33.55           | - | 33.90 |  | 124   | 3.04 | 3728 | 91.33   |
| 1       | 0.05  | 1984 | 99.90   | 33.90           | - | 34.25 |  | 103   | 2.52 | 3831 | 93.85   |
| 1       | 0.05  | 1985 | 99.95   | 34.25           | - | 34.60 |  | 74    | 1.81 | 3905 | 95.66   |
| 0       | 0.00  | 1985 | 99.95   | 34.60           | - | 34.95 |  | 73    | 1.79 | 3978 | 97.45   |
| 0       | 0.00  | 1985 | 99.95   | 34.95           | - | 35.30 |  | 30    | 0.73 | 4008 | 98.19   |
| 0       | 0.00  | 1985 | 99.95   | 35.30           | - | 35.65 |  | 33    | 0.81 | 4041 | 99.00   |
| 0       | 0.00  | 1985 | 99.95   | 35.65           | - | 36.00 |  | 16    | 0.39 | 4057 | 99.39   |
| 0       | 0.00  | 1985 | 99.95   | 36.00           | - | 36.35 |  | 12    | 0.29 | 4069 | 99.68   |
| 0       | 0.00  | 1985 | 99.95   | 36.35           | - | 36.70 |  | 5     | 0.12 | 4074 | 99.80   |
| 0       | 0.00  | 1985 | 99.95   | 36.70           | - | 37.05 |  | 4     | 0.10 | 4078 | 99.90   |
| 0       | 0.00  | 1985 | 99.95   | 37.05           | - | 37.40 |  | 0     | 0.00 | 4078 | 99.90   |
| 0       | 0.00  | 1985 | 99.95   | 37.40           | - | 37.75 |  | 1     | 0.02 | 4079 | 99.93   |
| 1       | 0.05  | 1986 | 100.00  | 37.75           | - | 38.10 |  | 1     | 0.02 | 4080 | 99.95   |
|         |       |      |         | 38.10           | - | 38.45 |  | 1     | 0.02 | 4081 | 99.98   |
|         |       |      |         | 38.45           | - | 38.80 |  | 0     | 0.00 | 4081 | 99.98   |
|         |       |      |         | 38.80           | - | 39.15 |  | 1     | 0.02 | 4082 | 100.00  |

## (15) BIZYGOMATIC BREADTH

The maximum horizontal breadth of the face (between the zygomatic arches) at the left and right zygion landmarks is measured with a spreading caliper.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 12.20       | 4.80 | 1ST  | 12.90 | 5.08 |
| 12.30       | 4.84 | 2ND  | 13.10 | 5.16 |
| 12.40       | 4.88 | 3RD  | 13.10 | 5.16 |
| 12.50       | 4.92 | 5TH  | 13.30 | 5.24 |
| 12.60       | 4.96 | 10TH | 13.50 | 5.31 |
| 12.80       | 5.04 | 15TH | 13.60 | 5.35 |
| 12.90       | 5.08 | 20TH | 13.70 | 5.39 |
| 13.00       | 5.12 | 25TH | 13.80 | 5.43 |
| 13.10       | 5.16 | 30TH | 13.90 | 5.47 |
| 13.10       | 5.16 | 35TH | 14.00 | 5.51 |
| 13.20       | 5.20 | 40TH | 14.10 | 5.55 |
| 13.30       | 5.24 | 45TH | 14.20 | 5.59 |
| 13.40       | 5.28 | 50TH | 14.30 | 5.63 |
| 13.40       | 5.28 | 55TH | 14.30 | 5.63 |
| 13.50       | 5.31 | 60TH | 14.40 | 5.67 |
| 13.60       | 5.35 | 65TH | 14.50 | 5.71 |
| 13.60       | 5.35 | 70TH | 14.60 | 5.75 |
| 13.70       | 5.39 | 75TH | 14.70 | 5.79 |
| 13.80       | 5.43 | 80TH | 14.80 | 5.83 |
| 14.00       | 5.51 | 85TH | 14.90 | 5.87 |
| 14.10       | 5.55 | 90TH | 15.00 | 5.91 |
| 14.30       | 5.63 | 95TH | 15.30 | 6.02 |
| 14.50       | 5.71 | 97TH | 15.40 | 6.06 |
| 14.60       | 5.75 | 98TH | 15.60 | 6.14 |
| 14.70       | 5.79 | 99TH | 15.80 | 6.22 |

## (15) BIZYGOMATIC BREADTH

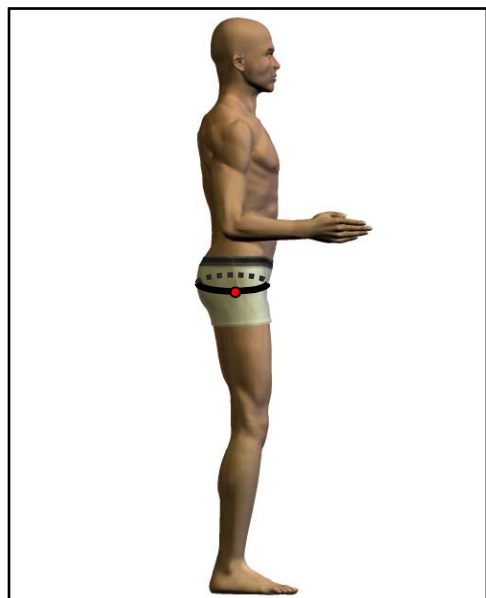
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 13.38                    |                     | 5.27 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.56                     | STANDARD DEVIATION  | 0.22 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 11.60                    | MINIMUM             | 4.57 |
| 15.20                    | MAXIMUM             | 5.98 |
| SKEWNESS                 |                     | 0.17 |
| KURTOSIS                 |                     | 2.94 |
| COEFFICIENT OF VARIATION |                     | 4.2% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 14.26                    |                     | 5.61 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.62                     | STANDARD DEVIATION  | 0.25 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 12.00                    | MINIMUM             | 4.72 |
| 17.40                    | MAXIMUM             | 6.85 |
| SKEWNESS                 |                     | 0.14 |
| KURTOSIS                 |                     | 3.19 |
| COEFFICIENT OF VARIATION |                     | 4.4% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |       |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 11.55           | - | 11.70 |  |       |       |      |         |
| 2       | 0.10  | 3    | 0.15    | 11.70           | - | 11.85 |  |       |       |      |         |
| 2       | 0.10  | 5    | 0.25    | 11.85           | - | 12.00 |  |       |       |      |         |
| 13      | 0.65  | 18   | 0.91    | 12.00           | - | 12.15 |  | 2     | 0.05  | 2    | 0.05    |
| 12      | 0.60  | 30   | 1.51    | 12.15           | - | 12.30 |  | 0     | 0.00  | 2    | 0.05    |
| 49      | 2.47  | 79   | 3.98    | 12.30           | - | 12.45 |  | 4     | 0.10  | 6    | 0.15    |
| 44      | 2.22  | 123  | 6.19    | 12.45           | - | 12.60 |  | 2     | 0.05  | 8    | 0.20    |
| 134     | 6.75  | 257  | 12.94   | 12.60           | - | 12.75 |  | 12    | 0.29  | 20   | 0.49    |
| 94      | 4.73  | 351  | 17.67   | 12.75           | - | 12.90 |  | 18    | 0.44  | 38   | 0.93    |
| 230     | 11.58 | 581  | 29.25   | 12.90           | - | 13.05 |  | 42    | 1.03  | 80   | 1.96    |
| 123     | 6.19  | 704  | 35.45   | 13.05           | - | 13.20 |  | 52    | 1.27  | 132  | 3.23    |
| 276     | 13.90 | 980  | 49.35   | 13.20           | - | 13.35 |  | 161   | 3.94  | 293  | 7.18    |
| 130     | 6.55  | 1110 | 55.89   | 13.35           | - | 13.50 |  | 92    | 2.25  | 385  | 9.43    |
| 281     | 14.15 | 1391 | 70.04   | 13.50           | - | 13.65 |  | 287   | 7.03  | 672  | 16.46   |
| 114     | 5.74  | 1505 | 75.78   | 13.65           | - | 13.80 |  | 179   | 4.39  | 851  | 20.85   |
| 175     | 8.81  | 1680 | 84.59   | 13.80           | - | 13.95 |  | 383   | 9.38  | 1234 | 30.23   |
| 96      | 4.83  | 1776 | 89.43   | 13.95           | - | 14.10 |  | 307   | 7.52  | 1541 | 37.75   |
| 74      | 3.73  | 1850 | 93.15   | 14.10           | - | 14.25 |  | 457   | 11.20 | 1998 | 48.95   |
| 40      | 2.01  | 1890 | 95.17   | 14.25           | - | 14.40 |  | 277   | 6.79  | 2275 | 55.73   |
| 52      | 2.62  | 1942 | 97.78   | 14.40           | - | 14.55 |  | 526   | 12.89 | 2801 | 68.62   |
| 10      | 0.50  | 1952 | 98.29   | 14.55           | - | 14.70 |  | 205   | 5.02  | 3006 | 73.64   |
| 22      | 1.11  | 1974 | 99.40   | 14.70           | - | 14.85 |  | 403   | 9.87  | 3409 | 83.51   |
| 4       | 0.20  | 1978 | 99.60   | 14.85           | - | 15.00 |  | 124   | 3.04  | 3533 | 86.55   |
| 7       | 0.35  | 1985 | 99.95   | 15.00           | - | 15.15 |  | 235   | 5.76  | 3768 | 92.31   |
| 1       | 0.05  | 1986 | 100.00  | 15.15           | - | 15.30 |  | 79    | 1.94  | 3847 | 94.24   |
|         |       |      |         | 15.30           | - | 15.45 |  | 114   | 2.79  | 3961 | 97.04   |
|         |       |      |         | 15.45           | - | 15.60 |  | 31    | 0.76  | 3992 | 97.80   |
|         |       |      |         | 15.60           | - | 15.75 |  | 44    | 1.08  | 4036 | 98.87   |
|         |       |      |         | 15.75           | - | 15.90 |  | 14    | 0.34  | 4050 | 99.22   |
|         |       |      |         | 15.90           | - | 16.05 |  | 19    | 0.47  | 4069 | 99.68   |
|         |       |      |         | 16.05           | - | 16.20 |  | 6     | 0.15  | 4075 | 99.83   |
|         |       |      |         | 16.20           | - | 16.35 |  | 2     | 0.05  | 4077 | 99.88   |
|         |       |      |         | 16.35           | - | 16.50 |  | 1     | 0.02  | 4078 | 99.90   |
|         |       |      |         | 16.50           | - | 16.65 |  | 3     | 0.07  | 4081 | 99.98   |
|         |       |      |         | 16.65           | - | 16.80 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 16.80           | - | 16.95 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 16.95           | - | 17.10 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 17.10           | - | 17.25 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 17.25           | - | 17.40 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 17.40           | - | 17.55 |  | 1     | 0.02  | 4082 | 100.00  |

## (16) BUTTOCK CIRCUMFERENCE

The horizontal circumference of the trunk at the level of the buttock point, posterior, right and left lateral landmarks, is measured with a tape. The participant stands erect with the heels together and the weight equally distributed on both feet.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 86.70       | 34.13 | 1ST  | 86.10  | 33.90 |
| 87.50       | 34.45 | 2ND  | 87.40  | 34.41 |
| 88.50       | 34.84 | 3RD  | 88.20  | 34.72 |
| 90.10       | 35.47 | 5TH  | 89.90  | 35.39 |
| 92.60       | 36.46 | 10TH | 92.20  | 36.30 |
| 94.50       | 37.20 | 15TH | 94.10  | 37.05 |
| 95.80       | 37.72 | 20TH | 95.50  | 37.60 |
| 96.90       | 38.15 | 25TH | 96.70  | 38.07 |
| 98.00       | 38.58 | 30TH | 97.70  | 38.46 |
| 98.90       | 38.94 | 35TH | 98.80  | 38.90 |
| 99.90       | 39.33 | 40TH | 99.70  | 39.25 |
| 100.80      | 39.69 | 45TH | 100.80 | 39.69 |
| 101.80      | 40.08 | 50TH | 101.70 | 40.04 |
| 102.90      | 40.51 | 55TH | 102.60 | 40.39 |
| 103.70      | 40.83 | 60TH | 103.60 | 40.79 |
| 104.60      | 41.18 | 65TH | 104.70 | 41.22 |
| 105.80      | 41.65 | 70TH | 105.70 | 41.61 |
| 106.90      | 42.09 | 75TH | 106.80 | 42.05 |
| 108.20      | 42.60 | 80TH | 108.20 | 42.60 |
| 110.00      | 43.31 | 85TH | 109.90 | 43.27 |
| 111.70      | 43.98 | 90TH | 111.80 | 44.02 |
| 115.60      | 45.51 | 95TH | 114.90 | 45.24 |
| 117.10      | 46.10 | 97TH | 117.20 | 46.14 |
| 118.20      | 46.54 | 98TH | 118.90 | 46.81 |
| 120.80      | 47.56 | 99TH | 121.80 | 47.95 |

## (16) BUTTOCK CIRCUMFERENCE

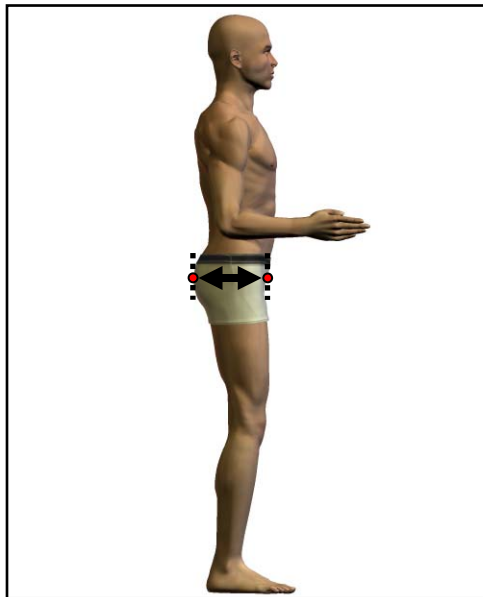
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 102.12                   | MEAN                | 40.21 |
| 0.17                     | STD ERROR (MEAN)    | 0.07  |
| 7.59                     | STANDARD DEVIATION  | 2.99  |
| 0.12                     | STD ERROR (STD DEV) | 0.05  |
| 79.80                    | MINIMUM             | 31.42 |
| 134.10                   | MAXIMUM             | 52.80 |
| SKEWNESS                 |                     | 0.31  |
| KURTOSIS                 |                     | 3.25  |
| COEFFICIENT OF VARIATION |                     | 7.4%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 101.95                   | MEAN                | 40.14 |
| 0.12                     | STD ERROR (MEAN)    | 0.05  |
| 7.67                     | STANDARD DEVIATION  | 3.02  |
| 0.08                     | STD ERROR (STD DEV) | 0.03  |
| 73.70                    | MINIMUM             | 29.02 |
| 130.50                   | MAXIMUM             | 51.38 |
| SKEWNESS                 |                     | 0.27  |
| KURTOSIS                 |                     | 3.17  |
| COEFFICIENT OF VARIATION |                     | 7.5%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
|         |      |      |         | 73.25           | - | 74.75  |  | 1     | 0.02 | 1    | 0.02    |
|         |      |      |         | 74.75           | - | 76.25  |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 76.25           | - | 77.75  |  | 1     | 0.02 | 2    | 0.05    |
|         |      |      |         | 77.75           | - | 79.25  |  | 0     | 0.00 | 2    | 0.05    |
| 2       | 0.10 | 2    | 0.10    | 79.25           | - | 80.75  |  | 1     | 0.02 | 3    | 0.07    |
| 2       | 0.10 | 4    | 0.20    | 80.75           | - | 82.25  |  | 4     | 0.10 | 7    | 0.17    |
| 4       | 0.20 | 8    | 0.40    | 82.25           | - | 83.75  |  | 3     | 0.07 | 10   | 0.24    |
| 3       | 0.15 | 11   | 0.55    | 83.75           | - | 85.25  |  | 16    | 0.39 | 26   | 0.64    |
| 11      | 0.55 | 22   | 1.11    | 85.25           | - | 86.75  |  | 33    | 0.81 | 59   | 1.45    |
| 32      | 1.61 | 54   | 2.72    | 86.75           | - | 88.25  |  | 66    | 1.62 | 125  | 3.06    |
| 28      | 1.41 | 82   | 4.13    | 88.25           | - | 89.75  |  | 72    | 1.76 | 197  | 4.83    |
| 54      | 2.72 | 136  | 6.85    | 89.75           | - | 91.25  |  | 114   | 2.79 | 311  | 7.62    |
| 70      | 3.52 | 206  | 10.37   | 91.25           | - | 92.75  |  | 155   | 3.80 | 466  | 11.42   |
| 80      | 4.03 | 286  | 14.40   | 92.75           | - | 94.25  |  | 176   | 4.31 | 642  | 15.73   |
| 108     | 5.44 | 394  | 19.84   | 94.25           | - | 95.75  |  | 210   | 5.14 | 852  | 20.87   |
| 132     | 6.65 | 526  | 26.49   | 95.75           | - | 97.25  |  | 265   | 6.49 | 1117 | 27.36   |
| 157     | 7.91 | 683  | 34.39   | 97.25           | - | 98.75  |  | 303   | 7.42 | 1420 | 34.79   |
| 154     | 7.75 | 837  | 42.15   | 98.75           | - | 100.25 |  | 311   | 7.62 | 1731 | 42.41   |
| 148     | 7.45 | 985  | 49.60   | 100.25          | - | 101.75 |  | 330   | 8.08 | 2061 | 50.49   |
| 151     | 7.60 | 1136 | 57.20   | 101.75          | - | 103.25 |  | 327   | 8.01 | 2388 | 58.50   |
| 161     | 8.11 | 1297 | 65.31   | 103.25          | - | 104.75 |  | 290   | 7.10 | 2678 | 65.61   |
| 142     | 7.15 | 1439 | 72.46   | 104.75          | - | 106.25 |  | 268   | 6.57 | 2946 | 72.17   |
| 113     | 5.69 | 1552 | 78.15   | 106.25          | - | 107.75 |  | 261   | 6.39 | 3207 | 78.56   |
| 100     | 5.04 | 1652 | 83.18   | 107.75          | - | 109.25 |  | 193   | 4.73 | 3400 | 83.29   |
| 89      | 4.48 | 1741 | 87.66   | 109.25          | - | 110.75 |  | 178   | 4.36 | 3578 | 87.65   |
| 57      | 2.87 | 1798 | 90.53   | 110.75          | - | 112.25 |  | 132   | 3.23 | 3710 | 90.89   |
| 40      | 2.01 | 1838 | 92.55   | 112.25          | - | 113.75 |  | 99    | 2.43 | 3809 | 93.31   |
| 43      | 2.17 | 1881 | 94.71   | 113.75          | - | 115.25 |  | 79    | 1.94 | 3888 | 95.25   |
| 38      | 1.91 | 1919 | 96.63   | 115.25          | - | 116.75 |  | 57    | 1.40 | 3945 | 96.64   |
| 28      | 1.41 | 1947 | 98.04   | 116.75          | - | 118.25 |  | 45    | 1.10 | 3990 | 97.75   |
| 13      | 0.65 | 1960 | 98.69   | 118.25          | - | 119.75 |  | 22    | 0.54 | 4012 | 98.29   |
| 9       | 0.45 | 1969 | 99.14   | 119.75          | - | 121.25 |  | 21    | 0.51 | 4033 | 98.80   |
| 3       | 0.15 | 1972 | 99.30   | 121.25          | - | 122.75 |  | 14    | 0.34 | 4047 | 99.14   |
| 3       | 0.15 | 1975 | 99.45   | 122.75          | - | 124.25 |  | 14    | 0.34 | 4061 | 99.49   |
| 3       | 0.15 | 1978 | 99.60   | 124.25          | - | 125.75 |  | 9     | 0.22 | 4070 | 99.71   |
| 3       | 0.15 | 1981 | 99.75   | 125.75          | - | 127.25 |  | 4     | 0.10 | 4074 | 99.80   |
| 2       | 0.10 | 1983 | 99.85   | 127.25          | - | 128.75 |  | 2     | 0.05 | 4076 | 99.85   |
| 0       | 0.00 | 1983 | 99.85   | 128.75          | - | 130.25 |  | 5     | 0.12 | 4081 | 99.98   |
| 2       | 0.10 | 1985 | 99.95   | 130.25          | - | 131.75 |  | 1     | 0.02 | 4082 | 100.00  |
| 0       | 0.00 | 1985 | 99.95   | 131.75          | - | 133.25 |  |       |      |      |         |
| 1       | 0.05 | 1986 | 100.00  | 133.25          | - | 134.75 |  |       |      |      |         |

## (17) BUTTOCK DEPTH

The horizontal depth of the torso at the level of the buttock point, posterior and right lateral landmarks, is measured using a beam caliper. The participant stands erect with the heels together and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 18.50       | 7.28  | 1ST  | 19.20 | 7.56  |
| 19.00       | 7.48  | 2ND  | 19.60 | 7.72  |
| 19.20       | 7.56  | 3RD  | 20.00 | 7.87  |
| 19.60       | 7.72  | 5TH  | 20.40 | 8.03  |
| 20.40       | 8.03  | 10TH | 21.20 | 8.35  |
| 20.90       | 8.23  | 15TH | 21.70 | 8.54  |
| 21.30       | 8.39  | 20TH | 22.20 | 8.74  |
| 21.60       | 8.50  | 25TH | 22.70 | 8.94  |
| 21.90       | 8.62  | 30TH | 23.10 | 9.09  |
| 22.20       | 8.74  | 35TH | 23.50 | 9.25  |
| 22.50       | 8.86  | 40TH | 23.80 | 9.37  |
| 22.80       | 8.98  | 45TH | 24.20 | 9.53  |
| 23.10       | 9.09  | 50TH | 24.60 | 9.69  |
| 23.40       | 9.21  | 55TH | 24.90 | 9.80  |
| 23.70       | 9.33  | 60TH | 25.20 | 9.92  |
| 24.00       | 9.45  | 65TH | 25.50 | 10.04 |
| 24.40       | 9.61  | 70TH | 25.90 | 10.20 |
| 24.80       | 9.76  | 75TH | 26.30 | 10.35 |
| 25.20       | 9.92  | 80TH | 26.80 | 10.55 |
| 25.80       | 10.16 | 85TH | 27.30 | 10.75 |
| 26.50       | 10.43 | 90TH | 28.00 | 11.02 |
| 27.70       | 10.91 | 95TH | 29.10 | 11.46 |
| 28.20       | 11.10 | 97TH | 29.70 | 11.69 |
| 28.70       | 11.30 | 98TH | 30.30 | 11.93 |
| 30.00       | 11.81 | 99TH | 31.30 | 12.32 |

## (17) BUTTOCK DEPTH

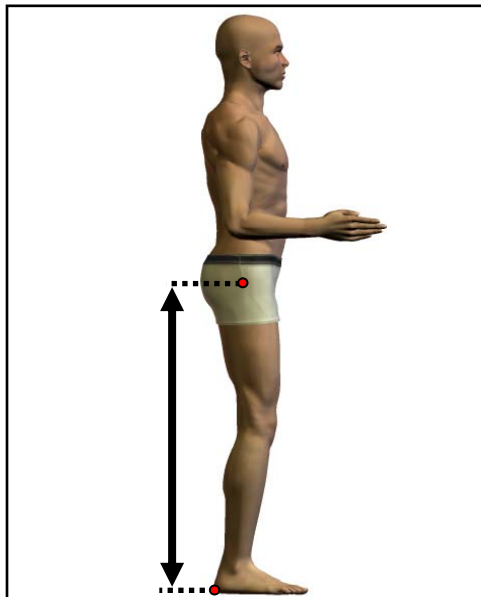
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 23.29                    | MEAN                | 9.17  |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 2.43                     | STANDARD DEVIATION  | 0.96  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 16.80                    | MINIMUM             | 6.61  |
| 34.90                    | MAXIMUM             | 13.74 |
| SKEWNESS                 |                     | 0.51  |
| KURTOSIS                 |                     | 3.43  |
| COEFFICIENT OF VARIATION |                     | 10.4% |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 24.58                    | MEAN                | 9.68  |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.65                     | STANDARD DEVIATION  | 1.04  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 17.10                    | MINIMUM             | 6.73  |
| 34.30                    | MAXIMUM             | 13.50 |
| SKEWNESS                 |                     | 0.25  |
| KURTOSIS                 |                     | 2.96  |
| COEFFICIENT OF VARIATION |                     | 10.8% |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |               |       |      |      |         |  |
|-----------------|------|------|---------|---------------|-------|------|------|---------|--|
| FEMALES         |      |      |         |               | MALES |      |      |         |  |
| F               | FPct | CumF | CumFPct | CM            | F     | FPct | CumF | CumFPct |  |
| 2               | 0.10 | 2    | 0.10    | 16.75 - 17.25 | 1     | 0.02 | 1    | 0.02    |  |
| 2               | 0.10 | 4    | 0.20    | 17.25 - 17.75 | 2     | 0.05 | 3    | 0.07    |  |
| 9               | 0.45 | 13   | 0.65    | 17.75 - 18.25 | 6     | 0.15 | 9    | 0.22    |  |
| 15              | 0.76 | 28   | 1.41    | 18.25 - 18.75 | 7     | 0.17 | 16   | 0.39    |  |
| 33              | 1.66 | 61   | 3.07    | 18.75 - 19.25 | 32    | 0.78 | 48   | 1.18    |  |
| 48              | 2.42 | 109  | 5.49    | 19.25 - 19.75 | 49    | 1.20 | 97   | 2.38    |  |
| 70              | 3.52 | 179  | 9.01    | 19.75 - 20.25 | 69    | 1.69 | 166  | 4.07    |  |
| 90              | 4.53 | 269  | 13.54   | 20.25 - 20.75 | 122   | 2.99 | 288  | 7.06    |  |
| 128             | 6.45 | 397  | 19.99   | 20.75 - 21.25 | 153   | 3.75 | 441  | 10.80   |  |
| 158             | 7.96 | 555  | 27.95   | 21.25 - 21.75 | 177   | 4.34 | 618  | 15.14   |  |
| 170             | 8.56 | 725  | 36.51   | 21.75 - 22.25 | 202   | 4.95 | 820  | 20.09   |  |
| 163             | 8.21 | 888  | 44.71   | 22.25 - 22.75 | 231   | 5.66 | 1051 | 25.75   |  |
| 147             | 7.40 | 1035 | 52.11   | 22.75 - 23.25 | 232   | 5.68 | 1283 | 31.43   |  |
| 159             | 8.01 | 1194 | 60.12   | 23.25 - 23.75 | 274   | 6.71 | 1557 | 38.14   |  |
| 154             | 7.75 | 1348 | 67.88   | 23.75 - 24.25 | 286   | 7.01 | 1843 | 45.15   |  |
| 128             | 6.45 | 1476 | 74.32   | 24.25 - 24.75 | 315   | 7.72 | 2158 | 52.87   |  |
| 119             | 5.99 | 1595 | 80.31   | 24.75 - 25.25 | 336   | 8.23 | 2494 | 61.10   |  |
| 88              | 4.43 | 1683 | 84.74   | 25.25 - 25.75 | 291   | 7.13 | 2785 | 68.23   |  |
| 72              | 3.63 | 1755 | 88.37   | 25.75 - 26.25 | 255   | 6.25 | 3040 | 74.47   |  |
| 53              | 2.67 | 1808 | 91.04   | 26.25 - 26.75 | 214   | 5.24 | 3254 | 79.72   |  |
| 49              | 2.47 | 1857 | 93.50   | 26.75 - 27.25 | 186   | 4.56 | 3440 | 84.27   |  |
| 31              | 1.56 | 1888 | 95.07   | 27.25 - 27.75 | 163   | 3.99 | 3603 | 88.27   |  |
| 39              | 1.96 | 1927 | 97.03   | 27.75 - 28.25 | 137   | 3.36 | 3740 | 91.62   |  |
| 21              | 1.06 | 1948 | 98.09   | 28.25 - 28.75 | 79    | 1.94 | 3819 | 93.56   |  |
| 7               | 0.35 | 1955 | 98.44   | 28.75 - 29.25 | 80    | 1.96 | 3899 | 95.52   |  |
| 7               | 0.35 | 1962 | 98.79   | 29.25 - 29.75 | 62    | 1.52 | 3961 | 97.04   |  |
| 8               | 0.40 | 1970 | 99.19   | 29.75 - 30.25 | 35    | 0.86 | 3996 | 97.89   |  |
| 6               | 0.30 | 1976 | 99.50   | 30.25 - 30.75 | 19    | 0.47 | 4015 | 98.36   |  |
| 2               | 0.10 | 1978 | 99.60   | 30.75 - 31.25 | 21    | 0.51 | 4036 | 98.87   |  |
| 4               | 0.20 | 1982 | 99.80   | 31.25 - 31.75 | 19    | 0.47 | 4055 | 99.34   |  |
| 2               | 0.10 | 1984 | 99.90   | 31.75 - 32.25 | 13    | 0.32 | 4068 | 99.66   |  |
| 1               | 0.05 | 1985 | 99.95   | 32.25 - 32.75 | 6     | 0.15 | 4074 | 99.80   |  |
| 0               | 0.00 | 1985 | 99.95   | 32.75 - 33.25 | 2     | 0.05 | 4076 | 99.85   |  |
| 0               | 0.00 | 1985 | 99.95   | 33.25 - 33.75 | 1     | 0.02 | 4077 | 99.88   |  |
| 0               | 0.00 | 1985 | 99.95   | 33.75 - 34.25 | 4     | 0.10 | 4081 | 99.98   |  |
| 0               | 0.00 | 1985 | 99.95   | 34.25 - 34.75 | 1     | 0.02 | 4082 | 100.00  |  |
| 1               | 0.05 | 1986 | 100.00  | 34.75 - 35.25 |       |      |      |         |  |

## (18) BUTTOCK HEIGHT

The vertical distance between a standing surface and the level of the buttock point, right lateral landmark, is measured with an anthropometer at the right side of the thigh. The participant stands erect with the heels together and the weight distributed equally on both feet.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 72.90       | 28.70 | 1ST  | 78.00  | 30.71 |
| 74.20       | 29.21 | 2ND  | 79.20  | 31.18 |
| 75.10       | 29.57 | 3RD  | 80.00  | 31.50 |
| 76.10       | 29.96 | 5TH  | 80.90  | 31.85 |
| 77.70       | 30.59 | 10TH | 82.60  | 32.52 |
| 78.80       | 31.02 | 15TH | 83.70  | 32.95 |
| 79.70       | 31.38 | 20TH | 84.50  | 33.27 |
| 80.40       | 31.65 | 25TH | 85.30  | 33.58 |
| 81.00       | 31.89 | 30TH | 86.00  | 33.86 |
| 81.50       | 32.09 | 35TH | 86.60  | 34.09 |
| 82.10       | 32.32 | 40TH | 87.30  | 34.37 |
| 82.60       | 32.52 | 45TH | 88.00  | 34.65 |
| 83.10       | 32.72 | 50TH | 88.50  | 34.84 |
| 83.80       | 32.99 | 55TH | 89.20  | 35.12 |
| 84.30       | 33.19 | 60TH | 89.90  | 35.39 |
| 84.90       | 33.43 | 65TH | 90.60  | 35.67 |
| 85.70       | 33.74 | 70TH | 91.30  | 35.94 |
| 86.40       | 34.02 | 75TH | 92.00  | 36.22 |
| 87.30       | 34.37 | 80TH | 92.90  | 36.57 |
| 88.10       | 34.69 | 85TH | 94.00  | 37.01 |
| 89.50       | 35.24 | 90TH | 95.30  | 37.52 |
| 91.10       | 35.87 | 95TH | 97.20  | 38.27 |
| 91.90       | 36.18 | 97TH | 98.70  | 38.86 |
| 92.90       | 36.57 | 98TH | 99.90  | 39.33 |
| 94.70       | 37.28 | 99TH | 101.40 | 39.92 |

## (18) BUTTOCK HEIGHT

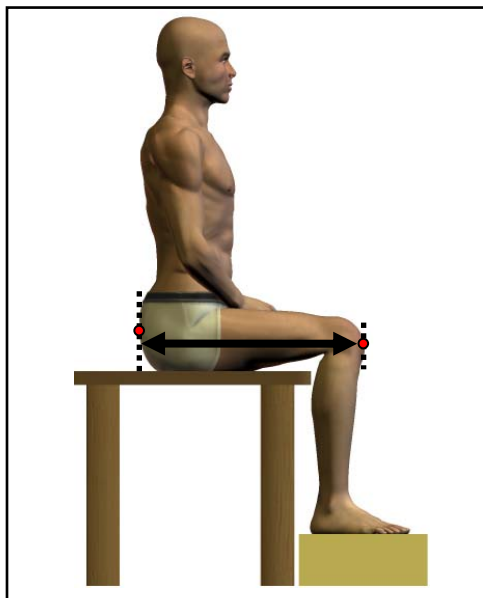
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 83.37                    | MEAN                | 32.82 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 4.57                     | STANDARD DEVIATION  | 1.80  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 65.60                    | MINIMUM             | 25.83 |
| 99.50                    | MAXIMUM             | 39.17 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.22  |
| COEFFICIENT OF VARIATION |                     | 5.5%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 88.79                    | MEAN                | 34.96 |
| 0.08                     | STD ERROR (MEAN)    | 0.03  |
| 4.99                     | STANDARD DEVIATION  | 1.97  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 71.60                    | MINIMUM             | 28.19 |
| 108.00                   | MAXIMUM             | 42.52 |
| SKEWNESS                 |                     | 0.24  |
| KURTOSIS                 |                     | 3.12  |
| COEFFICIENT OF VARIATION |                     | 5.6%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |                 |       |      |      |         |  |
|-----------------|------|------|---------|-----------------|-------|------|------|---------|--|
| FEMALES         |      |      |         |                 | MALES |      |      |         |  |
| F               | FPct | CumF | CumFPct | CM              | F     | FPct | CumF | CumFPct |  |
| 1               | 0.05 | 1    | 0.05    | 65.55 - 66.55   |       |      |      |         |  |
| 1               | 0.05 | 2    | 0.10    | 66.55 - 67.55   |       |      |      |         |  |
| 1               | 0.05 | 3    | 0.15    | 67.55 - 68.55   |       |      |      |         |  |
| 2               | 0.10 | 5    | 0.25    | 68.55 - 69.55   |       |      |      |         |  |
| 2               | 0.10 | 7    | 0.35    | 69.55 - 70.55   |       |      |      |         |  |
| 3               | 0.15 | 10   | 0.50    | 70.55 - 71.55   |       |      |      |         |  |
| 6               | 0.30 | 16   | 0.81    | 71.55 - 72.55   | 3     | 0.07 | 3    | 0.07    |  |
| 11              | 0.55 | 27   | 1.36    | 72.55 - 73.55   | 1     | 0.02 | 4    | 0.10    |  |
| 17              | 0.86 | 44   | 2.22    | 73.55 - 74.55   | 1     | 0.02 | 5    | 0.12    |  |
| 36              | 1.81 | 80   | 4.03    | 74.55 - 75.55   | 6     | 0.15 | 11   | 0.27    |  |
| 39              | 1.96 | 119  | 5.99    | 75.55 - 76.55   | 3     | 0.07 | 14   | 0.34    |  |
| 74              | 3.73 | 193  | 9.72    | 76.55 - 77.55   | 11    | 0.27 | 25   | 0.61    |  |
| 82              | 4.13 | 275  | 13.85   | 77.55 - 78.55   | 29    | 0.71 | 54   | 1.32    |  |
| 113             | 5.69 | 388  | 19.54   | 78.55 - 79.55   | 39    | 0.96 | 93   | 2.28    |  |
| 141             | 7.10 | 529  | 26.64   | 79.55 - 80.55   | 70    | 1.71 | 163  | 3.99    |  |
| 172             | 8.66 | 701  | 35.30   | 80.55 - 81.55   | 93    | 2.28 | 256  | 6.27    |  |
| 183             | 9.21 | 884  | 44.51   | 81.55 - 82.55   | 146   | 3.58 | 402  | 9.85    |  |
| 178             | 8.96 | 1062 | 53.47   | 82.55 - 83.55   | 186   | 4.56 | 588  | 14.40   |  |
| 171             | 8.61 | 1233 | 62.08   | 83.55 - 84.55   | 246   | 6.03 | 834  | 20.43   |  |
| 141             | 7.10 | 1374 | 69.18   | 84.55 - 85.55   | 255   | 6.25 | 1089 | 26.68   |  |
| 143             | 7.20 | 1517 | 76.38   | 85.55 - 86.55   | 304   | 7.45 | 1393 | 34.13   |  |
| 114             | 5.74 | 1631 | 82.12   | 86.55 - 87.55   | 316   | 7.74 | 1709 | 41.87   |  |
| 87              | 4.38 | 1718 | 86.51   | 87.55 - 88.55   | 340   | 8.33 | 2049 | 50.20   |  |
| 73              | 3.68 | 1791 | 90.18   | 88.55 - 89.55   | 295   | 7.23 | 2344 | 57.42   |  |
| 65              | 3.27 | 1856 | 93.45   | 89.55 - 90.55   | 308   | 7.55 | 2652 | 64.97   |  |
| 52              | 2.62 | 1908 | 96.07   | 90.55 - 91.55   | 278   | 6.81 | 2930 | 71.78   |  |
| 32              | 1.61 | 1940 | 97.68   | 91.55 - 92.55   | 263   | 6.44 | 3193 | 78.22   |  |
| 13              | 0.65 | 1953 | 98.34   | 92.55 - 93.55   | 185   | 4.53 | 3378 | 82.75   |  |
| 10              | 0.50 | 1963 | 98.84   | 93.55 - 94.55   | 198   | 4.85 | 3576 | 87.60   |  |
| 14              | 0.70 | 1977 | 99.55   | 94.55 - 95.55   | 131   | 3.21 | 3707 | 90.81   |  |
| 2               | 0.10 | 1979 | 99.65   | 95.55 - 96.55   | 119   | 2.92 | 3826 | 93.73   |  |
| 3               | 0.15 | 1982 | 99.80   | 96.55 - 97.55   | 73    | 1.79 | 3899 | 95.52   |  |
| 2               | 0.10 | 1984 | 99.90   | 97.55 - 98.55   | 50    | 1.22 | 3949 | 96.74   |  |
| 2               | 0.10 | 1986 | 100.00  | 98.55 - 99.55   | 42    | 1.03 | 3991 | 97.77   |  |
|                 |      |      |         | 99.55 - 100.55  | 34    | 0.83 | 4025 | 98.60   |  |
|                 |      |      |         | 100.55 - 101.55 | 23    | 0.56 | 4048 | 99.17   |  |
|                 |      |      |         | 101.55 - 102.55 | 10    | 0.24 | 4058 | 99.41   |  |
|                 |      |      |         | 102.55 - 103.55 | 11    | 0.27 | 4069 | 99.68   |  |
|                 |      |      |         | 103.55 - 104.55 | 5     | 0.12 | 4074 | 99.80   |  |
|                 |      |      |         | 104.55 - 105.55 | 1     | 0.02 | 4075 | 99.83   |  |
|                 |      |      |         | 105.55 - 106.55 | 2     | 0.05 | 4077 | 99.88   |  |
|                 |      |      |         | 106.55 - 107.55 | 4     | 0.10 | 4081 | 99.98   |  |
|                 |      |      |         | 107.55 - 108.55 | 1     | 0.02 | 4082 | 100.00  |  |

## (19) BUTTOCK-KNEE LENGTH

The horizontal distance between a buttock plate placed at the most posterior point on either buttock and the knee point, anterior landmark, is measured with an anthropometer. The participant sits erect. The thighs are parallel and the knees flexed 90° with the feet in line with the thighs.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 51.90       | 20.43 | 1ST  | 55.00 | 21.65 |
| 52.70       | 20.75 | 2ND  | 55.80 | 21.97 |
| 53.00       | 20.87 | 3RD  | 56.20 | 22.13 |
| 54.10       | 21.30 | 5TH  | 56.90 | 22.40 |
| 55.00       | 21.65 | 10TH | 57.80 | 22.76 |
| 55.80       | 21.97 | 15TH | 58.60 | 23.07 |
| 56.50       | 22.24 | 20TH | 59.20 | 23.31 |
| 56.90       | 22.40 | 25TH | 59.70 | 23.50 |
| 57.40       | 22.60 | 30TH | 60.20 | 23.70 |
| 57.80       | 22.76 | 35TH | 60.60 | 23.86 |
| 58.20       | 22.91 | 40TH | 61.00 | 24.02 |
| 58.50       | 23.03 | 45TH | 61.30 | 24.13 |
| 58.90       | 23.19 | 50TH | 61.70 | 24.29 |
| 59.30       | 23.35 | 55TH | 62.10 | 24.45 |
| 59.70       | 23.50 | 60TH | 62.50 | 24.61 |
| 60.10       | 23.66 | 65TH | 62.90 | 24.76 |
| 60.60       | 23.86 | 70TH | 63.40 | 24.96 |
| 61.00       | 24.02 | 75TH | 63.90 | 25.16 |
| 61.60       | 24.25 | 80TH | 64.40 | 25.35 |
| 62.40       | 24.57 | 85TH | 64.90 | 25.55 |
| 63.40       | 24.96 | 90TH | 65.80 | 25.91 |
| 64.60       | 25.43 | 95TH | 66.90 | 26.34 |
| 65.70       | 25.87 | 97TH | 67.70 | 26.65 |
| 66.60       | 26.22 | 98TH | 68.20 | 26.85 |
| 67.30       | 26.50 | 99TH | 69.20 | 27.24 |

## (19) BUTTOCK-KNEE LENGTH

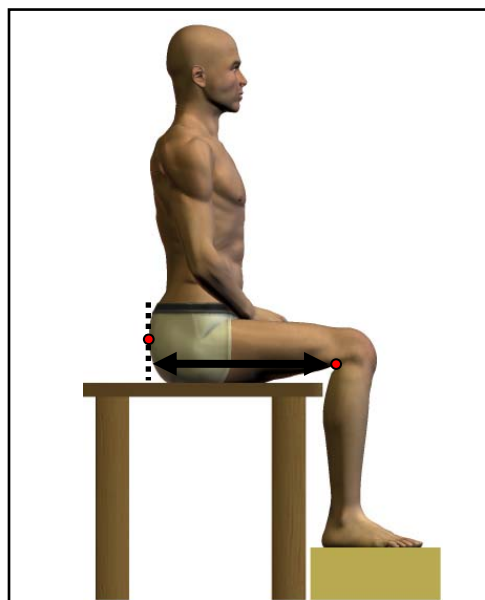
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 59.06                    | MEAN                | 23.25 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 3.26                     | STANDARD DEVIATION  | 1.28  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 46.60                    | MINIMUM             | 18.35 |
| 70.90                    | MAXIMUM             | 27.91 |
| SKEWNESS                 |                     | 0.22  |
| KURTOSIS                 |                     | 3.35  |
| COEFFICIENT OF VARIATION |                     | 5.5%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 61.80                    | MEAN                | 24.33 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 3.06                     | STANDARD DEVIATION  | 1.20  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 51.80                    | MINIMUM             | 20.39 |
| 73.60                    | MAXIMUM             | 28.98 |
| SKEWNESS                 |                     | 0.14  |
| KURTOSIS                 |                     | 2.95  |
| COEFFICIENT OF VARIATION |                     | 4.9%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |       |      |         |               |       |       |      |         |  |
|-----------------|-------|------|---------|---------------|-------|-------|------|---------|--|
| FEMALES         |       |      |         |               | MALES |       |      |         |  |
| F               | FPct  | CumF | CumFPct | CM            | F     | FPct  | CumF | CumFPct |  |
| 1               | 0.05  | 1    | 0.05    | 46.25 - 47.00 |       |       |      |         |  |
| 0               | 0.00  | 1    | 0.05    | 47.00 - 47.75 |       |       |      |         |  |
| 1               | 0.05  | 2    | 0.10    | 47.75 - 48.50 |       |       |      |         |  |
| 1               | 0.05  | 3    | 0.15    | 48.50 - 49.25 |       |       |      |         |  |
| 3               | 0.15  | 6    | 0.30    | 49.25 - 50.00 |       |       |      |         |  |
| 3               | 0.15  | 9    | 0.45    | 50.00 - 50.75 |       |       |      |         |  |
| 4               | 0.20  | 13   | 0.65    | 50.75 - 51.50 |       |       |      |         |  |
| 12              | 0.60  | 25   | 1.26    | 51.50 - 52.25 | 1     | 0.02  | 1    | 0.02    |  |
| 30              | 1.51  | 55   | 2.77    | 52.25 - 53.00 | 1     | 0.02  | 2    | 0.05    |  |
| 32              | 1.61  | 87   | 4.38    | 53.00 - 53.75 | 4     | 0.10  | 6    | 0.15    |  |
| 42              | 2.11  | 129  | 6.50    | 53.75 - 54.50 | 13    | 0.32  | 19   | 0.47    |  |
| 101             | 5.09  | 230  | 11.58   | 54.50 - 55.25 | 30    | 0.73  | 49   | 1.20    |  |
| 80              | 4.03  | 310  | 15.61   | 55.25 - 56.00 | 45    | 1.10  | 94   | 2.30    |  |
| 151             | 7.60  | 461  | 23.21   | 56.00 - 56.75 | 91    | 2.23  | 185  | 4.53    |  |
| 146             | 7.35  | 607  | 30.56   | 56.75 - 57.50 | 145   | 3.55  | 330  | 8.08    |  |
| 218             | 10.98 | 825  | 41.54   | 57.50 - 58.25 | 179   | 4.39  | 509  | 12.47   |  |
| 188             | 9.47  | 1013 | 51.01   | 58.25 - 59.00 | 218   | 5.34  | 727  | 17.81   |  |
| 181             | 9.11  | 1194 | 60.12   | 59.00 - 59.75 | 304   | 7.45  | 1031 | 25.26   |  |
| 165             | 8.31  | 1359 | 68.43   | 59.75 - 60.50 | 336   | 8.23  | 1367 | 33.49   |  |
| 174             | 8.76  | 1533 | 77.19   | 60.50 - 61.25 | 426   | 10.44 | 1793 | 43.92   |  |
| 100             | 5.04  | 1633 | 82.23   | 61.25 - 62.00 | 387   | 9.48  | 2180 | 53.41   |  |
| 99              | 4.98  | 1732 | 87.21   | 62.00 - 62.75 | 399   | 9.77  | 2579 | 63.18   |  |
| 58              | 2.92  | 1790 | 90.13   | 62.75 - 63.50 | 302   | 7.40  | 2881 | 70.58   |  |
| 69              | 3.47  | 1859 | 93.61   | 63.50 - 64.25 | 326   | 7.99  | 3207 | 78.56   |  |
| 48              | 2.42  | 1907 | 96.02   | 64.25 - 65.00 | 265   | 6.49  | 3472 | 85.06   |  |
| 22              | 1.11  | 1929 | 97.13   | 65.00 - 65.75 | 189   | 4.63  | 3661 | 89.69   |  |
| 15              | 0.76  | 1944 | 97.89   | 65.75 - 66.50 | 147   | 3.60  | 3808 | 93.29   |  |
| 22              | 1.11  | 1966 | 98.99   | 66.50 - 67.25 | 110   | 2.69  | 3918 | 95.98   |  |
| 7               | 0.35  | 1973 | 99.35   | 67.25 - 68.00 | 63    | 1.54  | 3981 | 97.53   |  |
| 6               | 0.30  | 1979 | 99.65   | 68.00 - 68.75 | 42    | 1.03  | 4023 | 98.55   |  |
| 2               | 0.10  | 1981 | 99.75   | 68.75 - 69.50 | 24    | 0.59  | 4047 | 99.14   |  |
| 4               | 0.20  | 1985 | 99.95   | 69.50 - 70.25 | 18    | 0.44  | 4065 | 99.58   |  |
| 1               | 0.05  | 1986 | 100.00  | 70.25 - 71.00 | 10    | 0.24  | 4075 | 99.83   |  |
|                 |       |      |         | 71.00 - 71.75 | 3     | 0.07  | 4078 | 99.90   |  |
|                 |       |      |         | 71.75 - 72.50 | 2     | 0.05  | 4080 | 99.95   |  |
|                 |       |      |         | 72.50 - 73.25 | 1     | 0.02  | 4081 | 99.98   |  |
|                 |       |      |         | 73.25 - 74.00 | 1     | 0.02  | 4082 | 100.00  |  |

## (20) BUTTOCK-POPLITEAL LENGTH

The horizontal distance between a buttock plate placed at the most posterior point on either buttock and the back of the right knee (the popliteal fossa at the dorsal juncture of the calf and thigh) is measured with an anthropometer. The participant sits erect. The thighs are parallel and the knees flexed 90° with the feet in line with the thighs.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 41.90       | 16.50 | 1ST  | 44.30 | 17.44 |
| 42.80       | 16.85 | 2ND  | 44.80 | 17.64 |
| 43.40       | 17.09 | 3RD  | 45.30 | 17.83 |
| 44.10       | 17.36 | 5TH  | 45.90 | 18.07 |
| 45.00       | 17.72 | 10TH | 46.70 | 18.39 |
| 45.70       | 17.99 | 15TH | 47.40 | 18.66 |
| 46.20       | 18.19 | 20TH | 48.00 | 18.90 |
| 46.60       | 18.35 | 25TH | 48.40 | 19.06 |
| 47.00       | 18.50 | 30TH | 48.80 | 19.21 |
| 47.30       | 18.62 | 35TH | 49.20 | 19.37 |
| 47.70       | 18.78 | 40TH | 49.50 | 19.49 |
| 48.00       | 18.90 | 45TH | 49.90 | 19.65 |
| 48.30       | 19.02 | 50TH | 50.20 | 19.76 |
| 48.70       | 19.17 | 55TH | 50.50 | 19.88 |
| 49.10       | 19.33 | 60TH | 50.90 | 20.04 |
| 49.50       | 19.49 | 65TH | 51.30 | 20.20 |
| 49.90       | 19.65 | 70TH | 51.70 | 20.35 |
| 50.30       | 19.80 | 75TH | 52.20 | 20.55 |
| 50.80       | 20.00 | 80TH | 52.70 | 20.75 |
| 51.50       | 20.28 | 85TH | 53.20 | 20.94 |
| 52.40       | 20.63 | 90TH | 53.80 | 21.18 |
| 53.50       | 21.06 | 95TH | 54.80 | 21.57 |
| 54.20       | 21.34 | 97TH | 55.60 | 21.89 |
| 54.70       | 21.54 | 98TH | 56.10 | 22.09 |
| 55.70       | 21.93 | 99TH | 56.80 | 22.36 |

## (20) BUTTOCK-POPLITEAL LENGTH

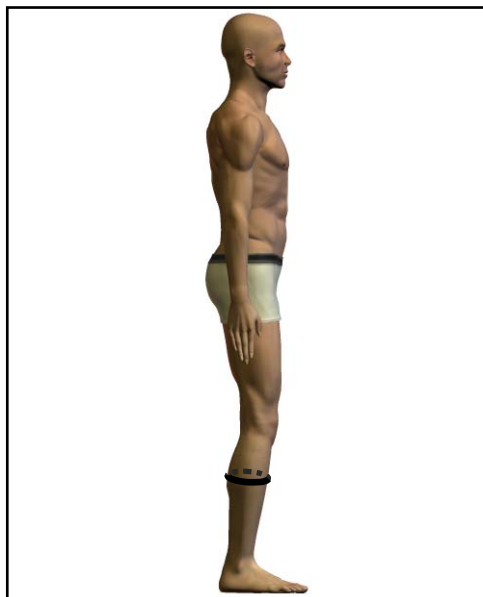
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 48.51                    |                     | 19.10 |
| 0.06                     | STD ERROR (MEAN)    | 0.03  |
| 2.87                     | STANDARD DEVIATION  | 1.13  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 36.70                    | MINIMUM             | 14.45 |
| 59.70                    | MAXIMUM             | 23.50 |
| SKEWNESS                 |                     | 0.17  |
| KURTOSIS                 |                     | 3.33  |
| COEFFICIENT OF VARIATION |                     | 5.9%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 50.29                    |                     | 19.80 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.74                     | STANDARD DEVIATION  | 1.08  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 41.80                    | MINIMUM             | 16.46 |
| 60.50                    | MAXIMUM             | 23.82 |
| SKEWNESS                 |                     | 0.12  |
| KURTOSIS                 |                     | 2.93  |
| COEFFICIENT OF VARIATION |                     | 5.5%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 36.25           | - | 36.75 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 36.75           | - | 37.25 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 37.25           | - | 37.75 |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 37.75           | - | 38.25 |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 38.25           | - | 38.75 |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 38.75           | - | 39.25 |  |       |      |      |         |
| 0       | 0.00 | 3    | 0.15    | 39.25           | - | 39.75 |  |       |      |      |         |
| 1       | 0.05 | 4    | 0.20    | 39.75           | - | 40.25 |  |       |      |      |         |
| 3       | 0.15 | 7    | 0.35    | 40.25           | - | 40.75 |  |       |      |      |         |
| 5       | 0.25 | 12   | 0.60    | 40.75           | - | 41.25 |  |       |      |      |         |
| 3       | 0.15 | 15   | 0.76    | 41.25           | - | 41.75 |  |       |      |      |         |
| 9       | 0.45 | 24   | 1.21    | 41.75           | - | 42.25 |  | 4     | 0.10 | 4    | 0.10    |
| 14      | 0.70 | 38   | 1.91    | 42.25           | - | 42.75 |  | 4     | 0.10 | 8    | 0.20    |
| 11      | 0.55 | 49   | 2.47    | 42.75           | - | 43.25 |  | 1     | 0.02 | 9    | 0.22    |
| 28      | 1.41 | 77   | 3.88    | 43.25           | - | 43.75 |  | 10    | 0.24 | 19   | 0.47    |
| 37      | 1.86 | 114  | 5.74    | 43.75           | - | 44.25 |  | 19    | 0.47 | 38   | 0.93    |
| 49      | 2.47 | 163  | 8.21    | 44.25           | - | 44.75 |  | 35    | 0.86 | 73   | 1.79    |
| 70      | 3.52 | 233  | 11.73   | 44.75           | - | 45.25 |  | 37    | 0.91 | 110  | 2.69    |
| 66      | 3.32 | 299  | 15.06   | 45.25           | - | 45.75 |  | 72    | 1.76 | 182  | 4.46    |
| 102     | 5.14 | 401  | 20.19   | 45.75           | - | 46.25 |  | 99    | 2.43 | 281  | 6.88    |
| 119     | 5.99 | 520  | 26.18   | 46.25           | - | 46.75 |  | 138   | 3.38 | 419  | 10.26   |
| 157     | 7.91 | 677  | 34.09   | 46.75           | - | 47.25 |  | 146   | 3.58 | 565  | 13.84   |
| 142     | 7.15 | 819  | 41.24   | 47.25           | - | 47.75 |  | 179   | 4.39 | 744  | 18.23   |
| 153     | 7.70 | 972  | 48.94   | 47.75           | - | 48.25 |  | 182   | 4.46 | 926  | 22.68   |
| 137     | 6.90 | 1109 | 55.84   | 48.25           | - | 48.75 |  | 260   | 6.37 | 1186 | 29.05   |
| 129     | 6.50 | 1238 | 62.34   | 48.75           | - | 49.25 |  | 282   | 6.91 | 1468 | 35.96   |
| 115     | 5.79 | 1353 | 68.13   | 49.25           | - | 49.75 |  | 276   | 6.76 | 1744 | 42.72   |
| 120     | 6.04 | 1473 | 74.17   | 49.75           | - | 50.25 |  | 317   | 7.77 | 2061 | 50.49   |
| 102     | 5.14 | 1575 | 79.31   | 50.25           | - | 50.75 |  | 306   | 7.50 | 2367 | 57.99   |
| 71      | 3.58 | 1646 | 82.88   | 50.75           | - | 51.25 |  | 242   | 5.93 | 2609 | 63.91   |
| 65      | 3.27 | 1711 | 86.15   | 51.25           | - | 51.75 |  | 267   | 6.54 | 2876 | 70.46   |
| 67      | 3.37 | 1778 | 89.53   | 51.75           | - | 52.25 |  | 223   | 5.46 | 3099 | 75.92   |
| 57      | 2.87 | 1835 | 92.40   | 52.25           | - | 52.75 |  | 209   | 5.12 | 3308 | 81.04   |
| 31      | 1.56 | 1866 | 93.96   | 52.75           | - | 53.25 |  | 169   | 4.14 | 3477 | 85.18   |
| 32      | 1.61 | 1898 | 95.57   | 53.25           | - | 53.75 |  | 169   | 4.14 | 3646 | 89.32   |
| 35      | 1.76 | 1933 | 97.33   | 53.75           | - | 54.25 |  | 132   | 3.23 | 3778 | 92.55   |
| 16      | 0.81 | 1949 | 98.14   | 54.25           | - | 54.75 |  | 91    | 2.23 | 3869 | 94.78   |
| 10      | 0.50 | 1959 | 98.64   | 54.75           | - | 55.25 |  | 56    | 1.37 | 3925 | 96.15   |
| 8       | 0.40 | 1967 | 99.04   | 55.25           | - | 55.75 |  | 50    | 1.22 | 3975 | 97.38   |
| 6       | 0.30 | 1973 | 99.35   | 55.75           | - | 56.25 |  | 34    | 0.83 | 4009 | 98.21   |
| 5       | 0.25 | 1978 | 99.60   | 56.25           | - | 56.75 |  | 28    | 0.69 | 4037 | 98.90   |
| 4       | 0.20 | 1982 | 99.80   | 56.75           | - | 57.25 |  | 14    | 0.34 | 4051 | 99.24   |
| 1       | 0.05 | 1983 | 99.85   | 57.25           | - | 57.75 |  | 16    | 0.39 | 4067 | 99.63   |
| 2       | 0.10 | 1985 | 99.95   | 57.75           | - | 58.25 |  | 4     | 0.10 | 4071 | 99.73   |
| 0       | 0.00 | 1985 | 99.95   | 58.25           | - | 58.75 |  | 4     | 0.10 | 4075 | 99.83   |
| 0       | 0.00 | 1985 | 99.95   | 58.75           | - | 59.25 |  | 3     | 0.07 | 4078 | 99.90   |
| 1       | 0.05 | 1986 | 100.00  | 59.25           | - | 59.75 |  | 2     | 0.05 | 4080 | 99.95   |
|         |      |      |         | 59.75           | - | 60.25 |  | 0     | 0.00 | 4080 | 99.95   |
|         |      |      |         | 60.25           | - | 60.75 |  | 2     | 0.05 | 4082 | 100.00  |

## (21) CALF CIRCUMFERENCE

The maximum horizontal circumference of the right calf is measured with a tape. The participant stands erect with the heels approximately 10 cm apart and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 31.10       | 12.24 | 1ST  | 32.90 | 12.95 |
| 32.00       | 12.58 | 2ND  | 33.50 | 13.19 |
| 32.40       | 12.76 | 3RD  | 34.00 | 13.39 |
| 32.80       | 12.91 | 5TH  | 34.60 | 13.62 |
| 33.80       | 13.31 | 10TH | 35.50 | 13.98 |
| 34.50       | 13.58 | 15TH | 36.20 | 14.25 |
| 35.00       | 13.78 | 20TH | 36.70 | 14.45 |
| 35.40       | 13.94 | 25TH | 37.20 | 14.65 |
| 35.80       | 14.09 | 30TH | 37.60 | 14.80 |
| 36.20       | 14.25 | 35TH | 38.00 | 14.96 |
| 36.50       | 14.37 | 40TH | 38.40 | 15.12 |
| 36.80       | 14.49 | 45TH | 38.70 | 15.24 |
| 37.20       | 14.65 | 50TH | 39.20 | 15.43 |
| 37.50       | 14.76 | 55TH | 39.50 | 15.55 |
| 37.80       | 14.88 | 60TH | 39.80 | 15.67 |
| 38.30       | 15.08 | 65TH | 40.30 | 15.87 |
| 38.70       | 15.24 | 70TH | 40.70 | 16.02 |
| 39.20       | 15.43 | 75TH | 41.20 | 16.22 |
| 39.50       | 15.55 | 80TH | 41.70 | 16.42 |
| 40.20       | 15.83 | 85TH | 42.30 | 16.65 |
| 41.00       | 16.14 | 90TH | 43.00 | 16.93 |
| 42.30       | 16.65 | 95TH | 44.30 | 17.44 |
| 43.20       | 17.03 | 97TH | 45.10 | 17.76 |
| 44.00       | 17.34 | 98TH | 45.70 | 17.99 |
| 45.20       | 17.80 | 99TH | 46.70 | 18.39 |

## (21) CALF CIRCUMFERENCE

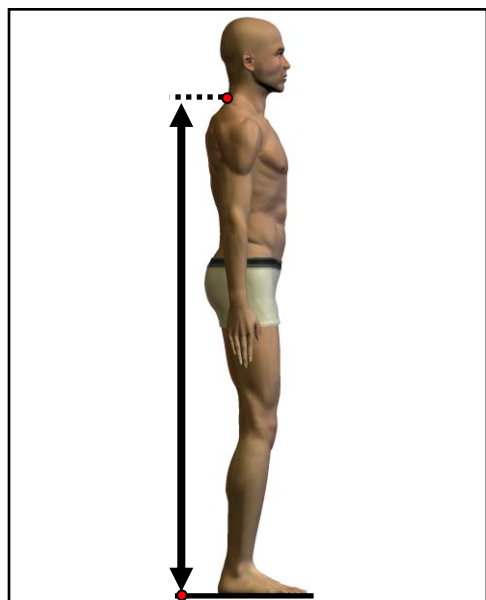
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 37.33                    |                     | 14.70 |
| 0.06                     | STD ERROR (MEAN)    | 0.03  |
| 2.85                     | STANDARD DEVIATION  | 1.12  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 28.20                    | MINIMUM             | 11.10 |
| 48.20                    | MAXIMUM             | 18.98 |
| SKEWNESS                 |                     | 0.33  |
| KURTOSIS                 |                     | 3.36  |
| COEFFICIENT OF VARIATION |                     | 7.6%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 39.23                    |                     | 15.44 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 2.97                     | STANDARD DEVIATION  | 1.17  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 26.60                    | MINIMUM             | 10.47 |
| 52.30                    | MAXIMUM             | 20.59 |
| SKEWNESS                 |                     | 0.25  |
| KURTOSIS                 |                     | 3.22  |
| COEFFICIENT OF VARIATION |                     | 7.6%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
|         |      |      |         | 26.25           | - | 26.75 |  | 1     | 0.02 | 1    | 0.02    |
|         |      |      |         | 26.75           | - | 27.25 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 27.25           | - | 27.75 |  | 0     | 0.00 | 1    | 0.02    |
| 1       | 0.05 | 1    | 0.05    | 27.75           | - | 28.25 |  | 0     | 0.00 | 1    | 0.02    |
| 0       | 0.00 | 1    | 0.05    | 28.25           | - | 28.75 |  | 0     | 0.00 | 1    | 0.02    |
| 1       | 0.05 | 2    | 0.10    | 28.75           | - | 29.25 |  | 0     | 0.00 | 1    | 0.02    |
| 4       | 0.20 | 6    | 0.30    | 29.25           | - | 29.75 |  | 1     | 0.02 | 2    | 0.05    |
| 4       | 0.20 | 10   | 0.50    | 29.75           | - | 30.25 |  | 0     | 0.00 | 2    | 0.05    |
| 4       | 0.20 | 14   | 0.70    | 30.25           | - | 30.75 |  | 1     | 0.02 | 3    | 0.07    |
| 6       | 0.30 | 20   | 1.01    | 30.75           | - | 31.25 |  | 2     | 0.05 | 5    | 0.12    |
| 14      | 0.70 | 34   | 1.71    | 31.25           | - | 31.75 |  | 1     | 0.02 | 6    | 0.15    |
| 16      | 0.81 | 50   | 2.52    | 31.75           | - | 32.25 |  | 7     | 0.17 | 13   | 0.32    |
| 40      | 2.01 | 90   | 4.53    | 32.25           | - | 32.75 |  | 24    | 0.59 | 37   | 0.91    |
| 36      | 1.81 | 126  | 6.34    | 32.75           | - | 33.25 |  | 22    | 0.54 | 59   | 1.45    |
| 58      | 2.92 | 184  | 9.26    | 33.25           | - | 33.75 |  | 41    | 1.00 | 100  | 2.45    |
| 64      | 3.22 | 248  | 12.49   | 33.75           | - | 34.25 |  | 54    | 1.32 | 154  | 3.77    |
| 98      | 4.93 | 346  | 17.42   | 34.25           | - | 34.75 |  | 86    | 2.11 | 240  | 5.88    |
| 104     | 5.24 | 450  | 22.66   | 34.75           | - | 35.25 |  | 93    | 2.28 | 333  | 8.16    |
| 138     | 6.95 | 588  | 29.61   | 35.25           | - | 35.75 |  | 146   | 3.58 | 479  | 11.73   |
| 137     | 6.90 | 725  | 36.51   | 35.75           | - | 36.25 |  | 160   | 3.92 | 639  | 15.65   |
| 142     | 7.15 | 867  | 43.66   | 36.25           | - | 36.75 |  | 218   | 5.34 | 857  | 20.99   |
| 152     | 7.65 | 1019 | 51.31   | 36.75           | - | 37.25 |  | 190   | 4.65 | 1047 | 25.65   |
| 157     | 7.91 | 1176 | 59.21   | 37.25           | - | 37.75 |  | 260   | 6.37 | 1307 | 32.02   |
| 110     | 5.54 | 1286 | 64.75   | 37.75           | - | 38.25 |  | 217   | 5.32 | 1524 | 37.33   |
| 119     | 5.99 | 1405 | 70.75   | 38.25           | - | 38.75 |  | 318   | 7.79 | 1842 | 45.12   |
| 104     | 5.24 | 1509 | 75.98   | 38.75           | - | 39.25 |  | 232   | 5.68 | 2074 | 50.81   |
| 108     | 5.44 | 1617 | 81.42   | 39.25           | - | 39.75 |  | 320   | 7.84 | 2394 | 58.65   |
| 74      | 3.73 | 1691 | 85.15   | 39.75           | - | 40.25 |  | 255   | 6.25 | 2649 | 64.89   |
| 68      | 3.42 | 1759 | 88.57   | 40.25           | - | 40.75 |  | 249   | 6.10 | 2898 | 70.99   |
| 54      | 2.72 | 1813 | 91.29   | 40.75           | - | 41.25 |  | 212   | 5.19 | 3110 | 76.19   |
| 48      | 2.42 | 1861 | 93.71   | 41.25           | - | 41.75 |  | 194   | 4.75 | 3304 | 80.94   |
| 23      | 1.16 | 1884 | 94.86   | 41.75           | - | 42.25 |  | 154   | 3.77 | 3458 | 84.71   |
| 23      | 1.16 | 1907 | 96.02   | 42.25           | - | 42.75 |  | 144   | 3.53 | 3602 | 88.24   |
| 20      | 1.01 | 1927 | 97.03   | 42.75           | - | 43.25 |  | 102   | 2.50 | 3704 | 90.74   |
| 15      | 0.76 | 1942 | 97.78   | 43.25           | - | 43.75 |  | 101   | 2.47 | 3805 | 93.21   |
| 6       | 0.30 | 1948 | 98.09   | 43.75           | - | 44.25 |  | 71    | 1.74 | 3876 | 94.95   |
| 12      | 0.60 | 1960 | 98.69   | 44.25           | - | 44.75 |  | 52    | 1.27 | 3928 | 96.23   |
| 9       | 0.45 | 1969 | 99.14   | 44.75           | - | 45.25 |  | 41    | 1.00 | 3969 | 97.23   |
| 9       | 0.45 | 1978 | 99.60   | 45.25           | - | 45.75 |  | 34    | 0.83 | 4003 | 98.06   |
| 4       | 0.20 | 1982 | 99.80   | 45.75           | - | 46.25 |  | 18    | 0.44 | 4021 | 98.51   |
| 0       | 0.00 | 1982 | 99.80   | 46.25           | - | 46.75 |  | 22    | 0.54 | 4043 | 99.04   |
| 2       | 0.10 | 1984 | 99.90   | 46.75           | - | 47.25 |  | 10    | 0.24 | 4053 | 99.29   |
| 0       | 0.00 | 1984 | 99.90   | 47.25           | - | 47.75 |  | 6     | 0.15 | 4059 | 99.44   |
| 2       | 0.10 | 1986 | 100.00  | 47.75           | - | 48.25 |  | 8     | 0.20 | 4067 | 99.63   |
|         |      |      |         | 48.25           | - | 48.75 |  | 6     | 0.15 | 4073 | 99.78   |
|         |      |      |         | 48.75           | - | 49.25 |  | 4     | 0.10 | 4077 | 99.88   |
|         |      |      |         | 49.25           | - | 49.75 |  | 0     | 0.00 | 4077 | 99.88   |
|         |      |      |         | 49.75           | - | 50.25 |  | 3     | 0.07 | 4080 | 99.95   |
|         |      |      |         | 50.25           | - | 50.75 |  | 0     | 0.00 | 4080 | 99.95   |
|         |      |      |         | 50.75           | - | 51.25 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 51.25           | - | 51.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 51.75           | - | 52.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 52.25           | - | 52.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (22) CERVICALE HEIGHT\*

The vertical distance between a standing surface and the cervicale landmark is measured with an anthropometer. The participant stands erect with the head in the Frankfurt plane. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 126.20      | 49.69 | 1ST  | 137.30 | 54.06 |
| 127.60      | 50.24 | 2ND  | 138.80 | 54.65 |
| 128.70      | 50.67 | 3RD  | 140.20 | 55.20 |
| 130.00      | 51.18 | 5TH  | 141.60 | 55.75 |
| 132.00      | 51.97 | 10TH | 143.70 | 56.57 |
| 133.40      | 52.52 | 15TH | 145.00 | 57.09 |
| 134.70      | 53.03 | 20TH | 146.30 | 57.60 |
| 135.50      | 53.35 | 25TH | 147.50 | 58.07 |
| 136.40      | 53.70 | 30TH | 148.50 | 58.46 |
| 137.20      | 54.02 | 35TH | 149.30 | 58.78 |
| 137.90      | 54.29 | 40TH | 150.10 | 59.09 |
| 138.70      | 54.61 | 45TH | 150.90 | 59.41 |
| 139.30      | 54.84 | 50TH | 151.70 | 59.72 |
| 140.10      | 55.16 | 55TH | 152.50 | 60.04 |
| 141.00      | 55.51 | 60TH | 153.30 | 60.35 |
| 141.70      | 55.79 | 65TH | 154.00 | 60.63 |
| 142.60      | 56.14 | 70TH | 155.00 | 61.02 |
| 143.40      | 56.46 | 75TH | 155.80 | 61.34 |
| 144.40      | 56.85 | 80TH | 156.90 | 61.77 |
| 145.70      | 57.36 | 85TH | 158.30 | 62.32 |
| 147.50      | 58.07 | 90TH | 159.70 | 62.87 |
| 149.80      | 58.98 | 95TH | 162.30 | 63.90 |
| 151.20      | 59.53 | 97TH | 164.00 | 64.57 |
| 152.10      | 59.88 | 98TH | 165.40 | 65.12 |
| 153.30      | 60.35 | 99TH | 167.80 | 66.06 |

\* In ANSUR cervicale was defined as the highest point on the seventh cervical vertebra. For consistency with international standards, it is now the most prominent point on the seventh cervical vertebra.

## (22) CERVICALE HEIGHT

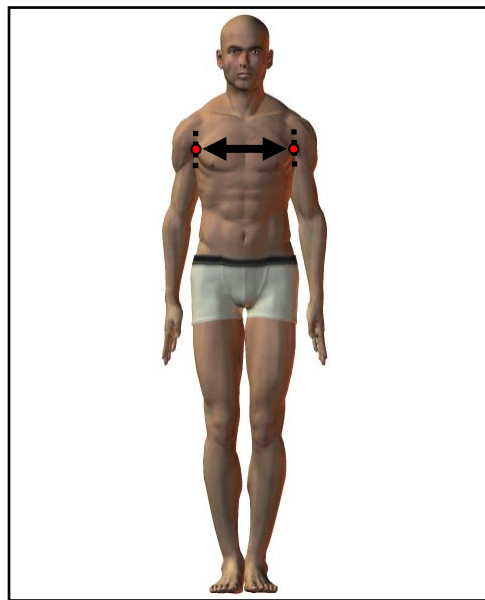
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 139.57                   | MEAN                | 54.95 |
| 0.13                     | STD ERROR (MEAN)    | 0.05  |
| 5.95                     | STANDARD DEVIATION  | 2.34  |
| 0.09                     | STD ERROR (STD DEV) | 0.04  |
| 118.40                   | MINIMUM             | 46.61 |
| 158.70                   | MAXIMUM             | 62.48 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.01  |
| COEFFICIENT OF VARIATION |                     | 4.3%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 151.73                   | MEAN                | 59.74 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 6.33                     | STANDARD DEVIATION  | 2.49  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 126.90                   | MINIMUM             | 49.96 |
| 173.80                   | MAXIMUM             | 68.43 |
| SKEWNESS                 |                     | 0.08  |
| KURTOSIS                 |                     | 3.09  |
| COEFFICIENT OF VARIATION |                     | 4.2%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |       |      |         |        |   |        |      |      |         |        |  |
|-----------------|-------|------|---------|--------|---|--------|------|------|---------|--------|--|
| FEMALES         |       |      |         |        |   | MALES  |      |      |         |        |  |
| F               | FPct  | CumF | CumFPct | CM     |   | F      | FPct | CumF | CumFPct |        |  |
| 1               | 0.05  | 1    | 0.05    | 117.25 | - | 118.75 |      |      |         |        |  |
| 0               | 0.00  | 1    | 0.05    | 118.75 | - | 120.25 |      |      |         |        |  |
| 2               | 0.10  | 3    | 0.15    | 120.25 | - | 121.75 |      |      |         |        |  |
| 2               | 0.10  | 5    | 0.25    | 121.75 | - | 123.25 |      |      |         |        |  |
| 6               | 0.30  | 11   | 0.55    | 123.25 | - | 124.75 |      |      |         |        |  |
| 9               | 0.45  | 20   | 1.01    | 124.75 | - | 126.25 |      |      |         |        |  |
| 21              | 1.06  | 41   | 2.06    | 126.25 | - | 127.75 |      |      |         |        |  |
| 34              | 1.71  | 75   | 3.78    | 127.75 | - | 129.25 | 1    | 0.02 | 1       | 0.02   |  |
| 59              | 2.97  | 134  | 6.75    | 129.25 | - | 130.75 | 0    | 0.00 | 1       | 0.02   |  |
| 79              | 3.98  | 213  | 10.73   | 130.75 | - | 132.25 | 1    | 0.02 | 2       | 0.05   |  |
| 105             | 5.29  | 318  | 16.01   | 132.25 | - | 133.75 | 0    | 0.00 | 2       | 0.05   |  |
| 144             | 7.25  | 462  | 23.26   | 133.75 | - | 135.25 | 5    | 0.12 | 7       | 0.17   |  |
| 172             | 8.66  | 634  | 31.92   | 135.25 | - | 136.75 | 11   | 0.27 | 18      | 0.44   |  |
| 209             | 10.52 | 843  | 42.45   | 136.75 | - | 138.25 | 16   | 0.39 | 34      | 0.83   |  |
| 204             | 10.27 | 1047 | 52.72   | 138.25 | - | 139.75 | 30   | 0.73 | 64      | 1.57   |  |
| 184             | 9.26  | 1231 | 61.98   | 139.75 | - | 141.25 | 42   | 1.03 | 106     | 2.60   |  |
| 179             | 9.01  | 1410 | 71.00   | 141.25 | - | 142.75 | 79   | 1.94 | 185     | 4.53   |  |
| 160             | 8.06  | 1570 | 79.05   | 142.75 | - | 144.25 | 111  | 2.72 | 296     | 7.25   |  |
| 120             | 6.04  | 1690 | 85.10   | 144.25 | - | 145.75 | 204  | 5.00 | 500     | 12.25  |  |
| 78              | 3.93  | 1768 | 89.02   | 145.75 | - | 147.25 | 222  | 5.44 | 722     | 17.69  |  |
| 80              | 4.03  | 1848 | 93.05   | 147.25 | - | 148.75 | 252  | 6.17 | 974     | 23.86  |  |
| 55              | 2.77  | 1903 | 95.82   | 148.75 | - | 150.25 | 304  | 7.45 | 1278    | 31.31  |  |
| 35              | 1.76  | 1938 | 97.58   | 150.25 | - | 151.75 | 403  | 9.87 | 1681    | 41.18  |  |
| 27              | 1.36  | 1965 | 98.94   | 151.75 | - | 153.25 | 368  | 9.02 | 2049    | 50.20  |  |
| 11              | 0.55  | 1976 | 99.50   | 153.25 | - | 154.75 | 390  | 9.55 | 2439    | 59.75  |  |
| 3               | 0.15  | 1979 | 99.65   | 154.75 | - | 156.25 | 365  | 8.94 | 2804    | 68.69  |  |
| 3               | 0.15  | 1982 | 99.80   | 156.25 | - | 157.75 | 338  | 8.28 | 3142    | 76.97  |  |
| 4               | 0.20  | 1986 | 100.00  | 157.75 | - | 159.25 | 267  | 6.54 | 3409    | 83.51  |  |
|                 |       |      |         | 159.25 | - | 160.75 | 203  | 4.97 | 3612    | 88.49  |  |
|                 |       |      |         | 160.75 | - | 162.25 | 164  | 4.02 | 3776    | 92.50  |  |
|                 |       |      |         | 162.25 | - | 163.75 | 101  | 2.47 | 3877    | 94.98  |  |
|                 |       |      |         | 163.75 | - | 165.25 | 71   | 1.74 | 3948    | 96.72  |  |
|                 |       |      |         | 165.25 | - | 166.75 | 45   | 1.10 | 3993    | 97.82  |  |
|                 |       |      |         | 166.75 | - | 168.25 | 37   | 0.91 | 4030    | 98.73  |  |
|                 |       |      |         | 168.25 | - | 169.75 | 20   | 0.49 | 4050    | 99.22  |  |
|                 |       |      |         | 169.75 | - | 171.25 | 18   | 0.44 | 4068    | 99.66  |  |
|                 |       |      |         | 171.25 | - | 172.75 | 9    | 0.22 | 4077    | 99.88  |  |
|                 |       |      |         | 172.75 | - | 174.25 | 4    | 0.10 | 4081    | 99.98  |  |
|                 |       |      |         |        |   |        | 1    | 0.02 | 4082    | 100.00 |  |

## (23) CHEST BREADTH\*

The maximum horizontal breadth of the chest at the level of the chest point anterior landmark is measured with a beam caliper. The participant stands erect, looking straight ahead with the heels together and the weight distributed evenly on both feet. The participant places both hands on the hips and takes a deep breath and holds it. The tissue is compressed with the beam caliper, and then the participant lowers the arms. The measurement is taken at maximum inspiration.



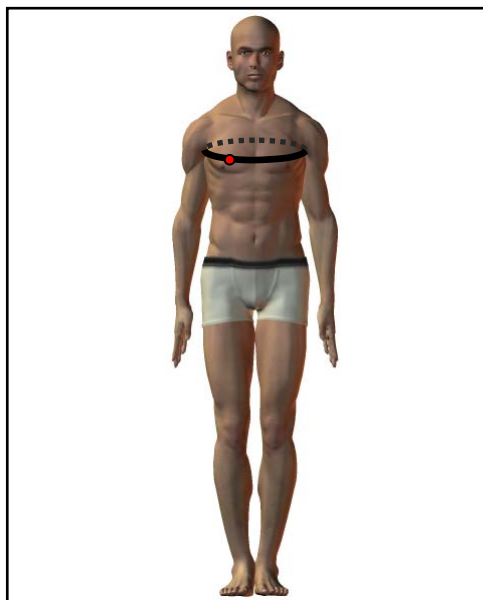
| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 23.20       | 9.13  | 1ST  | 25.00 | 9.84  |
| 23.40       | 9.21  | 2ND  | 25.40 | 10.00 |
| 23.80       | 9.37  | 3RD  | 25.60 | 10.08 |
| 24.10       | 9.49  | 5TH  | 26.10 | 10.28 |
| 24.60       | 9.69  | 10TH | 26.60 | 10.47 |
| 25.00       | 9.84  | 15TH | 27.00 | 10.63 |
| 25.40       | 10.00 | 20TH | 27.30 | 10.75 |
| 25.70       | 10.12 | 25TH | 27.70 | 10.91 |
| 25.90       | 10.20 | 30TH | 27.90 | 10.98 |
| 26.20       | 10.31 | 35TH | 28.20 | 11.10 |
| 26.40       | 10.39 | 40TH | 28.40 | 11.18 |
| 26.60       | 10.47 | 45TH | 28.70 | 11.30 |
| 26.80       | 10.55 | 50TH | 28.90 | 11.38 |
| 27.00       | 10.63 | 55TH | 29.10 | 11.46 |
| 27.30       | 10.75 | 60TH | 29.40 | 11.57 |
| 27.50       | 10.83 | 65TH | 29.60 | 11.65 |
| 27.80       | 10.94 | 70TH | 29.90 | 11.77 |
| 28.10       | 11.06 | 75TH | 30.10 | 11.85 |
| 28.50       | 11.22 | 80TH | 30.40 | 11.97 |
| 28.90       | 11.38 | 85TH | 30.80 | 12.13 |
| 29.40       | 11.57 | 90TH | 31.30 | 12.32 |
| 30.20       | 11.89 | 95TH | 32.00 | 12.60 |
| 30.60       | 12.05 | 97TH | 32.60 | 12.83 |
| 30.90       | 12.17 | 98TH | 32.90 | 12.95 |
| 31.40       | 12.36 | 99TH | 33.50 | 13.19 |

\* In ANSUR this measurement was taken (in males) at the level of the lion (nipple). This change was made in order to capture the breadth of the chest at its maximum. The landmark is unchanged for females. This measurement also differs from ANSUR because the tissue is now compressed and the measurement is taken at maximum inspiration.



## (24) CHEST CIRCUMFERENCE\*

The maximum horizontal circumference of the chest at the level of chest point, anterior is measured with a tape. The participant stands erect, looking straight ahead. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 78.40       | 30.87 | 1ST  | 87.20  | 34.33 |
| 79.50       | 31.30 | 2ND  | 89.40  | 35.20 |
| 80.70       | 31.77 | 3RD  | 90.70  | 35.71 |
| 82.40       | 32.44 | 5TH  | 92.20  | 36.30 |
| 84.50       | 33.27 | 10TH | 94.80  | 37.32 |
| 86.30       | 33.98 | 15TH | 96.70  | 38.07 |
| 87.70       | 34.53 | 20TH | 98.30  | 38.70 |
| 88.90       | 35.00 | 25TH | 99.60  | 39.21 |
| 90.00       | 35.43 | 30TH | 100.90 | 39.72 |
| 90.90       | 35.79 | 35TH | 102.10 | 40.20 |
| 92.00       | 36.22 | 40TH | 103.20 | 40.63 |
| 92.90       | 36.57 | 45TH | 104.30 | 41.06 |
| 94.00       | 37.01 | 50TH | 105.60 | 41.57 |
| 95.00       | 37.40 | 55TH | 106.70 | 42.01 |
| 96.10       | 37.83 | 60TH | 107.80 | 42.44 |
| 97.50       | 38.39 | 65TH | 109.00 | 42.91 |
| 98.70       | 38.86 | 70TH | 110.40 | 43.46 |
| 99.90       | 39.33 | 75TH | 111.70 | 43.98 |
| 101.50      | 39.96 | 80TH | 113.30 | 44.61 |
| 103.30      | 40.67 | 85TH | 115.10 | 45.31 |
| 105.70      | 41.61 | 90TH | 117.20 | 46.14 |
| 109.40      | 43.07 | 95TH | 120.70 | 47.52 |
| 111.80      | 44.02 | 97TH | 123.30 | 48.54 |
| 114.00      | 44.88 | 98TH | 125.10 | 49.25 |
| 116.10      | 45.71 | 99TH | 127.70 | 50.28 |

\* In ANSUR this measurement was taken “at the fullest part of the breast”. Although the wording of the definition has changed, the dimensions are equivalent.

## (24) CHEST CIRCUMFERENCE

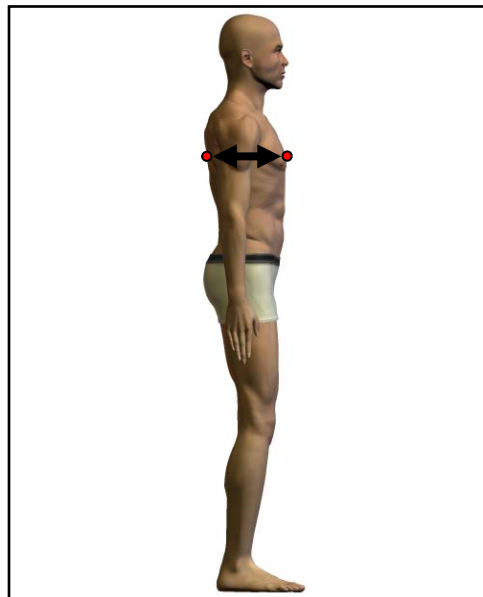
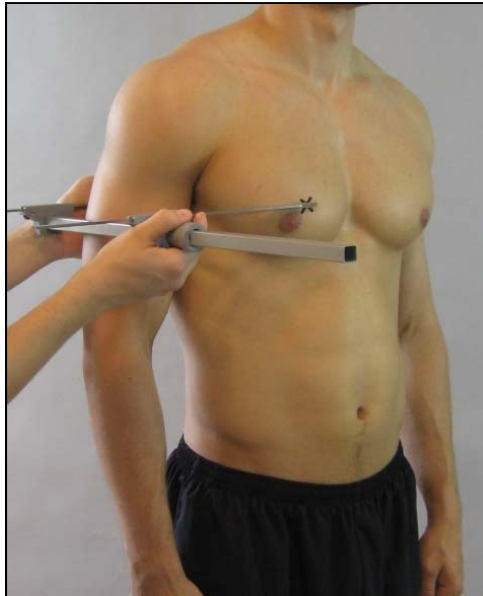
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 94.69                    | MEAN                | 37.28 |
| 0.19                     | STD ERROR (MEAN)    | 0.07  |
| 8.27                     | STANDARD DEVIATION  | 3.26  |
| 0.13                     | STD ERROR (STD DEV) | 0.05  |
| 69.50                    | MINIMUM             | 27.36 |
| 126.60                   | MAXIMUM             | 49.84 |
| SKEWNESS                 |                     | 0.43  |
| KURTOSIS                 |                     | 3.12  |
| COEFFICIENT OF VARIATION |                     | 8.7%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 105.87                   | MEAN                | 41.68 |
| 0.14                     | STD ERROR (MEAN)    | 0.05  |
| 8.74                     | STANDARD DEVIATION  | 3.44  |
| 0.10                     | STD ERROR (STD DEV) | 0.04  |
| 77.40                    | MINIMUM             | 30.47 |
| 146.90                   | MAXIMUM             | 57.83 |
| SKEWNESS                 |                     | 0.23  |
| KURTOSIS                 |                     | 2.95  |
| COEFFICIENT OF VARIATION |                     | 8.3%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |        |   |        |  |       |      |      |         |
|-----------------|------|------|---------|--------|---|--------|--|-------|------|------|---------|
| FEMALES         |      |      |         |        |   |        |  | MALES |      |      |         |
| F               | FPct | CumF | CumFPct | CM     |   |        |  | F     | FPct | CumF | CumFPct |
| 1               | 0.05 | 1    | 0.05    | 69.25  | - | 70.75  |  |       |      |      |         |
| 0               | 0.00 | 1    | 0.05    | 70.75  | - | 72.25  |  |       |      |      |         |
| 2               | 0.10 | 3    | 0.15    | 72.25  | - | 73.75  |  |       |      |      |         |
| 0               | 0.00 | 3    | 0.15    | 73.75  | - | 75.25  |  |       |      |      |         |
| 3               | 0.15 | 6    | 0.30    | 75.25  | - | 76.75  |  |       |      |      |         |
| 10              | 0.50 | 16   | 0.81    | 76.75  | - | 78.25  |  | 1     | 0.02 | 1    | 0.02    |
| 25              | 1.26 | 41   | 2.06    | 78.25  | - | 79.75  |  | 0     | 0.00 | 1    | 0.02    |
| 28              | 1.41 | 69   | 3.47    | 79.75  | - | 81.25  |  | 1     | 0.02 | 2    | 0.05    |
| 47              | 2.37 | 116  | 5.84    | 81.25  | - | 82.75  |  | 2     | 0.05 | 4    | 0.10    |
| 66              | 3.32 | 182  | 9.16    | 82.75  | - | 84.25  |  | 5     | 0.12 | 9    | 0.22    |
| 86              | 4.33 | 268  | 13.49   | 84.25  | - | 85.75  |  | 11    | 0.27 | 20   | 0.49    |
| 98              | 4.93 | 366  | 18.43   | 85.75  | - | 87.25  |  | 21    | 0.51 | 41   | 1.00    |
| 124             | 6.24 | 490  | 24.67   | 87.25  | - | 88.75  |  | 21    | 0.51 | 62   | 1.52    |
| 147             | 7.40 | 637  | 32.07   | 88.75  | - | 90.25  |  | 47    | 1.15 | 109  | 2.67    |
| 141             | 7.10 | 778  | 39.17   | 90.25  | - | 91.75  |  | 72    | 1.76 | 181  | 4.43    |
| 151             | 7.60 | 929  | 46.78   | 91.75  | - | 93.25  |  | 92    | 2.25 | 273  | 6.69    |
| 148             | 7.45 | 1077 | 54.23   | 93.25  | - | 94.75  |  | 129   | 3.16 | 402  | 9.85    |
| 124             | 6.24 | 1201 | 60.47   | 94.75  | - | 96.25  |  | 163   | 3.99 | 565  | 13.84   |
| 116             | 5.84 | 1317 | 66.31   | 96.25  | - | 97.75  |  | 185   | 4.53 | 750  | 18.37   |
| 125             | 6.29 | 1442 | 72.61   | 97.75  | - | 99.25  |  | 204   | 5.00 | 954  | 23.37   |
| 104             | 5.24 | 1546 | 77.84   | 99.25  | - | 100.75 |  | 235   | 5.76 | 1189 | 29.13   |
| 84              | 4.23 | 1630 | 82.07   | 100.75 | - | 102.25 |  | 265   | 6.49 | 1454 | 35.62   |
| 86              | 4.33 | 1716 | 86.40   | 102.25 | - | 103.75 |  | 268   | 6.57 | 1722 | 42.19   |
| 56              | 2.82 | 1772 | 89.22   | 103.75 | - | 105.25 |  | 253   | 6.20 | 1975 | 48.38   |
| 50              | 2.52 | 1822 | 91.74   | 105.25 | - | 106.75 |  | 289   | 7.08 | 2264 | 55.46   |
| 37              | 1.86 | 1859 | 93.61   | 106.75 | - | 108.25 |  | 265   | 6.49 | 2529 | 61.95   |
| 36              | 1.81 | 1895 | 95.42   | 108.25 | - | 109.75 |  | 239   | 5.85 | 2768 | 67.81   |
| 24              | 1.21 | 1919 | 96.63   | 109.75 | - | 111.25 |  | 213   | 5.22 | 2981 | 73.03   |
| 14              | 0.70 | 1933 | 97.33   | 111.25 | - | 112.75 |  | 218   | 5.34 | 3199 | 78.37   |
| 17              | 0.86 | 1950 | 98.19   | 112.75 | - | 114.25 |  | 172   | 4.21 | 3371 | 82.58   |
| 14              | 0.70 | 1964 | 98.89   | 114.25 | - | 115.75 |  | 165   | 4.04 | 3536 | 86.62   |
| 7               | 0.35 | 1971 | 99.24   | 115.75 | - | 117.25 |  | 140   | 3.43 | 3676 | 90.05   |
| 2               | 0.10 | 1973 | 99.35   | 117.25 | - | 118.75 |  | 104   | 2.55 | 3780 | 92.60   |
| 6               | 0.30 | 1979 | 99.65   | 118.75 | - | 120.25 |  | 75    | 1.84 | 3855 | 94.44   |
| 4               | 0.20 | 1983 | 99.85   | 120.25 | - | 121.75 |  | 68    | 1.67 | 3923 | 96.10   |
| 2               | 0.10 | 1985 | 99.95   | 121.75 | - | 123.25 |  | 34    | 0.83 | 3957 | 96.94   |
| 0               | 0.00 | 1985 | 99.95   | 123.25 | - | 124.75 |  | 36    | 0.88 | 3993 | 97.82   |
| 0               | 0.00 | 1985 | 99.95   | 124.75 | - | 126.25 |  | 33    | 0.81 | 4026 | 98.63   |
| 1               | 0.05 | 1986 | 100.00  | 126.25 | - | 127.75 |  | 20    | 0.49 | 4046 | 99.12   |
|                 |      |      |         | 127.75 | - | 129.25 |  | 17    | 0.42 | 4063 | 99.53   |
|                 |      |      |         | 129.25 | - | 130.75 |  | 6     | 0.15 | 4069 | 99.68   |
|                 |      |      |         | 130.75 | - | 132.25 |  | 5     | 0.12 | 4074 | 99.80   |
|                 |      |      |         | 132.25 | - | 133.75 |  | 4     | 0.10 | 4078 | 99.90   |
|                 |      |      |         | 133.75 | - | 135.25 |  | 0     | 0.00 | 4078 | 99.90   |
|                 |      |      |         | 135.25 | - | 136.75 |  | 1     | 0.02 | 4079 | 99.93   |
|                 |      |      |         | 136.75 | - | 138.25 |  | 2     | 0.05 | 4081 | 99.98   |
|                 |      |      |         | 138.25 | - | 139.75 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 139.75 | - | 141.25 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 141.25 | - | 142.75 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 142.75 | - | 144.25 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 144.25 | - | 145.75 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 145.75 | - | 147.25 |  | 1     | 0.02 | 4082 | 100.00  |

## (25) CHEST DEPTH\*

The horizontal distance between the chest point anterior landmark and the back at the same level is measured with a beam caliper. The participant stands erect, looking straight ahead. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 18.90       | 7.44  | 1ST  | 19.70 | 7.76  |
| 19.70       | 7.76  | 2ND  | 20.20 | 7.95  |
| 19.90       | 7.83  | 3RD  | 20.60 | 8.11  |
| 20.50       | 8.07  | 5TH  | 21.10 | 8.31  |
| 21.30       | 8.39  | 10TH | 22.00 | 8.66  |
| 21.90       | 8.62  | 15TH | 22.70 | 8.94  |
| 22.50       | 8.86  | 20TH | 23.10 | 9.09  |
| 22.80       | 8.98  | 25TH | 23.60 | 9.29  |
| 23.20       | 9.13  | 30TH | 23.90 | 9.41  |
| 23.60       | 9.29  | 35TH | 24.30 | 9.57  |
| 23.90       | 9.41  | 40TH | 24.60 | 9.69  |
| 24.20       | 9.53  | 45TH | 25.00 | 9.84  |
| 24.50       | 9.65  | 50TH | 25.30 | 9.96  |
| 24.90       | 9.80  | 55TH | 25.60 | 10.08 |
| 25.30       | 9.96  | 60TH | 26.00 | 10.24 |
| 25.60       | 10.08 | 65TH | 26.40 | 10.39 |
| 26.00       | 10.24 | 70TH | 26.70 | 10.51 |
| 26.60       | 10.47 | 75TH | 27.20 | 10.71 |
| 27.00       | 10.63 | 80TH | 27.70 | 10.91 |
| 27.60       | 10.87 | 85TH | 28.10 | 11.06 |
| 28.40       | 11.18 | 90TH | 28.80 | 11.34 |
| 29.60       | 11.65 | 95TH | 29.80 | 11.73 |
| 30.10       | 11.85 | 97TH | 30.40 | 11.97 |
| 30.70       | 12.09 | 98TH | 30.90 | 12.17 |
| 32.20       | 12.68 | 99TH | 31.60 | 12.44 |

\* In ANSUR this measurement was taken (in males) at the level of the nipple. This change was made in order to capture the breadth of the chest at its maximum. The landmark is unchanged for females.

## (25) CHEST DEPTH

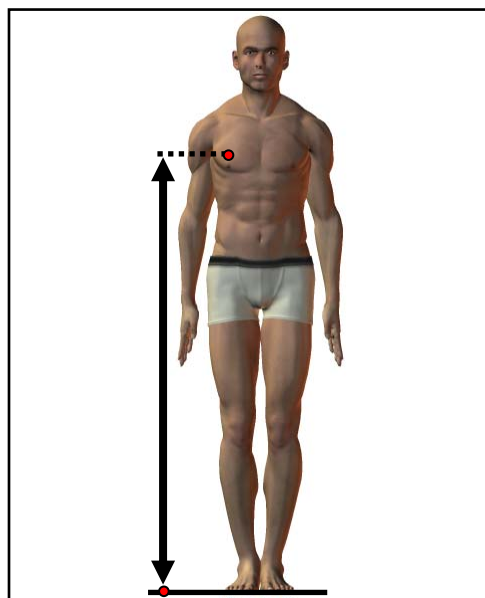
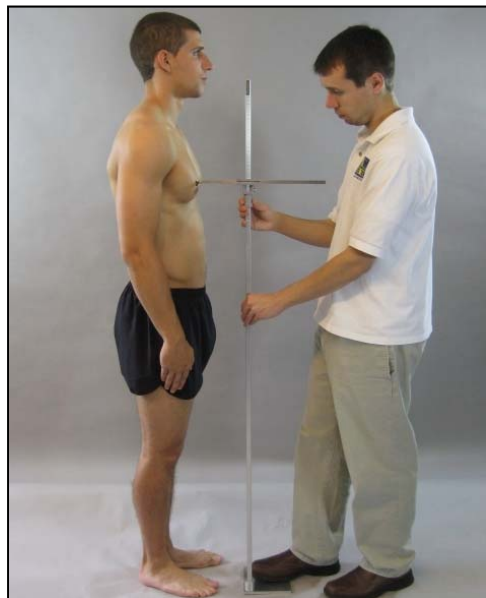
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 24.74                    | MEAN                | 9.74  |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 2.73                     | STANDARD DEVIATION  | 1.08  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 17.00                    | MINIMUM             | 6.69  |
| 35.30                    | MAXIMUM             | 13.90 |
| SKEWNESS                 |                     | 0.33  |
| KURTOSIS                 |                     | 3.11  |
| COEFFICIENT OF VARIATION |                     | 11.0% |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 25.38                    | MEAN                | 9.99  |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.62                     | STANDARD DEVIATION  | 1.03  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 17.60                    | MINIMUM             | 6.93  |
| 38.30                    | MAXIMUM             | 15.08 |
| SKEWNESS                 |                     | 0.16  |
| KURTOSIS                 |                     | 2.91  |
| COEFFICIENT OF VARIATION |                     | 10.3% |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |       |    |       |     |      |      |         |  |
|-----------------|------|------|---------|-------|----|-------|-----|------|------|---------|--|
| FEMALES         |      |      |         | MALES |    |       |     |      |      |         |  |
| F               | FPct | CumF | CumFPct |       | CM |       | F   | FPct | CumF | CumFPct |  |
| 2               | 0.10 | 2    | 0.10    | 16.75 | -  | 17.25 |     |      |      |         |  |
| 0               | 0.00 | 2    | 0.10    | 17.25 | -  | 17.75 | 1   | 0.02 | 1    | 0.02    |  |
| 1               | 0.05 | 3    | 0.15    | 17.75 | -  | 18.25 | 2   | 0.05 | 3    | 0.07    |  |
| 10              | 0.50 | 13   | 0.65    | 18.25 | -  | 18.75 | 3   | 0.07 | 6    | 0.15    |  |
| 17              | 0.86 | 30   | 1.51    | 18.75 | -  | 19.25 | 13  | 0.32 | 19   | 0.47    |  |
| 14              | 0.70 | 44   | 2.22    | 19.25 | -  | 19.75 | 22  | 0.54 | 41   | 1.00    |  |
| 39              | 1.96 | 83   | 4.18    | 19.75 | -  | 20.25 | 43  | 1.05 | 84   | 2.06    |  |
| 40              | 2.01 | 123  | 6.19    | 20.25 | -  | 20.75 | 64  | 1.57 | 148  | 3.63    |  |
| 59              | 2.97 | 182  | 9.16    | 20.75 | -  | 21.25 | 80  | 1.96 | 228  | 5.59    |  |
| 82              | 4.13 | 264  | 13.29   | 21.25 | -  | 21.75 | 93  | 2.28 | 321  | 7.86    |  |
| 86              | 4.33 | 350  | 17.62   | 21.75 | -  | 22.25 | 150 | 3.67 | 471  | 11.54   |  |
| 127             | 6.39 | 477  | 24.02   | 22.25 | -  | 22.75 | 175 | 4.29 | 646  | 15.83   |  |
| 119             | 5.99 | 596  | 30.01   | 22.75 | -  | 23.25 | 224 | 5.49 | 870  | 21.31   |  |
| 141             | 7.10 | 737  | 37.11   | 23.25 | -  | 23.75 | 256 | 6.27 | 1126 | 27.58   |  |
| 163             | 8.21 | 900  | 45.32   | 23.75 | -  | 24.25 | 268 | 6.57 | 1394 | 34.15   |  |
| 150             | 7.55 | 1050 | 52.87   | 24.25 | -  | 24.75 | 318 | 7.79 | 1712 | 41.94   |  |
| 141             | 7.10 | 1191 | 59.97   | 24.75 | -  | 25.25 | 300 | 7.35 | 2012 | 49.29   |  |
| 145             | 7.30 | 1336 | 67.27   | 25.25 | -  | 25.75 | 300 | 7.35 | 2312 | 56.64   |  |
| 102             | 5.14 | 1438 | 72.41   | 25.75 | -  | 26.25 | 292 | 7.15 | 2604 | 63.79   |  |
| 104             | 5.24 | 1542 | 77.64   | 26.25 | -  | 26.75 | 266 | 6.52 | 2870 | 70.31   |  |
| 96              | 4.83 | 1638 | 82.48   | 26.75 | -  | 27.25 | 237 | 5.81 | 3107 | 76.11   |  |
| 69              | 3.47 | 1707 | 85.95   | 27.25 | -  | 27.75 | 196 | 4.80 | 3303 | 80.92   |  |
| 62              | 3.12 | 1769 | 89.07   | 27.75 | -  | 28.25 | 201 | 4.92 | 3504 | 85.84   |  |
| 57              | 2.87 | 1826 | 91.94   | 28.25 | -  | 28.75 | 142 | 3.48 | 3646 | 89.32   |  |
| 40              | 2.01 | 1866 | 93.96   | 28.75 | -  | 29.25 | 132 | 3.23 | 3778 | 92.55   |  |
| 39              | 1.96 | 1905 | 95.92   | 29.25 | -  | 29.75 | 92  | 2.25 | 3870 | 94.81   |  |
| 25              | 1.26 | 1930 | 97.18   | 29.75 | -  | 30.25 | 72  | 1.76 | 3942 | 96.57   |  |
| 17              | 0.86 | 1947 | 98.04   | 30.25 | -  | 30.75 | 45  | 1.10 | 3987 | 97.67   |  |
| 9               | 0.45 | 1956 | 98.49   | 30.75 | -  | 31.25 | 33  | 0.81 | 4020 | 98.48   |  |
| 7               | 0.35 | 1963 | 98.84   | 31.25 | -  | 31.75 | 28  | 0.69 | 4048 | 99.17   |  |
| 6               | 0.30 | 1969 | 99.14   | 31.75 | -  | 32.25 | 14  | 0.34 | 4062 | 99.51   |  |
| 9               | 0.45 | 1978 | 99.60   | 32.25 | -  | 32.75 | 8   | 0.20 | 4070 | 99.71   |  |
| 2               | 0.10 | 1980 | 99.70   | 32.75 | -  | 33.25 | 5   | 0.12 | 4075 | 99.83   |  |
| 3               | 0.15 | 1983 | 99.85   | 33.25 | -  | 33.75 | 3   | 0.07 | 4078 | 99.90   |  |
| 2               | 0.10 | 1985 | 99.95   | 33.75 | -  | 34.25 | 3   | 0.07 | 4081 | 99.98   |  |
| 0               | 0.00 | 1985 | 99.95   | 34.25 | -  | 34.75 | 0   | 0.00 | 4081 | 99.98   |  |
| 0               | 0.00 | 1985 | 99.95   | 34.75 | -  | 35.25 | 0   | 0.00 | 4081 | 99.98   |  |
| 1               | 0.05 | 1986 | 100.00  | 35.25 | -  | 35.75 | 0   | 0.00 | 4081 | 99.98   |  |
|                 |      |      |         | 35.75 | -  | 36.25 | 0   | 0.00 | 4081 | 99.98   |  |
|                 |      |      |         | 36.25 | -  | 36.75 | 0   | 0.00 | 4081 | 99.98   |  |
|                 |      |      |         | 36.75 | -  | 37.25 | 0   | 0.00 | 4081 | 99.98   |  |
|                 |      |      |         | 37.25 | -  | 37.75 | 0   | 0.00 | 4081 | 99.98   |  |
|                 |      |      |         | 37.75 | -  | 38.25 | 0   | 0.00 | 4081 | 99.98   |  |
|                 |      |      |         | 38.25 | -  | 38.75 | 1   | 0.02 | 4082 | 100.00  |  |

## (26) CHEST HEIGHT\*

The vertical distance between a standing surface and the chest point anterior landmark is measured with an anthropometer. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 104.60      | 41.18 | 1ST  | 116.20 | 45.75 |
| 105.90      | 41.69 | 2ND  | 117.90 | 46.42 |
| 106.90      | 42.09 | 3RD  | 118.70 | 46.73 |
| 108.00      | 42.52 | 5TH  | 120.00 | 47.24 |
| 110.10      | 43.35 | 10TH | 122.00 | 48.03 |
| 111.50      | 43.90 | 15TH | 123.30 | 48.54 |
| 112.50      | 44.29 | 20TH | 124.40 | 48.98 |
| 113.40      | 44.65 | 25TH | 125.20 | 49.29 |
| 114.30      | 45.00 | 30TH | 126.10 | 49.65 |
| 115.00      | 45.28 | 35TH | 126.80 | 49.92 |
| 115.70      | 45.55 | 40TH | 127.50 | 50.20 |
| 116.40      | 45.83 | 45TH | 128.20 | 50.47 |
| 116.90      | 46.02 | 50TH | 128.90 | 50.75 |
| 117.60      | 46.30 | 55TH | 129.70 | 51.06 |
| 118.40      | 46.61 | 60TH | 130.50 | 51.38 |
| 119.20      | 46.93 | 65TH | 131.10 | 51.61 |
| 120.00      | 47.24 | 70TH | 132.00 | 51.97 |
| 120.90      | 47.60 | 75TH | 132.90 | 52.32 |
| 121.90      | 47.99 | 80TH | 133.80 | 52.68 |
| 122.90      | 48.39 | 85TH | 135.00 | 53.15 |
| 124.40      | 48.98 | 90TH | 136.40 | 53.70 |
| 126.60      | 49.84 | 95TH | 138.70 | 54.61 |
| 127.70      | 50.28 | 97TH | 140.30 | 55.24 |
| 129.00      | 50.79 | 98TH | 141.50 | 55.71 |
| 130.50      | 51.38 | 99TH | 143.20 | 56.38 |

\* In ANSUR this measurement was taken (in males) at the level of the nipple. This change was made in order to capture the breadth of the chest at its maximum. The landmark is unchanged for females.

## (26) CHEST HEIGHT

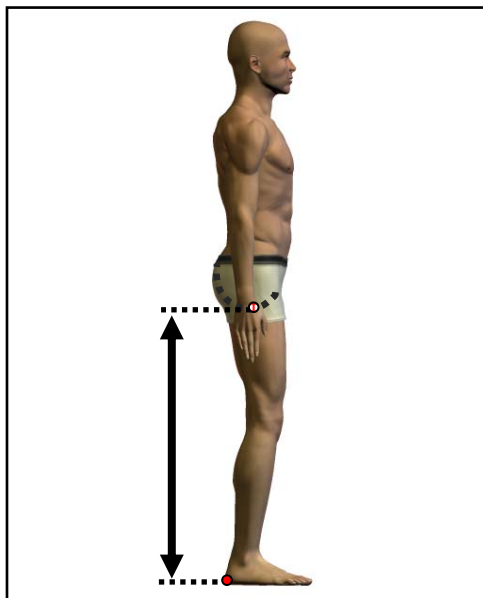
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 117.16                   | MEAN                | 46.13 |
| 0.12                     | STD ERROR (MEAN)    | 0.05  |
| 5.55                     | STANDARD DEVIATION  | 2.19  |
| 0.09                     | STD ERROR (STD DEV) | 0.03  |
| 98.40                    | MINIMUM             | 38.74 |
| 135.50                   | MAXIMUM             | 53.35 |
| SKEWNESS                 |                     | 0.08  |
| KURTOSIS                 |                     | 3.00  |
| COEFFICIENT OF VARIATION |                     | 4.7%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 129.11                   | MEAN                | 50.83 |
| 0.09                     | STD ERROR (MEAN)    | 0.04  |
| 5.70                     | STANDARD DEVIATION  | 2.24  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 108.80                   | MINIMUM             | 42.83 |
| 150.60                   | MAXIMUM             | 59.29 |
| SKEWNESS                 |                     | 0.15  |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 4.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 98.25           | - | 99.50  |  |       |      |      |         |
| 3       | 0.15 | 4    | 0.20    | 99.50           | - | 100.75 |  |       |      |      |         |
| 2       | 0.10 | 6    | 0.30    | 100.75          | - | 102.00 |  |       |      |      |         |
| 4       | 0.20 | 10   | 0.50    | 102.00          | - | 103.25 |  |       |      |      |         |
| 7       | 0.35 | 17   | 0.86    | 103.25          | - | 104.50 |  |       |      |      |         |
| 19      | 0.96 | 36   | 1.81    | 104.50          | - | 105.75 |  |       |      |      |         |
| 25      | 1.26 | 61   | 3.07    | 105.75          | - | 107.00 |  |       |      |      |         |
| 43      | 2.17 | 104  | 5.24    | 107.00          | - | 108.25 |  |       |      |      |         |
| 47      | 2.37 | 151  | 7.60    | 108.25          | - | 109.50 |  | 1     | 0.02 | 1    | 0.02    |
| 93      | 4.68 | 244  | 12.29   | 109.50          | - | 110.75 |  | 0     | 0.00 | 1    | 0.02    |
| 94      | 4.73 | 338  | 17.02   | 110.75          | - | 112.00 |  | 3     | 0.07 | 4    | 0.10    |
| 139     | 7.00 | 477  | 24.02   | 112.00          | - | 113.25 |  | 4     | 0.10 | 8    | 0.20    |
| 145     | 7.30 | 622  | 31.32   | 113.25          | - | 114.50 |  | 14    | 0.34 | 22   | 0.54    |
| 177     | 8.91 | 799  | 40.23   | 114.50          | - | 115.75 |  | 10    | 0.24 | 32   | 0.78    |
| 195     | 9.82 | 994  | 50.05   | 115.75          | - | 117.00 |  | 20    | 0.49 | 52   | 1.27    |
| 171     | 8.61 | 1165 | 58.66   | 117.00          | - | 118.25 |  | 50    | 1.22 | 102  | 2.50    |
| 159     | 8.01 | 1324 | 66.67   | 118.25          | - | 119.50 |  | 55    | 1.35 | 157  | 3.85    |
| 147     | 7.40 | 1471 | 74.07   | 119.50          | - | 120.75 |  | 105   | 2.57 | 262  | 6.42    |
| 128     | 6.45 | 1599 | 80.51   | 120.75          | - | 122.00 |  | 138   | 3.38 | 400  | 9.80    |
| 111     | 5.59 | 1710 | 86.10   | 122.00          | - | 123.25 |  | 207   | 5.07 | 607  | 14.87   |
| 82      | 4.13 | 1792 | 90.23   | 123.25          | - | 124.50 |  | 228   | 5.59 | 835  | 20.46   |
| 61      | 3.07 | 1853 | 93.30   | 124.50          | - | 125.75 |  | 305   | 7.47 | 1140 | 27.93   |
| 47      | 2.37 | 1900 | 95.67   | 125.75          | - | 127.00 |  | 323   | 7.91 | 1463 | 35.84   |
| 35      | 1.76 | 1935 | 97.43   | 127.00          | - | 128.25 |  | 383   | 9.38 | 1846 | 45.22   |
| 18      | 0.91 | 1953 | 98.34   | 128.25          | - | 129.50 |  | 337   | 8.26 | 2183 | 53.48   |
| 19      | 0.96 | 1972 | 99.30   | 129.50          | - | 130.75 |  | 351   | 8.60 | 2534 | 62.08   |
| 6       | 0.30 | 1978 | 99.60   | 130.75          | - | 132.00 |  | 313   | 7.67 | 2847 | 69.75   |
| 5       | 0.25 | 1983 | 99.85   | 132.00          | - | 133.25 |  | 324   | 7.94 | 3171 | 77.68   |
| 1       | 0.05 | 1984 | 99.90   | 133.25          | - | 134.50 |  | 211   | 5.17 | 3382 | 82.85   |
| 2       | 0.10 | 1986 | 100.00  | 134.50          | - | 135.75 |  | 212   | 5.19 | 3594 | 88.05   |
|         |      |      |         | 135.75          | - | 137.00 |  | 134   | 3.28 | 3728 | 91.33   |
|         |      |      |         | 137.00          | - | 138.25 |  | 126   | 3.09 | 3854 | 94.41   |
|         |      |      |         | 138.25          | - | 139.50 |  | 67    | 1.64 | 3921 | 96.06   |
|         |      |      |         | 139.50          | - | 140.75 |  | 52    | 1.27 | 3973 | 97.33   |
|         |      |      |         | 140.75          | - | 142.00 |  | 36    | 0.88 | 4009 | 98.21   |
|         |      |      |         | 142.00          | - | 143.25 |  | 34    | 0.83 | 4043 | 99.04   |
|         |      |      |         | 143.25          | - | 144.50 |  | 10    | 0.24 | 4053 | 99.29   |
|         |      |      |         | 144.50          | - | 145.75 |  | 19    | 0.47 | 4072 | 99.76   |
|         |      |      |         | 145.75          | - | 147.00 |  | 1     | 0.02 | 4073 | 99.78   |
|         |      |      |         | 147.00          | - | 148.25 |  | 6     | 0.15 | 4079 | 99.93   |
|         |      |      |         | 148.25          | - | 149.50 |  | 0     | 0.00 | 4079 | 99.93   |
|         |      |      |         | 149.50          | - | 150.75 |  | 3     | 0.07 | 4082 | 100.00  |

## (27) CROTCH HEIGHT

The vertical distance between the standing surface and the crotch is measured with an anthropometer. The participant stands erect, looking straight ahead. The heels are together, and the weight is distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 68.50       | 26.97 | 1ST  | 74.60 | 29.37 |
| 69.40       | 27.32 | 2ND  | 75.80 | 29.84 |
| 70.00       | 27.56 | 3RD  | 76.40 | 30.08 |
| 71.20       | 28.03 | 5TH  | 77.10 | 30.35 |
| 72.70       | 28.62 | 10TH | 78.80 | 31.02 |
| 73.70       | 29.02 | 15TH | 79.90 | 31.46 |
| 74.50       | 29.33 | 20TH | 80.70 | 31.77 |
| 75.30       | 29.65 | 25TH | 81.40 | 32.05 |
| 75.80       | 29.84 | 30TH | 82.00 | 32.28 |
| 76.40       | 30.08 | 35TH | 82.60 | 32.52 |
| 76.90       | 30.28 | 40TH | 83.20 | 32.76 |
| 77.40       | 30.47 | 45TH | 83.90 | 33.03 |
| 78.00       | 30.71 | 50TH | 84.50 | 33.27 |
| 78.50       | 30.91 | 55TH | 85.10 | 33.50 |
| 79.20       | 31.18 | 60TH | 85.70 | 33.74 |
| 79.90       | 31.46 | 65TH | 86.30 | 33.98 |
| 80.50       | 31.69 | 70TH | 87.00 | 34.25 |
| 81.20       | 31.97 | 75TH | 87.60 | 34.49 |
| 82.10       | 32.32 | 80TH | 88.30 | 34.76 |
| 82.90       | 32.64 | 85TH | 89.30 | 35.16 |
| 84.10       | 33.11 | 90TH | 90.60 | 35.67 |
| 85.70       | 33.74 | 95TH | 92.50 | 36.42 |
| 86.90       | 34.21 | 97TH | 93.90 | 36.97 |
| 87.70       | 34.53 | 98TH | 94.80 | 37.32 |
| 88.90       | 35.00 | 99TH | 96.00 | 37.80 |

## (27) CROTCH HEIGHT

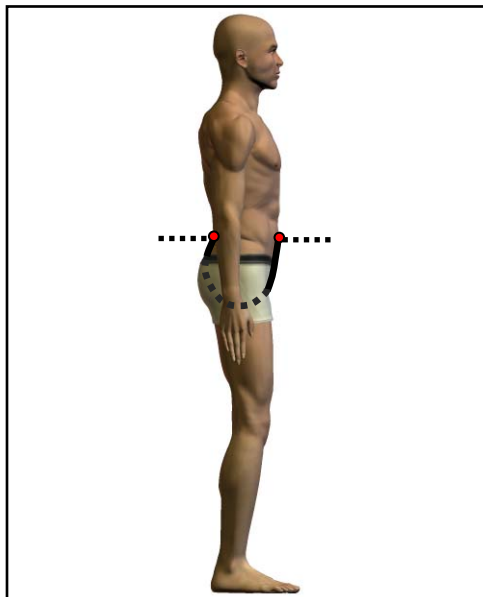
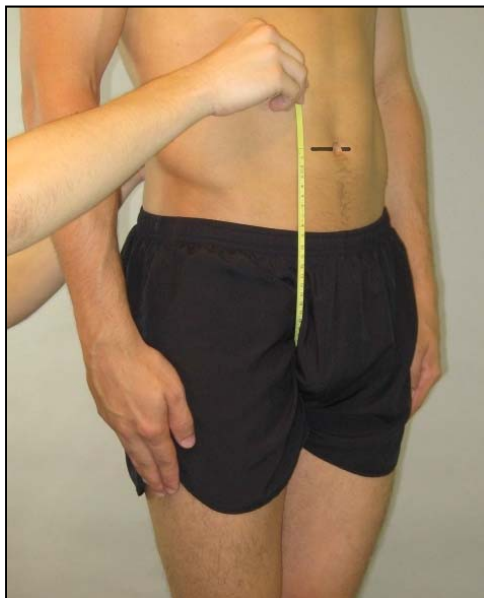
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 78.23                    | MEAN                | 30.80 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 4.46                     | STANDARD DEVIATION  | 1.76  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 61.00                    | MINIMUM             | 24.02 |
| 94.70                    | MAXIMUM             | 37.28 |
| SKEWNESS                 |                     | 0.13  |
| KURTOSIS                 |                     | 3.17  |
| COEFFICIENT OF VARIATION |                     | 5.7%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 84.59                    | MEAN                | 33.30 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 4.65                     | STANDARD DEVIATION  | 1.83  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 70.20                    | MINIMUM             | 27.64 |
| 103.10                   | MAXIMUM             | 40.59 |
| SKEWNESS                 |                     | 0.20  |
| KURTOSIS                 |                     | 3.11  |
| COEFFICIENT OF VARIATION |                     | 5.5%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 60.55           | - | 61.55  |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 61.55           | - | 62.55  |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 62.55           | - | 63.55  |  |       |      |      |         |
| 3       | 0.15 | 5    | 0.25    | 63.55           | - | 64.55  |  |       |      |      |         |
| 1       | 0.05 | 6    | 0.30    | 64.55           | - | 65.55  |  |       |      |      |         |
| 2       | 0.10 | 8    | 0.40    | 65.55           | - | 66.55  |  |       |      |      |         |
| 3       | 0.15 | 11   | 0.55    | 66.55           | - | 67.55  |  |       |      |      |         |
| 10      | 0.50 | 21   | 1.06    | 67.55           | - | 68.55  |  |       |      |      |         |
| 24      | 1.21 | 45   | 2.27    | 68.55           | - | 69.55  |  |       |      |      |         |
| 28      | 1.41 | 73   | 3.68    | 69.55           | - | 70.55  |  | 4     | 0.10 | 4    | 0.10    |
| 42      | 2.11 | 115  | 5.79    | 70.55           | - | 71.55  |  | 5     | 0.12 | 9    | 0.22    |
| 73      | 3.68 | 188  | 9.47    | 71.55           | - | 72.55  |  | 6     | 0.15 | 15   | 0.37    |
| 89      | 4.48 | 277  | 13.95   | 72.55           | - | 73.55  |  | 11    | 0.27 | 26   | 0.64    |
| 125     | 6.29 | 402  | 20.24   | 73.55           | - | 74.55  |  | 14    | 0.34 | 40   | 0.98    |
| 156     | 7.85 | 558  | 28.10   | 74.55           | - | 75.55  |  | 30    | 0.73 | 70   | 1.71    |
| 168     | 8.46 | 726  | 36.56   | 75.55           | - | 76.55  |  | 74    | 1.81 | 144  | 3.53    |
| 193     | 9.72 | 919  | 46.27   | 76.55           | - | 77.55  |  | 106   | 2.60 | 250  | 6.12    |
| 176     | 8.86 | 1095 | 55.14   | 77.55           | - | 78.55  |  | 127   | 3.11 | 377  | 9.24    |
| 157     | 7.91 | 1252 | 63.04   | 78.55           | - | 79.55  |  | 176   | 4.31 | 553  | 13.55   |
| 153     | 7.70 | 1405 | 70.75   | 79.55           | - | 80.55  |  | 238   | 5.83 | 791  | 19.38   |
| 128     | 6.45 | 1533 | 77.19   | 80.55           | - | 81.55  |  | 277   | 6.79 | 1068 | 26.16   |
| 112     | 5.64 | 1645 | 82.83   | 81.55           | - | 82.55  |  | 350   | 8.57 | 1418 | 34.74   |
| 103     | 5.19 | 1748 | 88.02   | 82.55           | - | 83.55  |  | 322   | 7.89 | 1740 | 42.63   |
| 70      | 3.52 | 1818 | 91.54   | 83.55           | - | 84.55  |  | 334   | 8.18 | 2074 | 50.81   |
| 63      | 3.17 | 1881 | 94.71   | 84.55           | - | 85.55  |  | 321   | 7.86 | 2395 | 58.67   |
| 33      | 1.66 | 1914 | 96.37   | 85.55           | - | 86.55  |  | 353   | 8.65 | 2748 | 67.32   |
| 31      | 1.56 | 1945 | 97.94   | 86.55           | - | 87.55  |  | 311   | 7.62 | 3059 | 74.94   |
| 19      | 0.96 | 1964 | 98.89   | 87.55           | - | 88.55  |  | 253   | 6.20 | 3312 | 81.14   |
| 6       | 0.30 | 1970 | 99.19   | 88.55           | - | 89.55  |  | 192   | 4.70 | 3504 | 85.84   |
| 5       | 0.25 | 1975 | 99.45   | 89.55           | - | 90.55  |  | 154   | 3.77 | 3658 | 89.61   |
| 6       | 0.30 | 1981 | 99.75   | 90.55           | - | 91.55  |  | 134   | 3.28 | 3792 | 92.90   |
| 2       | 0.10 | 1983 | 99.85   | 91.55           | - | 92.55  |  | 94    | 2.30 | 3886 | 95.20   |
| 2       | 0.10 | 1985 | 99.95   | 92.55           | - | 93.55  |  | 61    | 1.49 | 3947 | 96.69   |
| 0       | 0.00 | 1985 | 99.95   | 93.55           | - | 94.55  |  | 45    | 1.10 | 3992 | 97.80   |
| 1       | 0.05 | 1986 | 100.00  | 94.55           | - | 95.55  |  | 34    | 0.83 | 4026 | 98.63   |
|         |      |      |         | 95.55           | - | 96.55  |  | 26    | 0.64 | 4052 | 99.27   |
|         |      |      |         | 96.55           | - | 97.55  |  | 15    | 0.37 | 4067 | 99.63   |
|         |      |      |         | 97.55           | - | 98.55  |  | 5     | 0.12 | 4072 | 99.76   |
|         |      |      |         | 98.55           | - | 99.55  |  | 2     | 0.05 | 4074 | 99.80   |
|         |      |      |         | 99.55           | - | 100.55 |  | 1     | 0.02 | 4075 | 99.83   |
|         |      |      |         | 100.55          | - | 101.55 |  | 4     | 0.10 | 4079 | 99.93   |
|         |      |      |         | 101.55          | - | 102.55 |  | 2     | 0.05 | 4081 | 99.98   |
|         |      |      |         | 102.55          | - | 103.55 |  | 1     | 0.02 | 4082 | 100.00  |

## (28) CROTCH LENGTH (OMPHALION)

The distance between the abdomen at the level of the omphalion landmark to the same level on the back is measured with a tape passing through the crotch to the right of the genitalia. The tape is held vertically both in front and in back. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 52.70       | 20.75 | 1ST  | 52.20 | 20.55 |
| 54.20       | 21.34 | 2ND  | 53.20 | 20.94 |
| 54.60       | 21.50 | 3RD  | 54.00 | 21.26 |
| 55.30       | 21.77 | 5TH  | 54.90 | 21.61 |
| 56.70       | 22.32 | 10TH | 56.40 | 22.20 |
| 57.80       | 22.76 | 15TH | 57.40 | 22.60 |
| 58.50       | 23.03 | 20TH | 58.30 | 22.95 |
| 59.10       | 23.27 | 25TH | 59.00 | 23.23 |
| 59.70       | 23.50 | 30TH | 59.80 | 23.54 |
| 60.30       | 23.74 | 35TH | 60.30 | 23.74 |
| 60.80       | 23.94 | 40TH | 60.80 | 23.94 |
| 61.40       | 24.17 | 45TH | 61.40 | 24.17 |
| 61.90       | 24.37 | 50TH | 62.00 | 24.41 |
| 62.40       | 24.57 | 55TH | 62.70 | 24.69 |
| 63.00       | 24.80 | 60TH | 63.20 | 24.88 |
| 63.50       | 25.00 | 65TH | 63.80 | 25.12 |
| 64.20       | 25.28 | 70TH | 64.50 | 25.39 |
| 64.90       | 25.55 | 75TH | 65.20 | 25.67 |
| 65.70       | 25.87 | 80TH | 66.00 | 25.98 |
| 66.70       | 26.26 | 85TH | 67.10 | 26.42 |
| 67.60       | 26.61 | 90TH | 68.40 | 26.93 |
| 69.20       | 27.24 | 95TH | 70.10 | 27.60 |
| 70.40       | 27.72 | 97TH | 71.50 | 28.15 |
| 71.20       | 28.03 | 98TH | 72.40 | 28.50 |
| 72.30       | 28.46 | 99TH | 74.00 | 29.13 |

## (28) CROTCH LENGTH (OMPHALION)

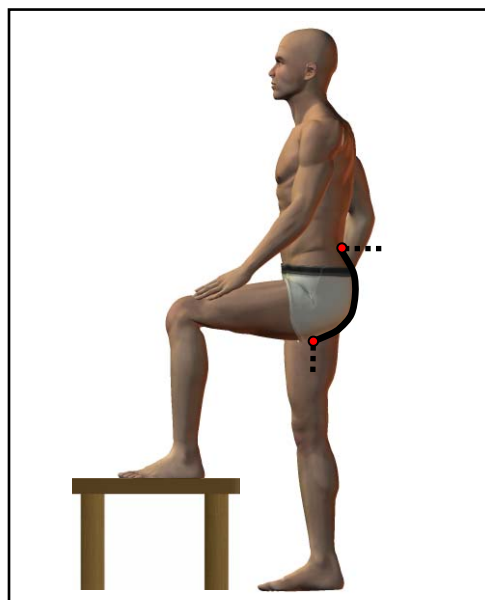
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 62.08                    | MEAN                | 24.44 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 4.24                     | STANDARD DEVIATION  | 1.67  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 49.50                    | MINIMUM             | 19.49 |
| 77.90                    | MAXIMUM             | 30.67 |
| SKEWNESS                 |                     | 0.21  |
| KURTOSIS                 |                     | 2.96  |
| COEFFICIENT OF VARIATION |                     | 6.8%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 62.23                    | MEAN                | 24.50 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 4.67                     | STANDARD DEVIATION  | 1.84  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 47.30                    | MINIMUM             | 18.62 |
| 79.90                    | MAXIMUM             | 31.46 |
| SKEWNESS                 |                     | 0.26  |
| KURTOSIS                 |                     | 3.10  |
| COEFFICIENT OF VARIATION |                     | 7.5%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |    |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|----|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct |                 | CM |       |  | F     | FPct | CumF | CumFPct |
|         |      |      |         | 47.25           | -  | 48.00 |  | 2     | 0.05 | 2    | 0.05    |
|         |      |      |         | 48.00           | -  | 48.75 |  | 0     | 0.00 | 2    | 0.05    |
|         |      |      |         | 48.75           | -  | 49.50 |  | 1     | 0.02 | 3    | 0.07    |
| 2       | 0.10 | 2    | 0.10    | 49.50           | -  | 50.25 |  | 4     | 0.10 | 7    | 0.17    |
| 2       | 0.10 | 4    | 0.20    | 50.25           | -  | 51.00 |  | 6     | 0.15 | 13   | 0.32    |
| 4       | 0.20 | 8    | 0.40    | 51.00           | -  | 51.75 |  | 14    | 0.34 | 27   | 0.66    |
| 9       | 0.45 | 17   | 0.86    | 51.75           | -  | 52.50 |  | 20    | 0.49 | 47   | 1.15    |
| 9       | 0.45 | 26   | 1.31    | 52.50           | -  | 53.25 |  | 36    | 0.88 | 83   | 2.03    |
| 8       | 0.40 | 34   | 1.71    | 53.25           | -  | 54.00 |  | 37    | 0.91 | 120  | 2.94    |
| 30      | 1.51 | 64   | 3.22    | 54.00           | -  | 54.75 |  | 70    | 1.71 | 190  | 4.65    |
| 46      | 2.32 | 110  | 5.54    | 54.75           | -  | 55.50 |  | 68    | 1.67 | 258  | 6.32    |
| 46      | 2.32 | 156  | 7.85    | 55.50           | -  | 56.25 |  | 120   | 2.94 | 378  | 9.26    |
| 57      | 2.87 | 213  | 10.73   | 56.25           | -  | 57.00 |  | 130   | 3.18 | 508  | 12.44   |
| 77      | 3.88 | 290  | 14.60   | 57.00           | -  | 57.75 |  | 195   | 4.78 | 703  | 17.22   |
| 97      | 4.88 | 387  | 19.49   | 57.75           | -  | 58.50 |  | 172   | 4.21 | 875  | 21.44   |
| 128     | 6.45 | 515  | 25.93   | 58.50           | -  | 59.25 |  | 211   | 5.17 | 1086 | 26.60   |
| 123     | 6.19 | 638  | 32.12   | 59.25           | -  | 60.00 |  | 215   | 5.27 | 1301 | 31.87   |
| 146     | 7.35 | 784  | 39.48   | 60.00           | -  | 60.75 |  | 298   | 7.30 | 1599 | 39.17   |
| 114     | 5.74 | 898  | 45.22   | 60.75           | -  | 61.50 |  | 252   | 6.17 | 1851 | 45.35   |
| 163     | 8.21 | 1061 | 53.42   | 61.50           | -  | 62.25 |  | 254   | 6.22 | 2105 | 51.57   |
| 112     | 5.64 | 1173 | 59.06   | 62.25           | -  | 63.00 |  | 264   | 6.47 | 2369 | 58.04   |
| 156     | 7.85 | 1329 | 66.92   | 63.00           | -  | 63.75 |  | 262   | 6.42 | 2631 | 64.45   |
| 96      | 4.83 | 1425 | 71.75   | 63.75           | -  | 64.50 |  | 206   | 5.05 | 2837 | 69.50   |
| 102     | 5.14 | 1527 | 76.89   | 64.50           | -  | 65.25 |  | 226   | 5.54 | 3063 | 75.04   |
| 81      | 4.08 | 1608 | 80.97   | 65.25           | -  | 66.00 |  | 187   | 4.58 | 3250 | 79.62   |
| 89      | 4.48 | 1697 | 85.45   | 66.00           | -  | 66.75 |  | 149   | 3.65 | 3399 | 83.27   |
| 71      | 3.58 | 1768 | 89.02   | 66.75           | -  | 67.50 |  | 131   | 3.21 | 3530 | 86.48   |
| 68      | 3.42 | 1836 | 92.45   | 67.50           | -  | 68.25 |  | 123   | 3.01 | 3653 | 89.49   |
| 33      | 1.66 | 1869 | 94.11   | 68.25           | -  | 69.00 |  | 92    | 2.25 | 3745 | 91.74   |
| 39      | 1.96 | 1908 | 96.07   | 69.00           | -  | 69.75 |  | 91    | 2.23 | 3836 | 93.97   |
| 20      | 1.01 | 1928 | 97.08   | 69.75           | -  | 70.50 |  | 65    | 1.59 | 3901 | 95.57   |
| 19      | 0.96 | 1947 | 98.04   | 70.50           | -  | 71.25 |  | 47    | 1.15 | 3948 | 96.72   |
| 15      | 0.76 | 1962 | 98.79   | 71.25           | -  | 72.00 |  | 31    | 0.76 | 3979 | 97.48   |
| 10      | 0.50 | 1972 | 99.30   | 72.00           | -  | 72.75 |  | 35    | 0.86 | 4014 | 98.33   |
| 3       | 0.15 | 1975 | 99.45   | 72.75           | -  | 73.50 |  | 14    | 0.34 | 4028 | 98.68   |
| 4       | 0.20 | 1979 | 99.65   | 73.50           | -  | 74.25 |  | 17    | 0.42 | 4045 | 99.09   |
| 1       | 0.05 | 1980 | 99.70   | 74.25           | -  | 75.00 |  | 6     | 0.15 | 4051 | 99.24   |
| 2       | 0.10 | 1982 | 99.80   | 75.00           | -  | 75.75 |  | 13    | 0.32 | 4064 | 99.56   |
| 2       | 0.10 | 1984 | 99.90   | 75.75           | -  | 76.50 |  | 6     | 0.15 | 4070 | 99.71   |
| 1       | 0.05 | 1985 | 99.95   | 76.50           | -  | 77.25 |  | 3     | 0.07 | 4073 | 99.78   |
| 1       | 0.05 | 1986 | 100.00  | 77.25           | -  | 78.00 |  | 3     | 0.07 | 4076 | 99.85   |
|         |      |      |         | 78.00           | -  | 78.75 |  | 3     | 0.07 | 4079 | 99.93   |
|         |      |      |         | 78.75           | -  | 79.50 |  | 0     | 0.00 | 4079 | 99.93   |
|         |      |      |         | 79.50           | -  | 80.25 |  | 3     | 0.07 | 4082 | 100.00  |

## (29) CROTCH LENGTH, POSTERIOR (OMPHALION)

The surface distance from the crotch at the inner thigh landmark to the omphalion posterior landmark is measured with a tape. The tape passes between the buttocks to the back of the waist. The participant stands with the left foot on a platform so that the knee is flexed.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 27.80       | 10.94 | 1ST  | 29.30 | 11.54 |
| 28.60       | 11.26 | 2ND  | 29.80 | 11.73 |
| 29.00       | 11.42 | 3RD  | 30.20 | 11.89 |
| 29.70       | 11.69 | 5TH  | 30.90 | 12.17 |
| 30.60       | 12.05 | 10TH | 31.90 | 12.56 |
| 31.20       | 12.28 | 15TH | 32.50 | 12.80 |
| 31.70       | 12.48 | 20TH | 33.00 | 12.99 |
| 32.10       | 12.64 | 25TH | 33.50 | 13.19 |
| 32.50       | 12.80 | 30TH | 33.90 | 13.35 |
| 33.00       | 12.99 | 35TH | 34.30 | 13.50 |
| 33.40       | 13.15 | 40TH | 34.70 | 13.66 |
| 33.80       | 13.31 | 45TH | 35.10 | 13.82 |
| 34.10       | 13.43 | 50TH | 35.50 | 13.98 |
| 34.50       | 13.58 | 55TH | 35.90 | 14.13 |
| 34.90       | 13.74 | 60TH | 36.30 | 14.29 |
| 35.30       | 13.90 | 65TH | 36.70 | 14.45 |
| 35.70       | 14.06 | 70TH | 37.10 | 14.61 |
| 36.10       | 14.21 | 75TH | 37.60 | 14.80 |
| 36.50       | 14.37 | 80TH | 38.10 | 15.00 |
| 37.20       | 14.65 | 85TH | 38.70 | 15.24 |
| 37.90       | 14.92 | 90TH | 39.50 | 15.55 |
| 39.00       | 15.35 | 95TH | 40.60 | 15.98 |
| 39.60       | 15.59 | 97TH | 41.30 | 16.26 |
| 40.20       | 15.83 | 98TH | 41.80 | 16.46 |
| 40.80       | 16.06 | 99TH | 42.70 | 16.81 |

## (29) CROTCH LENGTH, POSTERIOR (OMPHALION)

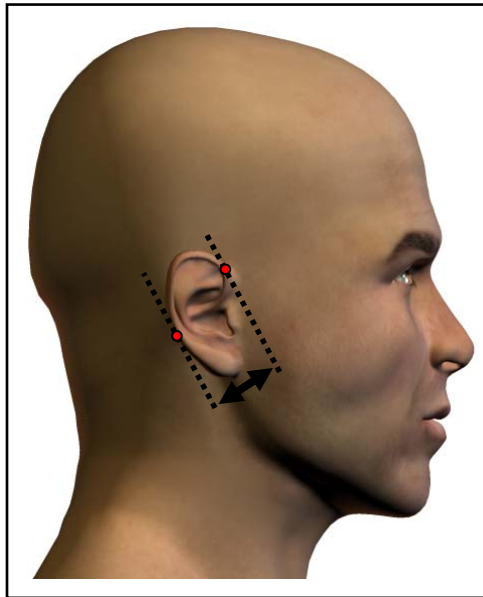
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 34.19                    | MEAN                | 13.46 |
| 0.06                     | STD ERROR (MEAN)    | 0.03  |
| 2.86                     | STANDARD DEVIATION  | 1.13  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 24.30                    | MINIMUM             | 9.57  |
| 45.10                    | MAXIMUM             | 17.76 |
| SKEWNESS                 |                     | 0.15  |
| KURTOSIS                 |                     | 3.04  |
| COEFFICIENT OF VARIATION |                     | 8.4%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 35.59                    | MEAN                | 14.01 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 2.95                     | STANDARD DEVIATION  | 1.16  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 26.10                    | MINIMUM             | 10.28 |
| 46.80                    | MAXIMUM             | 18.43 |
| SKEWNESS                 |                     | 0.18  |
| KURTOSIS                 |                     | 2.83  |
| COEFFICIENT OF VARIATION |                     | 8.3%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |       |   |       |  |       |      |      |         |
|-----------------|------|------|---------|-------|---|-------|--|-------|------|------|---------|
| FEMALES         |      |      |         |       |   |       |  | MALES |      |      |         |
| F               | FPct | CumF | CumFPct | CM    |   |       |  | F     | FPct | CumF | CumFPct |
| 2               | 0.10 | 2    | 0.10    | 24.25 | - | 24.75 |  |       |      |      |         |
| 0               | 0.00 | 2    | 0.10    | 24.75 | - | 25.25 |  |       |      |      |         |
| 0               | 0.00 | 2    | 0.10    | 25.25 | - | 25.75 |  |       |      |      |         |
| 0               | 0.00 | 2    | 0.10    | 25.75 | - | 26.25 |  | 1     | 0.02 | 1    | 0.02    |
| 3               | 0.15 | 5    | 0.25    | 26.25 | - | 26.75 |  | 0     | 0.00 | 1    | 0.02    |
| 3               | 0.15 | 8    | 0.40    | 26.75 | - | 27.25 |  | 0     | 0.00 | 1    | 0.02    |
| 10              | 0.50 | 18   | 0.91    | 27.25 | - | 27.75 |  | 2     | 0.05 | 3    | 0.07    |
| 13              | 0.65 | 31   | 1.56    | 27.75 | - | 28.25 |  | 4     | 0.10 | 7    | 0.17    |
| 14              | 0.70 | 45   | 2.27    | 28.25 | - | 28.75 |  | 14    | 0.34 | 21   | 0.51    |
| 20              | 1.01 | 65   | 3.27    | 28.75 | - | 29.25 |  | 15    | 0.37 | 36   | 0.88    |
| 40              | 2.01 | 105  | 5.29    | 29.25 | - | 29.75 |  | 37    | 0.91 | 73   | 1.79    |
| 59              | 2.97 | 164  | 8.26    | 29.75 | - | 30.25 |  | 52    | 1.27 | 125  | 3.06    |
| 53              | 2.67 | 217  | 10.93   | 30.25 | - | 30.75 |  | 48    | 1.18 | 173  | 4.24    |
| 90              | 4.53 | 307  | 15.46   | 30.75 | - | 31.25 |  | 90    | 2.20 | 263  | 6.44    |
| 100             | 5.04 | 407  | 20.49   | 31.25 | - | 31.75 |  | 89    | 2.18 | 352  | 8.62    |
| 118             | 5.94 | 525  | 26.44   | 31.75 | - | 32.25 |  | 176   | 4.31 | 528  | 12.93   |
| 101             | 5.09 | 626  | 31.52   | 32.25 | - | 32.75 |  | 156   | 3.82 | 684  | 16.76   |
| 124             | 6.24 | 750  | 37.76   | 32.75 | - | 33.25 |  | 218   | 5.34 | 902  | 22.10   |
| 130             | 6.55 | 880  | 44.31   | 33.25 | - | 33.75 |  | 208   | 5.10 | 1110 | 27.19   |
| 156             | 7.85 | 1036 | 52.17   | 33.75 | - | 34.25 |  | 296   | 7.25 | 1406 | 34.44   |
| 123             | 6.19 | 1159 | 58.36   | 34.25 | - | 34.75 |  | 246   | 6.03 | 1652 | 40.47   |
| 124             | 6.24 | 1283 | 64.60   | 34.75 | - | 35.25 |  | 262   | 6.42 | 1914 | 46.89   |
| 119             | 5.99 | 1402 | 70.59   | 35.25 | - | 35.75 |  | 239   | 5.85 | 2153 | 52.74   |
| 115             | 5.79 | 1517 | 76.38   | 35.75 | - | 36.25 |  | 293   | 7.18 | 2446 | 59.92   |
| 105             | 5.29 | 1622 | 81.67   | 36.25 | - | 36.75 |  | 235   | 5.76 | 2681 | 65.68   |
| 77              | 3.88 | 1699 | 85.55   | 36.75 | - | 37.25 |  | 239   | 5.85 | 2920 | 71.53   |
| 74              | 3.73 | 1773 | 89.27   | 37.25 | - | 37.75 |  | 206   | 5.05 | 3126 | 76.58   |
| 51              | 2.57 | 1824 | 91.84   | 37.75 | - | 38.25 |  | 180   | 4.41 | 3306 | 80.99   |
| 42              | 2.11 | 1866 | 93.96   | 38.25 | - | 38.75 |  | 166   | 4.07 | 3472 | 85.06   |
| 41              | 2.06 | 1907 | 96.02   | 38.75 | - | 39.25 |  | 134   | 3.28 | 3606 | 88.34   |
| 24              | 1.21 | 1931 | 97.23   | 39.25 | - | 39.75 |  | 109   | 2.67 | 3715 | 91.01   |
| 21              | 1.06 | 1952 | 98.29   | 39.75 | - | 40.25 |  | 97    | 2.38 | 3812 | 93.39   |
| 12              | 0.60 | 1964 | 98.89   | 40.25 | - | 40.75 |  | 85    | 2.08 | 3897 | 95.47   |
| 7               | 0.35 | 1971 | 99.24   | 40.75 | - | 41.25 |  | 55    | 1.35 | 3952 | 96.82   |
| 4               | 0.20 | 1975 | 99.45   | 41.25 | - | 41.75 |  | 40    | 0.98 | 3992 | 97.80   |
| 4               | 0.20 | 1979 | 99.65   | 41.75 | - | 42.25 |  | 25    | 0.61 | 4017 | 98.41   |
| 2               | 0.10 | 1981 | 99.75   | 42.25 | - | 42.75 |  | 27    | 0.66 | 4044 | 99.07   |
| 2               | 0.10 | 1983 | 99.85   | 42.75 | - | 43.25 |  | 14    | 0.34 | 4058 | 99.41   |
| 0               | 0.00 | 1983 | 99.85   | 43.25 | - | 43.75 |  | 10    | 0.24 | 4068 | 99.66   |
| 0               | 0.00 | 1983 | 99.85   | 43.75 | - | 44.25 |  | 6     | 0.15 | 4074 | 99.80   |
| 0               | 0.00 | 1983 | 99.85   | 44.25 | - | 44.75 |  | 5     | 0.12 | 4079 | 99.93   |
| 3               | 0.15 | 1986 | 100.00  | 44.75 | - | 45.25 |  | 1     | 0.02 | 4080 | 99.95   |
|                 |      |      |         | 45.25 | - | 45.75 |  | 1     | 0.02 | 4081 | 99.98   |
|                 |      |      |         | 45.75 | - | 46.25 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 46.25 | - | 46.75 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 46.75 | - | 47.25 |  | 1     | 0.02 | 4082 | 100.00  |

### (30) EAR BREADTH

The maximum breadth of the right ear perpendicular to its long axis is measured with a sliding caliper.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 2.70        | 1.06 | 1ST  | 2.90  | 1.14 |
| 2.80        | 1.10 | 2ND  | 3.00  | 1.18 |
| 2.80        | 1.10 | 3RD  | 3.00  | 1.18 |
| 2.90        | 1.14 | 5TH  | 3.10  | 1.22 |
| 3.00        | 1.18 | 10TH | 3.20  | 1.26 |
| 3.00        | 1.18 | 15TH | 3.30  | 1.30 |
| 3.10        | 1.22 | 20TH | 3.40  | 1.34 |
| 3.10        | 1.22 | 25TH | 3.40  | 1.34 |
| 3.20        | 1.26 | 30TH | 3.40  | 1.34 |
| 3.20        | 1.26 | 35TH | 3.50  | 1.38 |
| 3.30        | 1.30 | 40TH | 3.50  | 1.38 |
| 3.30        | 1.30 | 45TH | 3.60  | 1.42 |
| 3.30        | 1.30 | 50TH | 3.60  | 1.42 |
| 3.40        | 1.34 | 55TH | 3.60  | 1.42 |
| 3.40        | 1.34 | 60TH | 3.70  | 1.46 |
| 3.40        | 1.34 | 65TH | 3.70  | 1.46 |
| 3.50        | 1.38 | 70TH | 3.80  | 1.50 |
| 3.50        | 1.38 | 75TH | 3.80  | 1.50 |
| 3.50        | 1.38 | 80TH | 3.90  | 1.54 |
| 3.60        | 1.42 | 85TH | 3.90  | 1.54 |
| 3.70        | 1.46 | 90TH | 4.00  | 1.57 |
| 3.80        | 1.50 | 95TH | 4.10  | 1.61 |
| 3.90        | 1.54 | 97TH | 4.20  | 1.65 |
| 3.90        | 1.54 | 98TH | 4.30  | 1.69 |
| 4.00        | 1.57 | 99TH | 4.40  | 1.73 |

## (30) EAR BREADTH

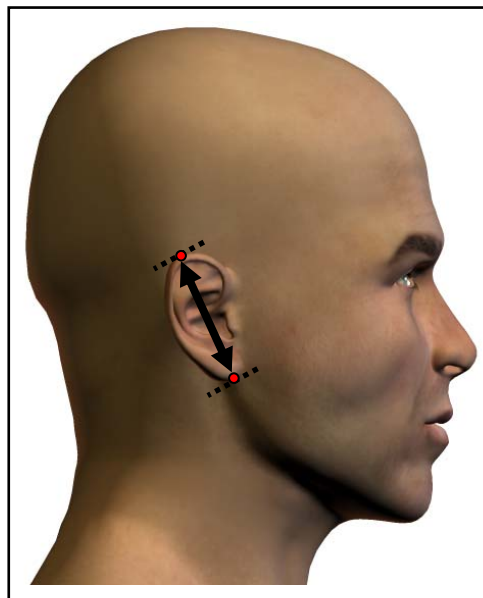
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 3.32                     | MEAN                | 1.31 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.28                     | STANDARD DEVIATION  | 0.11 |
| 0.00                     | STD ERROR (STD DEV) | 0.00 |
| 2.50                     | MINIMUM             | 0.98 |
| 4.20                     | MAXIMUM             | 1.65 |
| SKEWNESS                 |                     | 0.08 |
| KURTOSIS                 |                     | 2.87 |
| COEFFICIENT OF VARIATION |                     | 8.3% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 3.61                     | MEAN                | 1.42 |
| 0.00                     | STD ERROR (MEAN)    | 0.00 |
| 0.30                     | STANDARD DEVIATION  | 0.12 |
| 0.00                     | STD ERROR (STD DEV) | 0.00 |
| 2.60                     | MINIMUM             | 1.02 |
| 4.60                     | MAXIMUM             | 1.81 |
| SKEWNESS                 |                     | 0.15 |
| KURTOSIS                 |                     | 3.13 |
| COEFFICIENT OF VARIATION |                     | 8.4% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |       |      |         |             |       |       |      |         |  |
|-----------------|-------|------|---------|-------------|-------|-------|------|---------|--|
| FEMALES         |       |      |         |             | MALES |       |      |         |  |
| F               | FPct  | CumF | CumFPct | CM          | F     | FPct  | CumF | CumFPct |  |
| 3               | 0.15  | 3    | 0.15    | 2.45 - 2.55 | 2     | 0.05  | 2    | 0.05    |  |
| 2               | 0.10  | 5    | 0.25    | 2.55 - 2.65 | 4     | 0.10  | 6    | 0.15    |  |
| 26              | 1.31  | 31   | 1.56    | 2.65 - 2.75 | 14    | 0.34  | 20   | 0.49    |  |
| 48              | 2.42  | 79   | 3.98    | 2.75 - 2.85 | 35    | 0.86  | 55   | 1.35    |  |
| 113             | 5.69  | 192  | 9.67    | 2.85 - 2.95 | 68    | 1.67  | 123  | 3.01    |  |
| 151             | 7.60  | 343  | 17.27   | 2.95 - 3.05 | 117   | 2.87  | 240  | 5.88    |  |
| 190             | 9.57  | 533  | 26.84   | 3.05 - 3.15 | 197   | 4.83  | 437  | 10.71   |  |
| 235             | 11.83 | 768  | 38.67   | 3.15 - 3.25 | 361   | 8.84  | 798  | 19.55   |  |
| 304             | 15.31 | 1072 | 53.98   | 3.25 - 3.35 | 471   | 11.54 | 1269 | 31.09   |  |
| 285             | 14.35 | 1357 | 68.33   | 3.35 - 3.45 | 521   | 12.76 | 1790 | 43.85   |  |
| 245             | 12.34 | 1602 | 80.66   | 3.45 - 3.55 | 505   | 12.37 | 2295 | 56.22   |  |
| 151             | 7.60  | 1753 | 88.27   | 3.55 - 3.65 | 550   | 13.47 | 2845 | 69.70   |  |
| 103             | 5.19  | 1856 | 93.45   | 3.65 - 3.75 | 401   | 9.82  | 3246 | 79.52   |  |
| 69              | 3.47  | 1925 | 96.93   | 3.75 - 3.85 | 305   | 7.47  | 3551 | 86.99   |  |
| 32              | 1.61  | 1957 | 98.54   | 3.85 - 3.95 | 245   | 6.00  | 3796 | 92.99   |  |
| 20              | 1.01  | 1977 | 99.55   | 3.95 - 4.05 | 133   | 3.26  | 3929 | 96.25   |  |
| 7               | 0.35  | 1984 | 99.90   | 4.05 - 4.15 | 67    | 1.64  | 3996 | 97.89   |  |
| 2               | 0.10  | 1986 | 100.00  | 4.15 - 4.25 | 37    | 0.91  | 4033 | 98.80   |  |
|                 |       |      |         | 4.25 - 4.35 | 27    | 0.66  | 4060 | 99.46   |  |
|                 |       |      |         | 4.35 - 4.45 | 14    | 0.34  | 4074 | 99.80   |  |
|                 |       |      |         | 4.45 - 4.55 | 8     | 0.20  | 4082 | 100.00  |  |
|                 |       |      |         | 4.55 - 4.65 |       |       |      |         |  |

## (31) EAR LENGTH

The length of the right ear, from its highest to lowest points on a line parallel to the long axis of the ear, is measured with a sliding caliper.

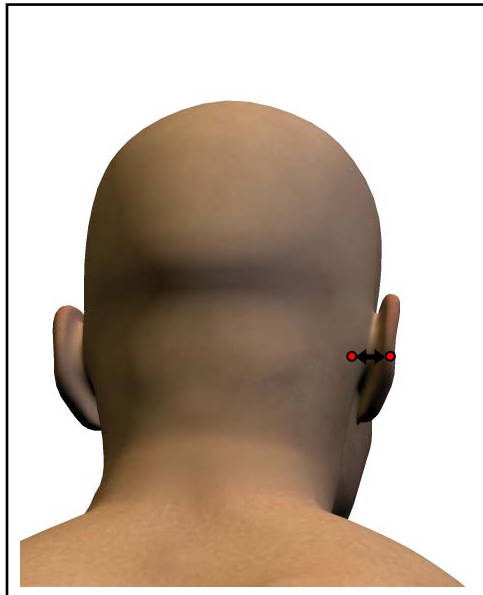


| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 5.00        | 1.97 | 1ST  | 5.40  | 2.13 |
| 5.20        | 2.05 | 2ND  | 5.60  | 2.20 |
| 5.30        | 2.09 | 3RD  | 5.60  | 2.20 |
| 5.30        | 2.09 | 5TH  | 5.70  | 2.24 |
| 5.50        | 2.17 | 10TH | 5.80  | 2.28 |
| 5.50        | 2.17 | 15TH | 6.00  | 2.36 |
| 5.60        | 2.20 | 20TH | 6.00  | 2.36 |
| 5.70        | 2.24 | 25TH | 6.10  | 2.40 |
| 5.70        | 2.24 | 30TH | 6.20  | 2.44 |
| 5.80        | 2.28 | 35TH | 6.20  | 2.44 |
| 5.80        | 2.28 | 40TH | 6.30  | 2.48 |
| 5.90        | 2.32 | 45TH | 6.40  | 2.52 |
| 6.00        | 2.36 | 50TH | 6.40  | 2.52 |
| 6.00        | 2.36 | 55TH | 6.50  | 2.56 |
| 6.00        | 2.36 | 60TH | 6.50  | 2.56 |
| 6.10        | 2.40 | 65TH | 6.60  | 2.60 |
| 6.10        | 2.40 | 70TH | 6.70  | 2.64 |
| 6.20        | 2.44 | 75TH | 6.70  | 2.64 |
| 6.30        | 2.48 | 80TH | 6.80  | 2.68 |
| 6.40        | 2.52 | 85TH | 6.90  | 2.72 |
| 6.40        | 2.52 | 90TH | 7.00  | 2.76 |
| 6.60        | 2.60 | 95TH | 7.20  | 2.83 |
| 6.70        | 2.64 | 97TH | 7.30  | 2.87 |
| 6.70        | 2.64 | 98TH | 7.40  | 2.91 |
| 6.90        | 2.72 | 99TH | 7.50  | 2.95 |



## (32) EAR PROTRUSION

The horizontal distance between the mastoid process and the outside edge of the right ear at its most lateral point is measured using a sliding caliper with its slide reversed.

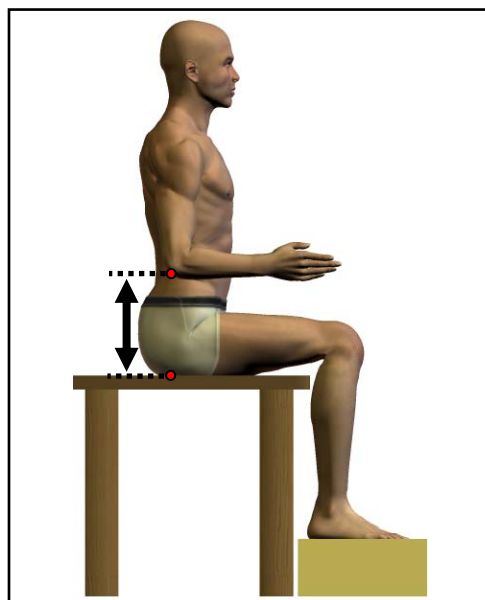


| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 1.50        | 0.59 | 1ST  | 1.70  | 0.67 |
| 1.60        | 0.63 | 2ND  | 1.80  | 0.71 |
| 1.60        | 0.63 | 3RD  | 1.80  | 0.71 |
| 1.60        | 0.63 | 5TH  | 1.90  | 0.75 |
| 1.70        | 0.67 | 10TH | 1.90  | 0.75 |
| 1.80        | 0.71 | 15TH | 2.00  | 0.79 |
| 1.80        | 0.71 | 20TH | 2.10  | 0.83 |
| 1.90        | 0.75 | 25TH | 2.10  | 0.83 |
| 1.90        | 0.75 | 30TH | 2.20  | 0.87 |
| 1.90        | 0.75 | 35TH | 2.20  | 0.87 |
| 2.00        | 0.79 | 40TH | 2.20  | 0.87 |
| 2.00        | 0.79 | 45TH | 2.30  | 0.91 |
| 2.00        | 0.79 | 50TH | 2.30  | 0.91 |
| 2.00        | 0.79 | 55TH | 2.30  | 0.91 |
| 2.10        | 0.83 | 60TH | 2.40  | 0.94 |
| 2.10        | 0.83 | 65TH | 2.40  | 0.94 |
| 2.20        | 0.87 | 70TH | 2.50  | 0.98 |
| 2.20        | 0.87 | 75TH | 2.50  | 0.98 |
| 2.30        | 0.91 | 80TH | 2.60  | 1.02 |
| 2.30        | 0.91 | 85TH | 2.60  | 1.02 |
| 2.40        | 0.94 | 90TH | 2.70  | 1.06 |
| 2.50        | 0.98 | 95TH | 2.80  | 1.10 |
| 2.60        | 1.02 | 97TH | 2.90  | 1.14 |
| 2.60        | 1.02 | 98TH | 3.00  | 1.18 |
| 2.70        | 1.06 | 99TH | 3.10  | 1.22 |



### (33) ELBOW REST HEIGHT

The vertical distance between a sitting surface and the olecranon, bottom landmark on the flexed right elbow, is measured with an anthropometer. The participant sits erect, looking straight ahead. The shoulders and upper arms are relaxed, and the forearms and hands are extended forward horizontally with the palms facing each other. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 17.20       | 6.77  | 1ST  | 17.60 | 6.93  |
| 17.70       | 6.97  | 2ND  | 18.30 | 7.20  |
| 18.20       | 7.17  | 3RD  | 18.80 | 7.40  |
| 18.90       | 7.44  | 5TH  | 19.70 | 7.76  |
| 19.80       | 7.80  | 10TH | 20.80 | 8.19  |
| 20.40       | 8.03  | 15TH | 21.60 | 8.50  |
| 21.00       | 8.27  | 20TH | 22.10 | 8.70  |
| 21.50       | 8.46  | 25TH | 22.60 | 8.90  |
| 21.90       | 8.62  | 30TH | 23.00 | 9.06  |
| 22.30       | 8.78  | 35TH | 23.40 | 9.21  |
| 22.60       | 8.90  | 40TH | 23.80 | 9.37  |
| 22.90       | 9.02  | 45TH | 24.20 | 9.53  |
| 23.30       | 9.17  | 50TH | 24.60 | 9.69  |
| 23.60       | 9.29  | 55TH | 25.00 | 9.84  |
| 23.90       | 9.41  | 60TH | 25.30 | 9.96  |
| 24.30       | 9.57  | 65TH | 25.70 | 10.12 |
| 24.70       | 9.72  | 70TH | 26.10 | 10.28 |
| 25.10       | 9.88  | 75TH | 26.50 | 10.43 |
| 25.50       | 10.04 | 80TH | 27.00 | 10.63 |
| 26.00       | 10.24 | 85TH | 27.50 | 10.83 |
| 26.50       | 10.43 | 90TH | 28.20 | 11.10 |
| 27.60       | 10.87 | 95TH | 29.10 | 11.46 |
| 28.10       | 11.06 | 97TH | 29.80 | 11.73 |
| 28.50       | 11.22 | 98TH | 30.20 | 11.89 |
| 29.30       | 11.54 | 99TH | 30.90 | 12.17 |

### (33) ELBOW REST HEIGHT

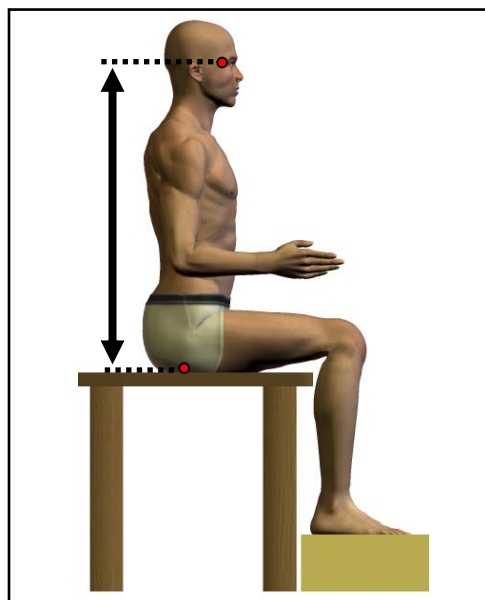
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 23.24                    | MEAN                | 9.15  |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 2.63                     | STANDARD DEVIATION  | 1.03  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 14.50                    | MINIMUM             | 5.71  |
| 31.00                    | MAXIMUM             | 12.20 |
| SKEWNESS                 |                     | -0.07 |
| KURTOSIS                 |                     | 2.83  |
| COEFFICIENT OF VARIATION |                     | 11.3% |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 24.50                    | MEAN                | 9.65  |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.87                     | STANDARD DEVIATION  | 1.13  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 13.80                    | MINIMUM             | 5.43  |
| 34.50                    | MAXIMUM             | 13.58 |
| SKEWNESS                 |                     | -0.12 |
| KURTOSIS                 |                     | 2.95  |
| COEFFICIENT OF VARIATION |                     | 11.7% |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |    |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|----|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct |                 | CM |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 13.75           | -  | 14.25 |  | 1     | 0.02 | 1    | 0.02    |
| 0       | 0.00 | 1    | 0.05    | 14.25           | -  | 14.75 |  | 0     | 0.00 | 1    | 0.02    |
| 3       | 0.15 | 4    | 0.20    | 14.75           | -  | 15.25 |  | 0     | 0.00 | 1    | 0.02    |
| 1       | 0.05 | 5    | 0.25    | 15.25           | -  | 15.75 |  | 4     | 0.10 | 5    | 0.12    |
| 8       | 0.40 | 13   | 0.65    | 15.75           | -  | 16.25 |  | 4     | 0.10 | 9    | 0.22    |
| 7       | 0.35 | 20   | 1.01    | 16.25           | -  | 16.75 |  | 6     | 0.15 | 15   | 0.37    |
| 22      | 1.11 | 42   | 2.11    | 16.75           | -  | 17.25 |  | 13    | 0.32 | 28   | 0.69    |
| 22      | 1.11 | 64   | 3.22    | 17.25           | -  | 17.75 |  | 18    | 0.44 | 46   | 1.13    |
| 27      | 1.36 | 91   | 4.58    | 17.75           | -  | 18.25 |  | 24    | 0.59 | 70   | 1.71    |
| 38      | 1.91 | 129  | 6.50    | 18.25           | -  | 18.75 |  | 45    | 1.10 | 115  | 2.82    |
| 66      | 3.32 | 195  | 9.82    | 18.75           | -  | 19.25 |  | 52    | 1.27 | 167  | 4.09    |
| 67      | 3.37 | 262  | 13.19   | 19.25           | -  | 19.75 |  | 51    | 1.25 | 218  | 5.34    |
| 99      | 4.98 | 361  | 18.18   | 19.75           | -  | 20.25 |  | 86    | 2.11 | 304  | 7.45    |
| 86      | 4.33 | 447  | 22.51   | 20.25           | -  | 20.75 |  | 90    | 2.20 | 394  | 9.65    |
| 105     | 5.29 | 552  | 27.79   | 20.75           | -  | 21.25 |  | 130   | 3.18 | 524  | 12.84   |
| 124     | 6.24 | 676  | 34.04   | 21.25           | -  | 21.75 |  | 160   | 3.92 | 684  | 16.76   |
| 163     | 8.21 | 839  | 42.25   | 21.75           | -  | 22.25 |  | 171   | 4.19 | 855  | 20.95   |
| 145     | 7.30 | 984  | 49.55   | 22.25           | -  | 22.75 |  | 249   | 6.10 | 1104 | 27.05   |
| 159     | 8.01 | 1143 | 57.55   | 22.75           | -  | 23.25 |  | 234   | 5.73 | 1338 | 32.78   |
| 130     | 6.55 | 1273 | 64.10   | 23.25           | -  | 23.75 |  | 256   | 6.27 | 1594 | 39.05   |
| 131     | 6.60 | 1404 | 70.69   | 23.75           | -  | 24.25 |  | 260   | 6.37 | 1854 | 45.42   |
| 131     | 6.60 | 1535 | 77.29   | 24.25           | -  | 24.75 |  | 277   | 6.79 | 2131 | 52.20   |
| 105     | 5.29 | 1640 | 82.58   | 24.75           | -  | 25.25 |  | 271   | 6.64 | 2402 | 58.84   |
| 95      | 4.78 | 1735 | 87.36   | 25.25           | -  | 25.75 |  | 299   | 7.32 | 2701 | 66.17   |
| 84      | 4.23 | 1819 | 91.59   | 25.75           | -  | 26.25 |  | 247   | 6.05 | 2948 | 72.22   |
| 42      | 2.11 | 1861 | 93.71   | 26.25           | -  | 26.75 |  | 227   | 5.56 | 3175 | 77.78   |
| 40      | 2.01 | 1901 | 95.72   | 26.75           | -  | 27.25 |  | 196   | 4.80 | 3371 | 82.58   |
| 32      | 1.61 | 1933 | 97.33   | 27.25           | -  | 27.75 |  | 190   | 4.65 | 3561 | 87.24   |
| 22      | 1.11 | 1955 | 98.44   | 27.75           | -  | 28.25 |  | 144   | 3.53 | 3705 | 90.76   |
| 11      | 0.55 | 1966 | 98.99   | 28.25           | -  | 28.75 |  | 126   | 3.09 | 3831 | 93.85   |
| 10      | 0.50 | 1976 | 99.50   | 28.75           | -  | 29.25 |  | 84    | 2.06 | 3915 | 95.91   |
| 5       | 0.25 | 1981 | 99.75   | 29.25           | -  | 29.75 |  | 44    | 1.08 | 3959 | 96.99   |
| 4       | 0.20 | 1985 | 99.95   | 29.75           | -  | 30.25 |  | 49    | 1.20 | 4008 | 98.19   |
| 1       | 0.05 | 1986 | 100.00  | 30.25           | -  | 30.75 |  | 27    | 0.66 | 4035 | 98.85   |
|         |      |      |         | 30.75           | -  | 31.25 |  | 16    | 0.39 | 4051 | 99.24   |
|         |      |      |         | 31.25           | -  | 31.75 |  | 11    | 0.27 | 4062 | 99.51   |
|         |      |      |         | 31.75           | -  | 32.25 |  | 9     | 0.22 | 4071 | 99.73   |
|         |      |      |         | 32.25           | -  | 32.75 |  | 6     | 0.15 | 4077 | 99.88   |
|         |      |      |         | 32.75           | -  | 33.25 |  | 3     | 0.07 | 4080 | 99.95   |
|         |      |      |         | 33.25           | -  | 33.75 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 33.75           | -  | 34.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 34.25           | -  | 34.75 |  | 1     | 0.02 | 4082 | 100.00  |

### (34) EYE HEIGHT, SITTING

The vertical distance between a sitting surface and the ectocanthus landmark is measured with an anthropometer. The participant sits erect with the head in the Frankfurt plane. The shoulders and upper arms are relaxed, and the forearms and hands are extended forward horizontally with the palms facing each other. The thighs are parallel, and the knees are flexed 90° with the feet in line with the thighs. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 68.10       | 26.81 | 1ST  | 72.80 | 28.66 |
| 68.60       | 27.01 | 2ND  | 73.50 | 28.94 |
| 69.00       | 27.17 | 3RD  | 74.20 | 29.21 |
| 69.80       | 27.48 | 5TH  | 75.00 | 29.53 |
| 70.80       | 27.87 | 10TH | 76.30 | 30.04 |
| 71.50       | 28.15 | 15TH | 77.10 | 30.35 |
| 72.20       | 28.43 | 20TH | 77.70 | 30.59 |
| 72.70       | 28.62 | 25TH | 78.20 | 30.79 |
| 73.20       | 28.82 | 30TH | 78.70 | 30.98 |
| 73.60       | 28.98 | 35TH | 79.10 | 31.14 |
| 74.00       | 29.13 | 40TH | 79.50 | 31.30 |
| 74.40       | 29.29 | 45TH | 80.00 | 31.50 |
| 74.80       | 29.45 | 50TH | 80.40 | 31.65 |
| 75.20       | 29.61 | 55TH | 80.80 | 31.81 |
| 75.50       | 29.72 | 60TH | 81.30 | 32.01 |
| 75.90       | 29.88 | 65TH | 81.70 | 32.17 |
| 76.40       | 30.08 | 70TH | 82.20 | 32.36 |
| 76.80       | 30.24 | 75TH | 82.70 | 32.56 |
| 77.40       | 30.47 | 80TH | 83.20 | 32.76 |
| 78.00       | 30.71 | 85TH | 83.90 | 33.03 |
| 78.70       | 30.98 | 90TH | 84.70 | 33.35 |
| 79.90       | 31.46 | 95TH | 86.00 | 33.86 |
| 80.50       | 31.69 | 97TH | 86.90 | 34.21 |
| 81.00       | 31.89 | 98TH | 87.50 | 34.45 |
| 81.60       | 32.13 | 99TH | 88.30 | 34.76 |

## (34) EYE HEIGHT, SITTING

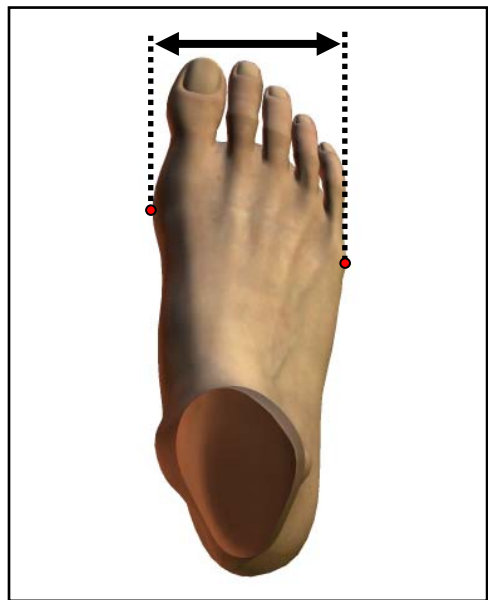
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 74.77                    | MEAN                | 29.44 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 3.04                     | STANDARD DEVIATION  | 1.20  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 65.40                    | MINIMUM             | 25.75 |
| 83.70                    | MAXIMUM             | 32.95 |
| SKEWNESS                 |                     |       |
|                          |                     | -0.01 |
| KURTOSIS                 |                     |       |
|                          |                     | 2.77  |
| COEFFICIENT OF VARIATION |                     |       |
|                          |                     | 4.1%  |
| NUMBER OF PARTICIPANTS   |                     |       |
|                          |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 80.45                    | MEAN                | 31.67 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 3.32                     | STANDARD DEVIATION  | 1.31  |
| 0.04                     | STD ERROR (STD DEV) | 0.01  |
| 68.80                    | MINIMUM             | 27.09 |
| 91.20                    | MAXIMUM             | 35.91 |
| SKEWNESS                 |                     |       |
|                          |                     | 0.04  |
| KURTOSIS                 |                     |       |
|                          |                     | 3.05  |
| COEFFICIENT OF VARIATION |                     |       |
|                          |                     | 4.1%  |
| NUMBER OF PARTICIPANTS   |                     |       |
|                          |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |    |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|----|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct |                 | CM |       |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10 | 2    | 0.10    | 65.25           | -  | 65.75 |  |       |      |      |         |
| 3       | 0.15 | 5    | 0.25    | 65.75           | -  | 66.25 |  |       |      |      |         |
| 3       | 0.15 | 8    | 0.40    | 66.25           | -  | 66.75 |  |       |      |      |         |
| 3       | 0.15 | 11   | 0.55    | 66.75           | -  | 67.25 |  |       |      |      |         |
| 4       | 0.20 | 15   | 0.76    | 67.25           | -  | 67.75 |  |       |      |      |         |
| 11      | 0.55 | 26   | 1.31    | 67.75           | -  | 68.25 |  |       |      |      |         |
| 21      | 1.06 | 47   | 2.37    | 68.25           | -  | 68.75 |  |       |      |      |         |
| 23      | 1.16 | 70   | 3.52    | 68.75           | -  | 69.25 |  | 2     | 0.05 | 2    | 0.05    |
| 23      | 1.16 | 93   | 4.68    | 69.25           | -  | 69.75 |  | 1     | 0.02 | 3    | 0.07    |
| 41      | 2.06 | 134  | 6.75    | 69.75           | -  | 70.25 |  | 2     | 0.05 | 5    | 0.12    |
| 53      | 2.67 | 187  | 9.42    | 70.25           | -  | 70.75 |  | 2     | 0.05 | 7    | 0.17    |
| 67      | 3.37 | 254  | 12.79   | 70.75           | -  | 71.25 |  | 6     | 0.15 | 13   | 0.32    |
| 83      | 4.18 | 337  | 16.97   | 71.25           | -  | 71.75 |  | 2     | 0.05 | 15   | 0.37    |
| 75      | 3.78 | 412  | 20.75   | 71.75           | -  | 72.25 |  | 12    | 0.29 | 27   | 0.66    |
| 99      | 4.98 | 511  | 25.73   | 72.25           | -  | 72.75 |  | 13    | 0.32 | 40   | 0.98    |
| 92      | 4.63 | 603  | 30.36   | 72.75           | -  | 73.25 |  | 26    | 0.64 | 66   | 1.62    |
| 138     | 6.95 | 741  | 37.31   | 73.25           | -  | 73.75 |  | 27    | 0.66 | 93   | 2.28    |
| 120     | 6.04 | 861  | 43.35   | 73.75           | -  | 74.25 |  | 30    | 0.73 | 123  | 3.01    |
| 121     | 6.09 | 982  | 49.45   | 74.25           | -  | 74.75 |  | 49    | 1.20 | 172  | 4.21    |
| 132     | 6.65 | 1114 | 56.09   | 74.75           | -  | 75.25 |  | 53    | 1.30 | 225  | 5.51    |
| 131     | 6.60 | 1245 | 62.69   | 75.25           | -  | 75.75 |  | 85    | 2.08 | 310  | 7.59    |
| 110     | 5.54 | 1355 | 68.23   | 75.75           | -  | 76.25 |  | 80    | 1.96 | 390  | 9.55    |
| 122     | 6.14 | 1477 | 74.37   | 76.25           | -  | 76.75 |  | 125   | 3.06 | 515  | 12.62   |
| 91      | 4.58 | 1568 | 78.95   | 76.75           | -  | 77.25 |  | 142   | 3.48 | 657  | 16.10   |
| 89      | 4.48 | 1657 | 83.43   | 77.25           | -  | 77.75 |  | 167   | 4.09 | 824  | 20.19   |
| 70      | 3.52 | 1727 | 86.96   | 77.75           | -  | 78.25 |  | 211   | 5.17 | 1035 | 25.36   |
| 66      | 3.32 | 1793 | 90.28   | 78.25           | -  | 78.75 |  | 216   | 5.29 | 1251 | 30.65   |
| 44      | 2.22 | 1837 | 92.50   | 78.75           | -  | 79.25 |  | 221   | 5.41 | 1472 | 36.06   |
| 38      | 1.91 | 1875 | 94.41   | 79.25           | -  | 79.75 |  | 256   | 6.27 | 1728 | 42.33   |
| 33      | 1.66 | 1908 | 96.07   | 79.75           | -  | 80.25 |  | 242   | 5.93 | 1970 | 48.26   |
| 26      | 1.31 | 1934 | 97.38   | 80.25           | -  | 80.75 |  | 245   | 6.00 | 2215 | 54.26   |
| 19      | 0.96 | 1953 | 98.34   | 80.75           | -  | 81.25 |  | 228   | 5.59 | 2443 | 59.85   |
| 15      | 0.76 | 1968 | 99.09   | 81.25           | -  | 81.75 |  | 224   | 5.49 | 2667 | 65.34   |
| 12      | 0.60 | 1980 | 99.70   | 81.75           | -  | 82.25 |  | 241   | 5.90 | 2908 | 71.24   |
| 3       | 0.15 | 1983 | 99.85   | 82.25           | -  | 82.75 |  | 185   | 4.53 | 3093 | 75.77   |
| 0       | 0.00 | 1983 | 99.85   | 82.75           | -  | 83.25 |  | 191   | 4.68 | 3284 | 80.45   |
| 3       | 0.15 | 1986 | 100.00  | 83.25           | -  | 83.75 |  | 151   | 3.70 | 3435 | 84.15   |
|         |      |      |         | 83.75           | -  | 84.25 |  | 134   | 3.28 | 3569 | 87.43   |
|         |      |      |         | 84.25           | -  | 84.75 |  | 108   | 2.65 | 3677 | 90.08   |
|         |      |      |         | 84.75           | -  | 85.25 |  | 89    | 2.18 | 3766 | 92.26   |
|         |      |      |         | 85.25           | -  | 85.75 |  | 79    | 1.94 | 3845 | 94.19   |
|         |      |      |         | 85.75           | -  | 86.25 |  | 59    | 1.45 | 3904 | 95.64   |
|         |      |      |         | 86.25           | -  | 86.75 |  | 51    | 1.25 | 3955 | 96.89   |
|         |      |      |         | 86.75           | -  | 87.25 |  | 28    | 0.69 | 3983 | 97.57   |
|         |      |      |         | 87.25           | -  | 87.75 |  | 32    | 0.78 | 4015 | 98.36   |
|         |      |      |         | 87.75           | -  | 88.25 |  | 24    | 0.59 | 4039 | 98.95   |
|         |      |      |         | 88.25           | -  | 88.75 |  | 11    | 0.27 | 4050 | 99.22   |
|         |      |      |         | 88.75           | -  | 89.25 |  | 12    | 0.29 | 4062 | 99.51   |
|         |      |      |         | 89.25           | -  | 89.75 |  | 10    | 0.24 | 4072 | 99.76   |
|         |      |      |         | 89.75           | -  | 90.25 |  | 2     | 0.05 | 4074 | 99.80   |
|         |      |      |         | 90.25           | -  | 90.75 |  | 6     | 0.15 | 4080 | 99.95   |
|         |      |      |         | 90.75           | -  | 91.25 |  | 2     | 0.05 | 4082 | 100.00  |

### (35) FOOT BREADTH, HORIZONTAL

The maximum breadth of the right foot is measured with a Brannock Device<sup>®</sup>. The participant stands with the right foot on the device and the left foot on a board of equal height with the weight distributed equally on both feet. The heel of the right foot lightly touches the back of the device, and the medial side of the right foot is parallel with the long axis of the device. The vertical slide of the device is moved until it lightly touches the fifth metatarsophalangeal protrusion landmark.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 8.20        | 3.23 | 1ST  | 9.10  | 3.58 |
| 8.40        | 3.31 | 2ND  | 9.20  | 3.62 |
| 8.40        | 3.31 | 3RD  | 9.20  | 3.62 |
| 8.50        | 3.35 | 5TH  | 9.40  | 3.70 |
| 8.70        | 3.43 | 10TH | 9.50  | 3.74 |
| 8.80        | 3.46 | 15TH | 9.70  | 3.82 |
| 8.90        | 3.50 | 20TH | 9.80  | 3.86 |
| 8.90        | 3.50 | 25TH | 9.80  | 3.86 |
| 9.00        | 3.54 | 30TH | 9.90  | 3.90 |
| 9.10        | 3.58 | 35TH | 10.00 | 3.94 |
| 9.10        | 3.58 | 40TH | 10.00 | 3.94 |
| 9.20        | 3.62 | 45TH | 10.10 | 3.98 |
| 9.30        | 3.66 | 50TH | 10.20 | 4.02 |
| 9.30        | 3.66 | 55TH | 10.20 | 4.02 |
| 9.40        | 3.70 | 60TH | 10.30 | 4.06 |
| 9.40        | 3.70 | 65TH | 10.40 | 4.09 |
| 9.50        | 3.74 | 70TH | 10.40 | 4.09 |
| 9.60        | 3.78 | 75TH | 10.50 | 4.13 |
| 9.70        | 3.82 | 80TH | 10.60 | 4.17 |
| 9.80        | 3.86 | 85TH | 10.70 | 4.21 |
| 9.90        | 3.90 | 90TH | 10.90 | 4.29 |
| 10.10       | 3.98 | 95TH | 11.10 | 4.37 |
| 10.20       | 4.02 | 97TH | 11.20 | 4.41 |
| 10.30       | 4.06 | 98TH | 11.40 | 4.49 |
| 10.40       | 4.09 | 99TH | 11.50 | 4.53 |

### (35) FOOT BREADTH, HORIZONTAL

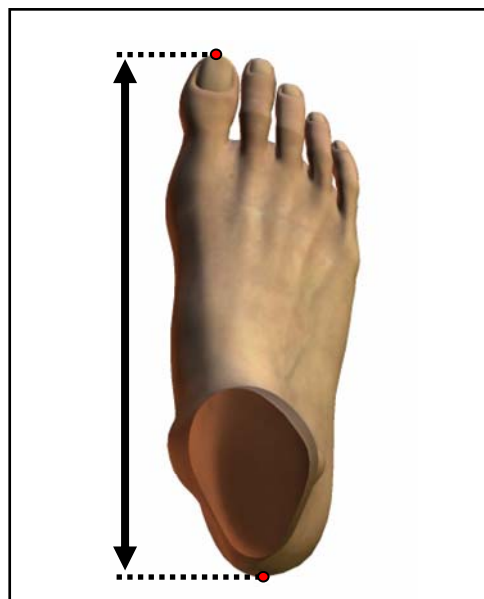
| FEMALES                  |                     |           |
|--------------------------|---------------------|-----------|
| <u>CM</u>                |                     | <u>IN</u> |
| 9.27                     | MEAN                | 3.65      |
| 0.01                     | STD ERROR (MEAN)    | 0.00      |
| 0.48                     | STANDARD DEVIATION  | 0.19      |
| 0.01                     | STD ERROR (STD DEV) | 0.00      |
| 7.70                     | MINIMUM             | 3.03      |
| 10.80                    | MAXIMUM             | 4.25      |
| SKEWNESS                 |                     | 0.12      |
| KURTOSIS                 |                     | 2.92      |
| COEFFICIENT OF VARIATION |                     | 5.2%      |
| NUMBER OF PARTICIPANTS   |                     | 1986      |

| MALES                    |                     |           |
|--------------------------|---------------------|-----------|
| <u>CM</u>                |                     | <u>IN</u> |
| 10.19                    | MEAN                | 4.01      |
| 0.01                     | STD ERROR (MEAN)    | 0.00      |
| 0.52                     | STANDARD DEVIATION  | 0.21      |
| 0.01                     | STD ERROR (STD DEV) | 0.00      |
| 7.90                     | MINIMUM             | 3.11      |
| 12.60                    | MAXIMUM             | 4.96      |
| SKEWNESS                 |                     | 0.27      |
| KURTOSIS                 |                     | 3.54      |
| COEFFICIENT OF VARIATION |                     | 5.1%      |
| NUMBER OF PARTICIPANTS   |                     | 4082      |

| FREQUENCY TABLE |      |      |         |               |       |      |      |         |  |
|-----------------|------|------|---------|---------------|-------|------|------|---------|--|
| FEMALES         |      |      |         |               | MALES |      |      |         |  |
| F               | FPct | CumF | CumFPct | <u>CM</u>     | F     | FPct | CumF | CumFPct |  |
| 3               | 0.15 | 3    | 0.15    | 7.65 - 7.75   |       |      |      |         |  |
| 1               | 0.05 | 4    | 0.20    | 7.75 - 7.85   |       |      |      |         |  |
| 1               | 0.05 | 5    | 0.25    | 7.85 - 7.95   | 1     | 0.02 | 1    | 0.02    |  |
| 2               | 0.10 | 7    | 0.35    | 7.95 - 8.05   | 0     | 0.00 | 1    | 0.02    |  |
| 5               | 0.25 | 12   | 0.60    | 8.05 - 8.15   | 0     | 0.00 | 1    | 0.02    |  |
| 8               | 0.40 | 20   | 1.01    | 8.15 - 8.25   | 0     | 0.00 | 1    | 0.02    |  |
| 16              | 0.81 | 36   | 1.81    | 8.25 - 8.35   | 1     | 0.02 | 2    | 0.05    |  |
| 35              | 1.76 | 71   | 3.58    | 8.35 - 8.45   | 0     | 0.00 | 2    | 0.05    |  |
| 52              | 2.62 | 123  | 6.19    | 8.45 - 8.55   | 0     | 0.00 | 2    | 0.05    |  |
| 55              | 2.77 | 178  | 8.96    | 8.55 - 8.65   | 4     | 0.10 | 6    | 0.15    |  |
| 97              | 4.88 | 275  | 13.85   | 8.65 - 8.75   | 5     | 0.12 | 11   | 0.27    |  |
| 113             | 5.69 | 388  | 19.54   | 8.75 - 8.85   | 5     | 0.12 | 16   | 0.39    |  |
| 134             | 6.75 | 522  | 26.28   | 8.85 - 8.95   | 8     | 0.20 | 24   | 0.59    |  |
| 145             | 7.30 | 667  | 33.59   | 8.95 - 9.05   | 16    | 0.39 | 40   | 0.98    |  |
| 145             | 7.30 | 812  | 40.89   | 9.05 - 9.15   | 31    | 0.76 | 71   | 1.74    |  |
| 159             | 8.01 | 971  | 48.89   | 9.15 - 9.25   | 58    | 1.42 | 129  | 3.16    |  |
| 157             | 7.91 | 1128 | 56.80   | 9.25 - 9.35   | 59    | 1.45 | 188  | 4.61    |  |
| 176             | 8.86 | 1304 | 65.66   | 9.35 - 9.45   | 105   | 2.57 | 293  | 7.18    |  |
| 138             | 6.95 | 1442 | 72.61   | 9.45 - 9.55   | 126   | 3.09 | 419  | 10.26   |  |
| 105             | 5.29 | 1547 | 77.90   | 9.55 - 9.65   | 145   | 3.55 | 564  | 13.82   |  |
| 127             | 6.39 | 1674 | 84.29   | 9.65 - 9.75   | 230   | 5.63 | 794  | 19.45   |  |
| 72              | 3.63 | 1746 | 87.92   | 9.75 - 9.85   | 239   | 5.85 | 1033 | 25.31   |  |
| 78              | 3.93 | 1824 | 91.84   | 9.85 - 9.95   | 329   | 8.06 | 1362 | 33.37   |  |
| 58              | 2.92 | 1882 | 94.76   | 9.95 - 10.05  | 376   | 9.21 | 1738 | 42.58   |  |
| 29              | 1.46 | 1911 | 96.22   | 10.05 - 10.15 | 260   | 6.37 | 1998 | 48.95   |  |
| 29              | 1.46 | 1940 | 97.68   | 10.15 - 10.25 | 297   | 7.28 | 2295 | 56.22   |  |
| 17              | 0.86 | 1957 | 98.54   | 10.25 - 10.35 | 280   | 6.86 | 2575 | 63.08   |  |
| 15              | 0.76 | 1972 | 99.30   | 10.35 - 10.45 | 338   | 8.28 | 2913 | 71.36   |  |
| 5               | 0.25 | 1977 | 99.55   | 10.45 - 10.55 | 260   | 6.37 | 3173 | 77.73   |  |
| 4               | 0.20 | 1981 | 99.75   | 10.55 - 10.65 | 179   | 4.39 | 3352 | 82.12   |  |
| 2               | 0.10 | 1983 | 99.85   | 10.65 - 10.75 | 187   | 4.58 | 3539 | 86.70   |  |
| 3               | 0.15 | 1986 | 100.00  | 10.75 - 10.85 | 127   | 3.11 | 3666 | 89.81   |  |
|                 |      |      |         | 10.85 - 10.95 | 113   | 2.77 | 3779 | 92.58   |  |
|                 |      |      |         | 10.95 - 11.05 | 94    | 2.30 | 3873 | 94.88   |  |
|                 |      |      |         | 11.05 - 11.15 | 52    | 1.27 | 3925 | 96.15   |  |
|                 |      |      |         | 11.15 - 11.25 | 42    | 1.03 | 3967 | 97.18   |  |
|                 |      |      |         | 11.25 - 11.35 | 30    | 0.73 | 3997 | 97.92   |  |
|                 |      |      |         | 11.35 - 11.45 | 22    | 0.54 | 4019 | 98.46   |  |
|                 |      |      |         | 11.45 - 11.55 | 24    | 0.59 | 4043 | 99.04   |  |
|                 |      |      |         | 11.55 - 11.65 | 10    | 0.24 | 4053 | 99.29   |  |
|                 |      |      |         | 11.65 - 11.75 | 9     | 0.22 | 4062 | 99.51   |  |
|                 |      |      |         | 11.75 - 11.85 | 7     | 0.17 | 4069 | 99.68   |  |
|                 |      |      |         | 11.85 - 11.95 | 3     | 0.07 | 4072 | 99.76   |  |
|                 |      |      |         | 11.95 - 12.05 | 4     | 0.10 | 4076 | 99.85   |  |
|                 |      |      |         | 12.05 - 12.15 | 2     | 0.05 | 4078 | 99.90   |  |
|                 |      |      |         | 12.15 - 12.25 | 1     | 0.02 | 4079 | 99.93   |  |
|                 |      |      |         | 12.25 - 12.35 | 1     | 0.02 | 4080 | 99.95   |  |
|                 |      |      |         | 12.35 - 12.45 | 1     | 0.02 | 4081 | 99.98   |  |
|                 |      |      |         | 12.45 - 12.55 | 0     | 0.00 | 4081 | 99.98   |  |
|                 |      |      |         | 12.55 -       | 1     | 0.02 | 4082 | 100.00  |  |

## (36) FOOT LENGTH

The maximum length of the right foot is measured with a Brannock Device<sup>®</sup>. The participant stands with the right foot on the device and the left foot on a board of equal height with the weight distributed equally on both feet. The heel of the right foot lightly touches the back of the device, and the medial side of the right foot is parallel with the long axis of the device. A block is placed against the tip of the longest toe to establish the measurement on the scale of the device.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 21.90       | 8.62  | 1ST  | 24.20 | 9.53  |
| 22.20       | 8.74  | 2ND  | 24.40 | 9.61  |
| 22.40       | 8.82  | 3RD  | 24.70 | 9.72  |
| 22.60       | 8.90  | 5TH  | 25.00 | 9.84  |
| 23.00       | 9.06  | 10TH | 25.40 | 10.00 |
| 23.30       | 9.17  | 15TH | 25.70 | 10.12 |
| 23.60       | 9.29  | 20TH | 26.00 | 10.24 |
| 23.80       | 9.37  | 25TH | 26.30 | 10.35 |
| 23.90       | 9.41  | 30TH | 26.40 | 10.39 |
| 24.10       | 9.49  | 35TH | 26.60 | 10.47 |
| 24.30       | 9.57  | 40TH | 26.80 | 10.55 |
| 24.40       | 9.61  | 45TH | 26.90 | 10.59 |
| 24.60       | 9.69  | 50TH | 27.10 | 10.67 |
| 24.80       | 9.76  | 55TH | 27.30 | 10.75 |
| 24.90       | 9.80  | 60TH | 27.40 | 10.79 |
| 25.10       | 9.88  | 65TH | 27.60 | 10.87 |
| 25.30       | 9.96  | 70TH | 27.80 | 10.94 |
| 25.40       | 10.00 | 75TH | 28.00 | 11.02 |
| 25.70       | 10.12 | 80TH | 28.20 | 11.10 |
| 25.90       | 10.20 | 85TH | 28.50 | 11.22 |
| 26.30       | 10.35 | 90TH | 28.80 | 11.34 |
| 26.80       | 10.55 | 95TH | 29.30 | 11.54 |
| 27.10       | 10.67 | 97TH | 29.60 | 11.65 |
| 27.30       | 10.75 | 98TH | 29.90 | 11.77 |
| 27.60       | 10.87 | 99TH | 30.20 | 11.89 |

### (36) FOOT LENGTH

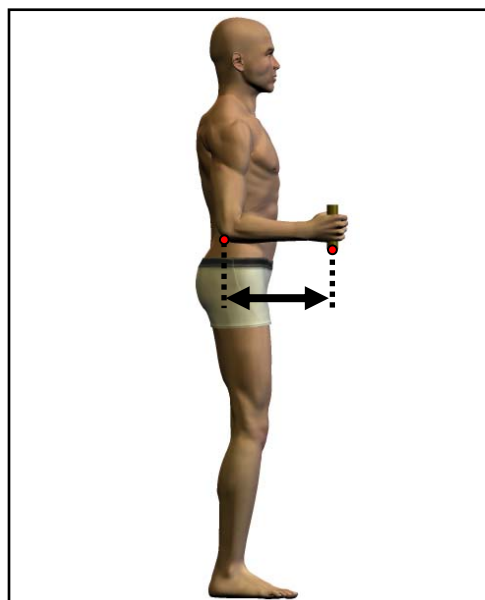
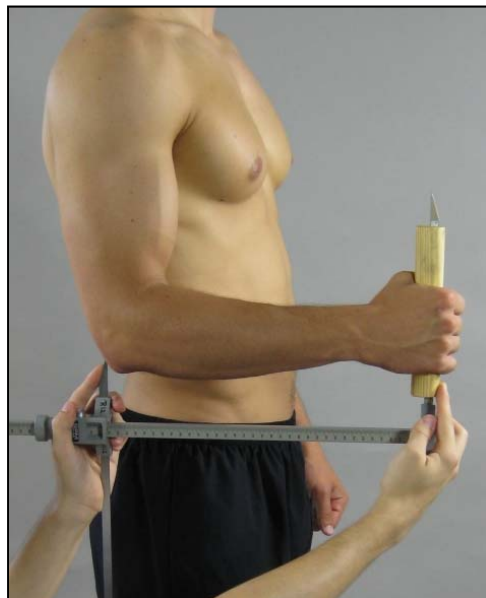
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 24.63                    |                     | 9.70  |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.24                     | STANDARD DEVIATION  | 0.49  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 19.80                    | MINIMUM             | 7.80  |
| 28.60                    | MAXIMUM             | 11.26 |
| SKEWNESS                 |                     | 0.11  |
| KURTOSIS                 |                     | 2.93  |
| COEFFICIENT OF VARIATION |                     | 5.0%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 27.12                    |                     | 10.68 |
| 0.02                     | STD ERROR (MEAN)    | 0.01  |
| 1.31                     | STANDARD DEVIATION  | 0.52  |
| 0.01                     | STD ERROR (STD DEV) | 0.01  |
| 21.60                    | MINIMUM             | 8.50  |
| 32.30                    | MAXIMUM             | 12.72 |
| SKEWNESS                 |                     | 0.05  |
| KURTOSIS                 |                     | 3.06  |
| COEFFICIENT OF VARIATION |                     | 4.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 19.60           | - | 19.85 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 19.85           | - | 20.10 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 20.10           | - | 20.35 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 20.35           | - | 20.60 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 20.60           | - | 20.85 |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 20.85           | - | 21.10 |  |       |      |      |         |
| 2       | 0.10 | 4    | 0.20    | 21.10           | - | 21.35 |  |       |      |      |         |
| 4       | 0.20 | 8    | 0.40    | 21.35           | - | 21.60 |  |       |      |      |         |
| 9       | 0.45 | 17   | 0.86    | 21.60           | - | 21.85 |  | 1     | 0.02 | 1    | 0.02    |
| 11      | 0.55 | 28   | 1.41    | 21.85           | - | 22.10 |  | 0     | 0.00 | 1    | 0.02    |
| 27      | 1.36 | 55   | 2.77    | 22.10           | - | 22.35 |  | 0     | 0.00 | 1    | 0.02    |
| 30      | 1.51 | 85   | 4.28    | 22.35           | - | 22.60 |  | 0     | 0.00 | 1    | 0.02    |
| 67      | 3.37 | 152  | 7.65    | 22.60           | - | 22.85 |  | 1     | 0.02 | 2    | 0.05    |
| 58      | 2.92 | 210  | 10.57   | 22.85           | - | 23.10 |  | 1     | 0.02 | 3    | 0.07    |
| 89      | 4.48 | 299  | 15.06   | 23.10           | - | 23.35 |  | 6     | 0.15 | 9    | 0.22    |
| 92      | 4.63 | 391  | 19.69   | 23.35           | - | 23.60 |  | 4     | 0.10 | 13   | 0.32    |
| 163     | 8.21 | 554  | 27.90   | 23.60           | - | 23.85 |  | 8     | 0.20 | 21   | 0.51    |
| 102     | 5.14 | 656  | 33.03   | 23.85           | - | 24.10 |  | 10    | 0.24 | 31   | 0.76    |
| 173     | 8.71 | 829  | 41.74   | 24.10           | - | 24.35 |  | 36    | 0.88 | 67   | 1.64    |
| 135     | 6.80 | 964  | 48.54   | 24.35           | - | 24.60 |  | 27    | 0.66 | 94   | 2.30    |
| 175     | 8.81 | 1139 | 57.35   | 24.60           | - | 24.85 |  | 61    | 1.49 | 155  | 3.80    |
| 124     | 6.24 | 1263 | 63.60   | 24.85           | - | 25.10 |  | 66    | 1.62 | 221  | 5.41    |
| 183     | 9.21 | 1446 | 72.81   | 25.10           | - | 25.35 |  | 135   | 3.31 | 356  | 8.72    |
| 91      | 4.58 | 1537 | 77.39   | 25.35           | - | 25.60 |  | 132   | 3.23 | 488  | 11.95   |
| 135     | 6.80 | 1672 | 84.19   | 25.60           | - | 25.85 |  | 217   | 5.32 | 705  | 17.27   |
| 66      | 3.32 | 1738 | 87.51   | 25.85           | - | 26.10 |  | 158   | 3.87 | 863  | 21.14   |
| 71      | 3.58 | 1809 | 91.09   | 26.10           | - | 26.35 |  | 259   | 6.34 | 1122 | 27.49   |
| 46      | 2.32 | 1855 | 93.40   | 26.35           | - | 26.60 |  | 238   | 5.83 | 1360 | 33.32   |
| 49      | 2.47 | 1904 | 95.87   | 26.60           | - | 26.85 |  | 362   | 8.87 | 1722 | 42.19   |
| 22      | 1.11 | 1926 | 96.98   | 26.85           | - | 27.10 |  | 255   | 6.25 | 1977 | 48.43   |
| 21      | 1.06 | 1947 | 98.04   | 27.10           | - | 27.35 |  | 341   | 8.35 | 2318 | 56.79   |
| 18      | 0.91 | 1965 | 98.94   | 27.35           | - | 27.60 |  | 264   | 6.47 | 2582 | 63.25   |
| 10      | 0.50 | 1975 | 99.45   | 27.60           | - | 27.85 |  | 351   | 8.60 | 2933 | 71.85   |
| 5       | 0.25 | 1980 | 99.70   | 27.85           | - | 28.10 |  | 199   | 4.88 | 3132 | 76.73   |
| 4       | 0.20 | 1984 | 99.90   | 28.10           | - | 28.35 |  | 228   | 5.59 | 3360 | 82.31   |
| 1       | 0.05 | 1985 | 99.95   | 28.35           | - | 28.60 |  | 168   | 4.12 | 3528 | 86.43   |
| 1       | 0.05 | 1986 | 100.00  | 28.60           | - | 28.85 |  | 189   | 4.63 | 3717 | 91.06   |
|         |      |      |         | 28.85           | - | 29.10 |  | 82    | 2.01 | 3799 | 93.07   |
|         |      |      |         | 29.10           | - | 29.35 |  | 94    | 2.30 | 3893 | 95.37   |
|         |      |      |         | 29.35           | - | 29.60 |  | 53    | 1.30 | 3946 | 96.67   |
|         |      |      |         | 29.60           | - | 29.85 |  | 54    | 1.32 | 4000 | 97.99   |
|         |      |      |         | 29.85           | - | 30.10 |  | 30    | 0.73 | 4030 | 98.73   |
|         |      |      |         | 30.10           | - | 30.35 |  | 22    | 0.54 | 4052 | 99.27   |
|         |      |      |         | 30.35           | - | 30.60 |  | 8     | 0.20 | 4060 | 99.46   |
|         |      |      |         | 30.60           | - | 30.85 |  | 8     | 0.20 | 4068 | 99.66   |
|         |      |      |         | 30.85           | - | 31.10 |  | 6     | 0.15 | 4074 | 99.80   |
|         |      |      |         | 31.10           | - | 31.35 |  | 5     | 0.12 | 4079 | 99.93   |
|         |      |      |         | 31.35           | - | 31.60 |  | 0     | 0.00 | 4079 | 99.93   |
|         |      |      |         | 31.60           | - | 31.85 |  | 2     | 0.05 | 4081 | 99.98   |
|         |      |      |         | 31.85           | - | 32.10 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 32.10           | - | 32.35 |  | 1     | 0.02 | 4082 | 100.00  |

### (37) FOREARM-CENTER OF GRIP LENGTH

The horizontal distance between the olecranon rear landmark and the center of a 1-1/4"-diameter dowel gripped in the right hand is measured with a beam caliper. The participant stands erect with the upper arms hanging at the side and the right elbow flexed 90°. The hand grips a 1-1/4"-diameter dowel placed on the fixed blade of a beam caliper. The hand gripping the dowel should be in line with the long axis of the arm.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 27.90       | 10.98 | 1ST  | 31.00 | 12.20 |
| 28.30       | 11.14 | 2ND  | 31.40 | 12.36 |
| 28.60       | 11.26 | 3RD  | 31.70 | 12.48 |
| 29.00       | 11.42 | 5TH  | 32.00 | 12.60 |
| 29.60       | 11.65 | 10TH | 32.60 | 12.83 |
| 30.00       | 11.81 | 15TH | 33.00 | 12.99 |
| 30.30       | 11.93 | 20TH | 33.40 | 13.15 |
| 30.60       | 12.05 | 25TH | 33.70 | 13.27 |
| 30.80       | 12.13 | 30TH | 33.90 | 13.35 |
| 31.00       | 12.20 | 35TH | 34.20 | 13.46 |
| 31.20       | 12.28 | 40TH | 34.40 | 13.54 |
| 31.40       | 12.36 | 45TH | 34.60 | 13.62 |
| 31.60       | 12.44 | 50TH | 34.80 | 13.70 |
| 31.80       | 12.52 | 55TH | 35.10 | 13.82 |
| 32.10       | 12.64 | 60TH | 35.30 | 13.90 |
| 32.30       | 12.72 | 65TH | 35.60 | 14.02 |
| 32.50       | 12.80 | 70TH | 35.80 | 14.09 |
| 32.90       | 12.95 | 75TH | 36.10 | 14.21 |
| 33.20       | 13.07 | 80TH | 36.40 | 14.33 |
| 33.60       | 13.23 | 85TH | 36.70 | 14.45 |
| 34.10       | 13.43 | 90TH | 37.20 | 14.65 |
| 35.00       | 13.78 | 95TH | 37.90 | 14.92 |
| 35.40       | 13.94 | 97TH | 38.50 | 15.16 |
| 35.80       | 14.09 | 98TH | 38.90 | 15.31 |
| 36.40       | 14.33 | 99TH | 39.50 | 15.55 |

### (37) FOREARM-CENTER OF GRIP LENGTH

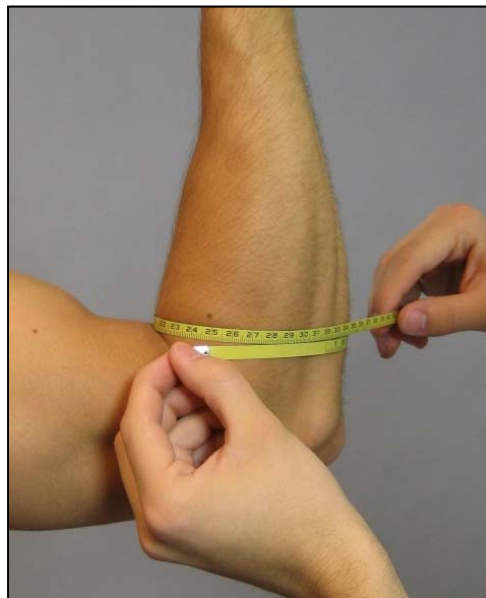
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 31.77                    | MEAN                | 12.51 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 1.80                     | STANDARD DEVIATION  | 0.71  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 25.80                    | MINIMUM             | 10.16 |
| 39.20                    | MAXIMUM             | 15.43 |
| SKEWNESS                 |                     | 0.30  |
| KURTOSIS                 |                     | 3.28  |
| COEFFICIENT OF VARIATION |                     | 5.7%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 34.90                    | MEAN                | 13.74 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.80                     | STANDARD DEVIATION  | 0.71  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 29.00                    | MINIMUM             | 11.42 |
| 41.60                    | MAXIMUM             | 16.38 |
| SKEWNESS                 |                     | 0.20  |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 5.2%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |       |   |       |      |      |         |        |  |
|-----------------|------|------|---------|-------|---|-------|------|------|---------|--------|--|
| FEMALES         |      |      |         |       |   | MALES |      |      |         |        |  |
| F               | FPct | CumF | CumFPct | CM    |   | F     | FPct | CumF | CumFPct |        |  |
| 2               | 0.10 | 2    | 0.10    | 25.65 | - | 26.00 |      |      |         |        |  |
| 0               | 0.00 | 2    | 0.10    | 26.00 | - | 26.35 |      |      |         |        |  |
| 2               | 0.10 | 4    | 0.20    | 26.35 | - | 26.70 |      |      |         |        |  |
| 5               | 0.25 | 9    | 0.45    | 26.70 | - | 27.05 |      |      |         |        |  |
| 0               | 0.00 | 9    | 0.45    | 27.05 | - | 27.40 |      |      |         |        |  |
| 7               | 0.35 | 16   | 0.81    | 27.40 | - | 27.75 |      |      |         |        |  |
| 13              | 0.65 | 29   | 1.46    | 27.75 | - | 28.10 |      |      |         |        |  |
| 25              | 1.26 | 54   | 2.72    | 28.10 | - | 28.45 |      |      |         |        |  |
| 18              | 0.91 | 72   | 3.63    | 28.45 | - | 28.80 |      |      |         |        |  |
| 42              | 2.11 | 114  | 5.74    | 28.80 | - | 29.15 | 3    | 0.07 | 3       | 0.07   |  |
| 46              | 2.32 | 160  | 8.06    | 29.15 | - | 29.50 | 0    | 0.00 | 3       | 0.07   |  |
| 105             | 5.29 | 265  | 13.34   | 29.50 | - | 29.85 | 4    | 0.10 | 7       | 0.17   |  |
| 75              | 3.78 | 340  | 17.12   | 29.85 | - | 30.20 | 6    | 0.15 | 13      | 0.32   |  |
| 151             | 7.60 | 491  | 24.72   | 30.20 | - | 30.55 | 5    | 0.12 | 18      | 0.44   |  |
| 134             | 6.75 | 625  | 31.47   | 30.55 | - | 30.90 | 14   | 0.34 | 32      | 0.78   |  |
| 176             | 8.86 | 801  | 40.33   | 30.90 | - | 31.25 | 31   | 0.76 | 63      | 1.54   |  |
| 153             | 7.70 | 954  | 48.04   | 31.25 | - | 31.60 | 33   | 0.81 | 96      | 2.35   |  |
| 188             | 9.47 | 1142 | 57.50   | 31.60 | - | 31.95 | 85   | 2.08 | 181     | 4.43   |  |
| 137             | 6.90 | 1279 | 64.40   | 31.95 | - | 32.30 | 90   | 2.20 | 271     | 6.64   |  |
| 143             | 7.20 | 1422 | 71.60   | 32.30 | - | 32.65 | 139  | 3.41 | 410     | 10.04  |  |
| 82              | 4.13 | 1504 | 75.73   | 32.65 | - | 33.00 | 159  | 3.90 | 569     | 13.94  |  |
| 109             | 5.49 | 1613 | 81.22   | 33.00 | - | 33.35 | 243  | 5.95 | 812     | 19.89  |  |
| 80              | 4.03 | 1693 | 85.25   | 33.35 | - | 33.70 | 199  | 4.88 | 1011    | 24.77  |  |
| 79              | 3.98 | 1772 | 89.22   | 33.70 | - | 34.05 | 304  | 7.45 | 1315    | 32.21  |  |
| 42              | 2.11 | 1814 | 91.34   | 34.05 | - | 34.40 | 258  | 6.32 | 1573    | 38.54  |  |
| 45              | 2.27 | 1859 | 93.61   | 34.40 | - | 34.75 | 358  | 8.77 | 1931    | 47.31  |  |
| 28              | 1.41 | 1887 | 95.02   | 34.75 | - | 35.10 | 287  | 7.03 | 2218    | 54.34  |  |
| 40              | 2.01 | 1927 | 97.03   | 35.10 | - | 35.45 | 338  | 8.28 | 2556    | 62.62  |  |
| 17              | 0.86 | 1944 | 97.89   | 35.45 | - | 35.80 | 255  | 6.25 | 2811    | 68.86  |  |
| 13              | 0.65 | 1957 | 98.54   | 35.80 | - | 36.15 | 308  | 7.55 | 3119    | 76.41  |  |
| 11              | 0.55 | 1968 | 99.09   | 36.15 | - | 36.50 | 192  | 4.70 | 3311    | 81.11  |  |
| 11              | 0.55 | 1979 | 99.65   | 36.50 | - | 36.85 | 233  | 5.71 | 3544    | 86.82  |  |
| 2               | 0.10 | 1981 | 99.75   | 36.85 | - | 37.20 | 104  | 2.55 | 3648    | 89.37  |  |
| 2               | 0.10 | 1983 | 99.85   | 37.20 | - | 37.55 | 149  | 3.65 | 3797    | 93.02  |  |
| 1               | 0.05 | 1984 | 99.90   | 37.55 | - | 37.90 | 77   | 1.89 | 3874    | 94.90  |  |
| 1               | 0.05 | 1985 | 99.95   | 37.90 | - | 38.25 | 62   | 1.52 | 3936    | 96.42  |  |
| 0               | 0.00 | 1985 | 99.95   | 38.25 | - | 38.60 | 35   | 0.86 | 3971    | 97.28  |  |
| 0               | 0.00 | 1985 | 99.95   | 38.60 | - | 38.95 | 33   | 0.81 | 4004    | 98.09  |  |
| 1               | 0.05 | 1986 | 100.00  | 38.95 | - | 39.30 | 22   | 0.54 | 4026    | 98.63  |  |
|                 |      |      |         | 39.30 | - | 39.65 | 21   | 0.51 | 4047    | 99.14  |  |
|                 |      |      |         | 39.65 | - | 40.00 | 9    | 0.22 | 4056    | 99.36  |  |
|                 |      |      |         | 40.00 | - | 40.35 | 12   | 0.29 | 4068    | 99.66  |  |
|                 |      |      |         | 40.35 | - | 40.70 | 7    | 0.17 | 4075    | 99.83  |  |
|                 |      |      |         | 40.70 | - | 41.05 | 2    | 0.05 | 4077    | 99.88  |  |
|                 |      |      |         | 41.05 | - | 41.40 | 2    | 0.05 | 4079    | 99.93  |  |
|                 |      |      |         | 41.40 | - | 41.75 | 3    | 0.07 | 4082    | 100.00 |  |

### (38) FOREARM CIRCUMFERENCE, FLEXED

The circumference of the flexed right forearm is measured with a tape passing across the crease at the juncture between the upper arm and the forearm. The measurement is taken in a plane perpendicular to the long axis of the forearm. The participant stands with the upper arm extended forward horizontally, the elbow flexed 90°, and the fist tightly clenched with palm facing the head.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 22.50       | 8.86  | 1ST  | 26.30 | 10.35 |
| 22.90       | 9.02  | 2ND  | 26.70 | 10.51 |
| 23.20       | 9.13  | 3RD  | 27.00 | 10.63 |
| 23.50       | 9.25  | 5TH  | 27.50 | 10.83 |
| 24.10       | 9.49  | 10TH | 28.30 | 11.14 |
| 24.50       | 9.65  | 15TH | 28.80 | 11.34 |
| 24.80       | 9.76  | 20TH | 29.10 | 11.46 |
| 25.10       | 9.88  | 25TH | 29.50 | 11.61 |
| 25.40       | 10.00 | 30TH | 29.80 | 11.73 |
| 25.60       | 10.08 | 35TH | 30.10 | 11.85 |
| 25.90       | 10.20 | 40TH | 30.40 | 11.97 |
| 26.10       | 10.28 | 45TH | 30.70 | 12.09 |
| 26.30       | 10.35 | 50TH | 31.00 | 12.20 |
| 26.50       | 10.43 | 55TH | 31.20 | 12.28 |
| 26.80       | 10.55 | 60TH | 31.50 | 12.40 |
| 27.00       | 10.63 | 65TH | 31.80 | 12.52 |
| 27.30       | 10.75 | 70TH | 32.10 | 12.64 |
| 27.60       | 10.87 | 75TH | 32.40 | 12.76 |
| 27.90       | 10.98 | 80TH | 32.80 | 12.91 |
| 28.30       | 11.14 | 85TH | 33.20 | 13.07 |
| 28.70       | 11.30 | 90TH | 33.80 | 13.31 |
| 29.60       | 11.65 | 95TH | 34.80 | 13.70 |
| 30.30       | 11.93 | 97TH | 35.40 | 13.94 |
| 30.70       | 12.09 | 98TH | 35.80 | 14.09 |
| 31.30       | 12.32 | 99TH | 36.50 | 14.37 |

### (38) FOREARM CIRCUMFERENCE, FLEXED

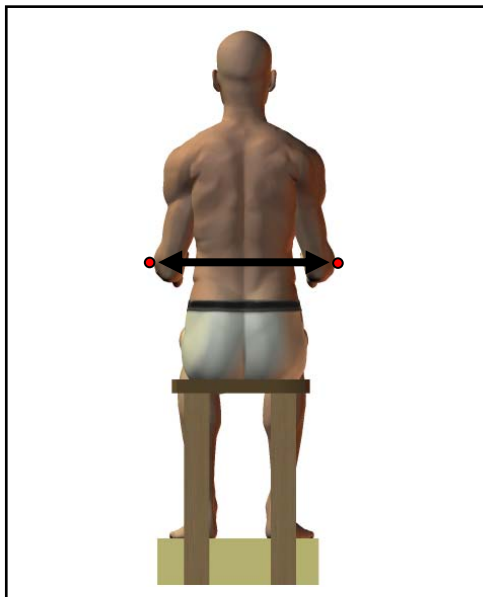
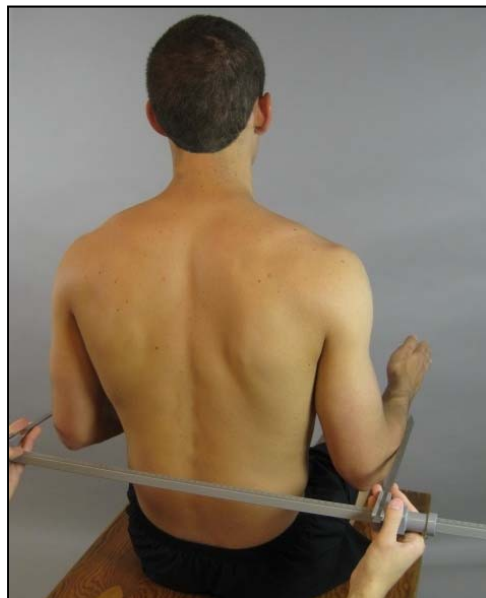
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 26.41                    | MEAN                | 10.40 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 1.85                     | STANDARD DEVIATION  | 0.73  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 20.00                    | MINIMUM             | 7.87  |
| 34.20                    | MAXIMUM             | 13.46 |
| SKEWNESS                 |                     | 0.34  |
| KURTOSIS                 |                     | 3.31  |
| COEFFICIENT OF VARIATION |                     | 7.0%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 31.01                    | MEAN                | 12.21 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 2.20                     | STANDARD DEVIATION  | 0.87  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 23.30                    | MINIMUM             | 9.17  |
| 40.20                    | MAXIMUM             | 15.83 |
| SKEWNESS                 |                     | 0.22  |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 7.1%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 19.75           | - | 20.25 |  |       |      |      |         |
| 0       | 0.00  | 1    | 0.05    | 20.25           | - | 20.75 |  |       |      |      |         |
| 0       | 0.00  | 1    | 0.05    | 20.75           | - | 21.25 |  |       |      |      |         |
| 2       | 0.10  | 3    | 0.15    | 21.25           | - | 21.75 |  |       |      |      |         |
| 11      | 0.55  | 14   | 0.70    | 21.75           | - | 22.25 |  |       |      |      |         |
| 16      | 0.81  | 30   | 1.51    | 22.25           | - | 22.75 |  |       |      |      |         |
| 35      | 1.76  | 65   | 3.27    | 22.75           | - | 23.25 |  |       |      |      |         |
| 65      | 3.27  | 130  | 6.55    | 23.25           | - | 23.75 |  | 1     | 0.02 | 1    | 0.02    |
| 90      | 4.53  | 220  | 11.08   | 23.75           | - | 24.25 |  | 0     | 0.00 | 1    | 0.02    |
| 151     | 7.60  | 371  | 18.68   | 24.25           | - | 24.75 |  | 3     | 0.07 | 4    | 0.10    |
| 178     | 8.96  | 549  | 27.64   | 24.75           | - | 25.25 |  | 4     | 0.10 | 8    | 0.20    |
| 193     | 9.72  | 742  | 37.36   | 25.25           | - | 25.75 |  | 13    | 0.32 | 21   | 0.51    |
| 230     | 11.58 | 972  | 48.94   | 25.75           | - | 26.25 |  | 19    | 0.47 | 40   | 0.98    |
| 210     | 10.57 | 1182 | 59.52   | 26.25           | - | 26.75 |  | 44    | 1.08 | 84   | 2.06    |
| 200     | 10.07 | 1382 | 69.59   | 26.75           | - | 27.25 |  | 75    | 1.84 | 159  | 3.90    |
| 164     | 8.26  | 1546 | 77.84   | 27.25           | - | 27.75 |  | 94    | 2.30 | 253  | 6.20    |
| 141     | 7.10  | 1687 | 84.94   | 27.75           | - | 28.25 |  | 155   | 3.80 | 408  | 10.00   |
| 106     | 5.34  | 1793 | 90.28   | 28.25           | - | 28.75 |  | 197   | 4.83 | 605  | 14.82   |
| 63      | 3.17  | 1856 | 93.45   | 28.75           | - | 29.25 |  | 281   | 6.88 | 886  | 21.71   |
| 38      | 1.91  | 1894 | 95.37   | 29.25           | - | 29.75 |  | 317   | 7.77 | 1203 | 29.47   |
| 28      | 1.41  | 1922 | 96.78   | 29.75           | - | 30.25 |  | 356   | 8.72 | 1559 | 38.19   |
| 26      | 1.31  | 1948 | 98.09   | 30.25           | - | 30.75 |  | 339   | 8.30 | 1898 | 46.50   |
| 18      | 0.91  | 1966 | 98.99   | 30.75           | - | 31.25 |  | 388   | 9.51 | 2286 | 56.00   |
| 11      | 0.55  | 1977 | 99.55   | 31.25           | - | 31.75 |  | 333   | 8.16 | 2619 | 64.16   |
| 4       | 0.20  | 1981 | 99.75   | 31.75           | - | 32.25 |  | 330   | 8.08 | 2949 | 72.24   |
| 2       | 0.10  | 1983 | 99.85   | 32.25           | - | 32.75 |  | 289   | 7.08 | 3238 | 79.32   |
| 1       | 0.05  | 1984 | 99.90   | 32.75           | - | 33.25 |  | 237   | 5.81 | 3475 | 85.13   |
| 1       | 0.05  | 1985 | 99.95   | 33.25           | - | 33.75 |  | 183   | 4.48 | 3658 | 89.61   |
| 1       | 0.05  | 1986 | 100.00  | 33.75           | - | 34.25 |  | 127   | 3.11 | 3785 | 92.72   |
|         |       |      |         | 34.25           | - | 34.75 |  | 92    | 2.25 | 3877 | 94.98   |
|         |       |      |         | 34.75           | - | 35.25 |  | 72    | 1.76 | 3949 | 96.74   |
|         |       |      |         | 35.25           | - | 35.75 |  | 41    | 1.00 | 3990 | 97.75   |
|         |       |      |         | 35.75           | - | 36.25 |  | 38    | 0.93 | 4028 | 98.68   |
|         |       |      |         | 36.25           | - | 36.75 |  | 17    | 0.42 | 4045 | 99.09   |
|         |       |      |         | 36.75           | - | 37.25 |  | 15    | 0.37 | 4060 | 99.46   |
|         |       |      |         | 37.25           | - | 37.75 |  | 8     | 0.20 | 4068 | 99.66   |
|         |       |      |         | 37.75           | - | 38.25 |  | 6     | 0.15 | 4074 | 99.80   |
|         |       |      |         | 38.25           | - | 38.75 |  | 6     | 0.15 | 4080 | 99.95   |
|         |       |      |         | 38.75           | - | 39.25 |  | 1     | 0.02 | 4081 | 99.98   |
|         |       |      |         | 39.25           | - | 39.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |       |      |         | 39.75           | - | 40.25 |  | 1     | 0.02 | 4082 | 100.00  |

### (39) FOREARM-FOREARM BREADTH

The maximum horizontal distance across the upper body between the outer sides of the forearms is measured with a beam caliper. The participant sits erect, looking straight ahead. The shoulders and upper arms are relaxed, and the forearms and hands are extended forward horizontally with the palms facing each other. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 40.70       | 16.02 | 1ST  | 47.00 | 18.50 |
| 41.60       | 16.38 | 2ND  | 48.00 | 18.90 |
| 42.30       | 16.65 | 3RD  | 48.80 | 19.21 |
| 43.20       | 17.01 | 5TH  | 49.70 | 19.57 |
| 44.30       | 17.44 | 10TH | 51.40 | 20.24 |
| 45.20       | 17.80 | 15TH | 52.50 | 20.67 |
| 46.00       | 18.11 | 20TH | 53.60 | 21.10 |
| 46.60       | 18.35 | 25TH | 54.50 | 21.46 |
| 47.20       | 18.58 | 30TH | 55.30 | 21.77 |
| 47.70       | 18.78 | 35TH | 55.90 | 22.01 |
| 48.30       | 19.02 | 40TH | 56.60 | 22.28 |
| 48.70       | 19.17 | 45TH | 57.30 | 22.56 |
| 49.20       | 19.37 | 50TH | 57.90 | 22.80 |
| 49.80       | 19.61 | 55TH | 58.60 | 23.07 |
| 50.30       | 19.80 | 60TH | 59.20 | 23.31 |
| 51.00       | 20.08 | 65TH | 59.90 | 23.58 |
| 51.50       | 20.28 | 70TH | 60.60 | 23.86 |
| 52.00       | 20.47 | 75TH | 61.30 | 24.13 |
| 52.80       | 20.79 | 80TH | 62.30 | 24.53 |
| 53.80       | 21.18 | 85TH | 63.30 | 24.92 |
| 55.00       | 21.65 | 90TH | 64.60 | 25.43 |
| 56.40       | 22.20 | 95TH | 66.70 | 26.26 |
| 57.50       | 22.64 | 97TH | 67.80 | 26.69 |
| 58.60       | 23.07 | 98TH | 68.70 | 27.05 |
| 59.80       | 23.54 | 99TH | 70.00 | 27.56 |

### (39) FOREARM-FOREARM BREADTH

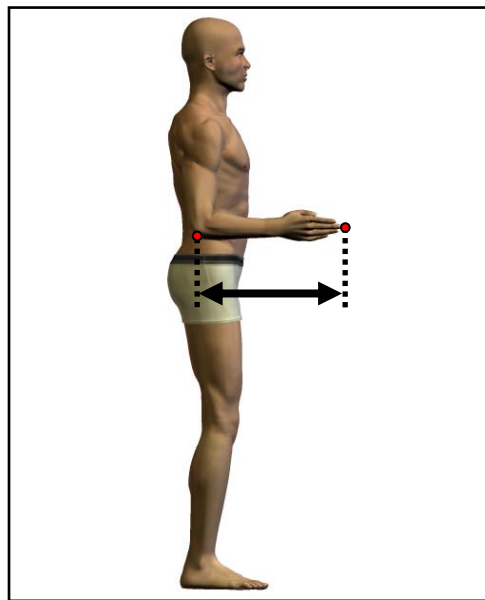
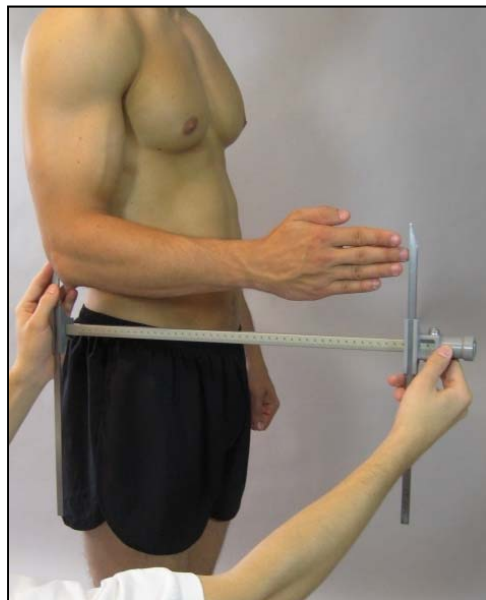
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 49.48                    |                     | 19.48 |
| 0.09                     | STD ERROR (MEAN)    | 0.04  |
| 4.10                     | STANDARD DEVIATION  | 1.61  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 37.60                    | MINIMUM             | 14.80 |
| 66.70                    | MAXIMUM             | 26.26 |
| SKEWNESS                 |                     | 0.27  |
| KURTOSIS                 |                     | 3.11  |
| COEFFICIENT OF VARIATION |                     | 8.3%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 57.99                    |                     | 22.83 |
| 0.08                     | STD ERROR (MEAN)    | 0.03  |
| 5.09                     | STANDARD DEVIATION  | 2.01  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 39.80                    | MINIMUM             | 15.67 |
| 77.80                    | MAXIMUM             | 30.63 |
| SKEWNESS                 |                     | 0.13  |
| KURTOSIS                 |                     | 2.86  |
| COEFFICIENT OF VARIATION |                     | 8.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10  | 2    | 0.10    | 37.55           | - | 38.55 |  |       |      |      |         |
| 7       | 0.35  | 9    | 0.45    | 38.55           | - | 39.55 |  |       |      |      |         |
| 10      | 0.50  | 19   | 0.96    | 39.55           | - | 40.55 |  | 1     | 0.02 | 1    | 0.02    |
| 20      | 1.01  | 39   | 1.96    | 40.55           | - | 41.55 |  | 0     | 0.00 | 1    | 0.02    |
| 29      | 1.46  | 68   | 3.42    | 41.55           | - | 42.55 |  | 1     | 0.02 | 2    | 0.05    |
| 61      | 3.07  | 129  | 6.50    | 42.55           | - | 43.55 |  | 1     | 0.02 | 3    | 0.07    |
| 82      | 4.13  | 211  | 10.62   | 43.55           | - | 44.55 |  | 1     | 0.02 | 4    | 0.10    |
| 120     | 6.04  | 331  | 16.67   | 44.55           | - | 45.55 |  | 6     | 0.15 | 10   | 0.24    |
| 159     | 8.01  | 490  | 24.67   | 45.55           | - | 46.55 |  | 12    | 0.29 | 22   | 0.54    |
| 173     | 8.71  | 663  | 33.38   | 46.55           | - | 47.55 |  | 38    | 0.93 | 60   | 1.47    |
| 192     | 9.67  | 855  | 43.05   | 47.55           | - | 48.55 |  | 53    | 1.30 | 113  | 2.77    |
| 199     | 10.02 | 1054 | 53.07   | 48.55           | - | 49.55 |  | 77    | 1.89 | 190  | 4.65    |
| 172     | 8.66  | 1226 | 61.73   | 49.55           | - | 50.55 |  | 106   | 2.60 | 296  | 7.25    |
| 174     | 8.76  | 1400 | 70.49   | 50.55           | - | 51.55 |  | 132   | 3.23 | 428  | 10.49   |
| 153     | 7.70  | 1553 | 78.20   | 51.55           | - | 52.55 |  | 190   | 4.65 | 618  | 15.14   |
| 113     | 5.69  | 1666 | 83.89   | 52.55           | - | 53.55 |  | 197   | 4.83 | 815  | 19.97   |
| 89      | 4.48  | 1755 | 88.37   | 53.55           | - | 54.55 |  | 226   | 5.54 | 1041 | 25.50   |
| 80      | 4.03  | 1835 | 92.40   | 54.55           | - | 55.55 |  | 265   | 6.49 | 1306 | 31.99   |
| 64      | 3.22  | 1899 | 95.62   | 55.55           | - | 56.55 |  | 300   | 7.35 | 1606 | 39.34   |
| 30      | 1.51  | 1929 | 97.13   | 56.55           | - | 57.55 |  | 313   | 7.67 | 1919 | 47.01   |
| 17      | 0.86  | 1946 | 97.99   | 57.55           | - | 58.55 |  | 320   | 7.84 | 2239 | 54.85   |
| 14      | 0.70  | 1960 | 98.69   | 58.55           | - | 59.55 |  | 314   | 7.69 | 2553 | 62.54   |
| 11      | 0.55  | 1971 | 99.24   | 59.55           | - | 60.55 |  | 281   | 6.88 | 2834 | 69.43   |
| 9       | 0.45  | 1980 | 99.70   | 60.55           | - | 61.55 |  | 277   | 6.79 | 3111 | 76.21   |
| 2       | 0.10  | 1982 | 99.80   | 61.55           | - | 62.55 |  | 216   | 5.29 | 3327 | 81.50   |
| 2       | 0.10  | 1984 | 99.90   | 62.55           | - | 63.55 |  | 188   | 4.61 | 3515 | 86.11   |
| 1       | 0.05  | 1985 | 99.95   | 63.55           | - | 64.55 |  | 146   | 3.58 | 3661 | 89.69   |
| 0       | 0.00  | 1985 | 99.95   | 64.55           | - | 65.55 |  | 120   | 2.94 | 3781 | 92.63   |
| 0       | 0.00  | 1985 | 99.95   | 65.55           | - | 66.55 |  | 94    | 2.30 | 3875 | 94.93   |
| 1       | 0.05  | 1986 | 100.00  | 66.55           | - | 67.55 |  | 67    | 1.64 | 3942 | 96.57   |
|         |       |      |         | 67.55           | - | 68.55 |  | 52    | 1.27 | 3994 | 97.84   |
|         |       |      |         | 68.55           | - | 69.55 |  | 34    | 0.83 | 4028 | 98.68   |
|         |       |      |         | 69.55           | - | 70.55 |  | 25    | 0.61 | 4053 | 99.29   |
|         |       |      |         | 70.55           | - | 71.55 |  | 10    | 0.24 | 4063 | 99.53   |
|         |       |      |         | 71.55           | - | 72.55 |  | 9     | 0.22 | 4072 | 99.76   |
|         |       |      |         | 72.55           | - | 73.55 |  | 5     | 0.12 | 4077 | 99.88   |
|         |       |      |         | 73.55           | - | 74.55 |  | 4     | 0.10 | 4081 | 99.98   |
|         |       |      |         | 74.55           | - | 75.55 |  | 0     | 0.00 | 4081 | 99.98   |
|         |       |      |         | 75.55           | - | 76.55 |  | 0     | 0.00 | 4081 | 99.98   |
|         |       |      |         | 76.55           | - | 77.55 |  | 0     | 0.00 | 4081 | 99.98   |
|         |       |      |         | 77.55           | - | 78.55 |  | 1     | 0.02 | 4082 | 100.00  |

## (40) FOREARM-HAND LENGTH

The horizontal distance between the olecranon rear landmark and the dactylion III landmark is measured with a beam caliper. The participant stands erect with the upper arms hanging at the sides and the right elbow flexed 90°. The hand is held out straight with the palm facing inward.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 39.00       | 15.35 | 1ST  | 43.00 | 16.93 |
| 39.60       | 15.59 | 2ND  | 43.60 | 17.17 |
| 40.00       | 15.75 | 3RD  | 43.90 | 17.28 |
| 40.40       | 15.91 | 5TH  | 44.40 | 17.48 |
| 41.20       | 16.22 | 10TH | 45.00 | 17.72 |
| 41.60       | 16.38 | 15TH | 45.60 | 17.95 |
| 42.10       | 16.57 | 20TH | 46.00 | 18.11 |
| 42.40       | 16.69 | 25TH | 46.50 | 18.31 |
| 42.70       | 16.81 | 30TH | 46.80 | 18.43 |
| 43.00       | 16.93 | 35TH | 47.10 | 18.54 |
| 43.30       | 17.05 | 40TH | 47.40 | 18.66 |
| 43.50       | 17.13 | 45TH | 47.70 | 18.78 |
| 43.80       | 17.24 | 50TH | 48.00 | 18.90 |
| 44.00       | 17.32 | 55TH | 48.30 | 19.02 |
| 44.40       | 17.48 | 60TH | 48.50 | 19.09 |
| 44.70       | 17.60 | 65TH | 48.80 | 19.21 |
| 45.10       | 17.76 | 70TH | 49.20 | 19.37 |
| 45.40       | 17.87 | 75TH | 49.50 | 19.49 |
| 45.90       | 18.07 | 80TH | 49.90 | 19.65 |
| 46.50       | 18.31 | 85TH | 50.40 | 19.84 |
| 47.10       | 18.54 | 90TH | 50.90 | 20.04 |
| 48.00       | 18.90 | 95TH | 52.00 | 20.47 |
| 48.80       | 19.21 | 97TH | 52.70 | 20.75 |
| 49.20       | 19.37 | 98TH | 53.20 | 20.94 |
| 50.00       | 19.69 | 99TH | 54.00 | 21.26 |

## (40) FOREARM-HAND LENGTH

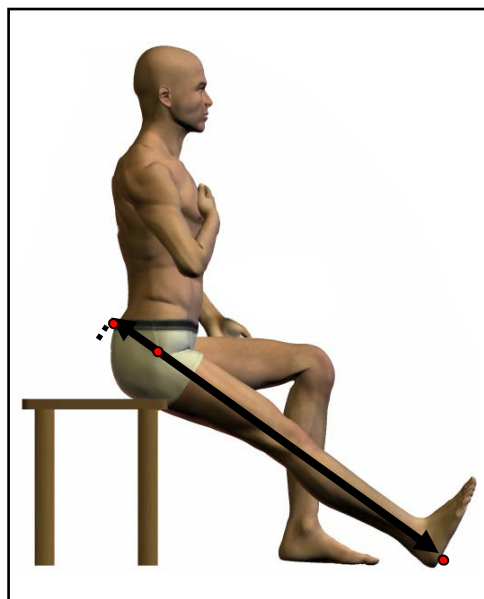
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 43.99                    |                     | 17.32 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 2.34                     | STANDARD DEVIATION  | 0.92  |
| 0.04                     | STD ERROR (STD DEV) | 0.01  |
| 34.20                    | MINIMUM             | 13.46 |
| 52.70                    | MAXIMUM             | 20.75 |
| SKEWNESS                 |                     | 0.28  |
| KURTOSIS                 |                     | 3.27  |
| COEFFICIENT OF VARIATION |                     | 5.3%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 48.02                    |                     | 18.91 |
| 0.04                     | STD ERROR (MEAN)    | 0.01  |
| 2.33                     | STANDARD DEVIATION  | 0.92  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 40.00                    | MINIMUM             | 15.75 |
| 57.40                    | MAXIMUM             | 22.60 |
| SKEWNESS                 |                     | 0.24  |
| KURTOSIS                 |                     | 3.24  |
| COEFFICIENT OF VARIATION |                     | 4.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 33.75           | - | 34.25 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 34.25           | - | 34.75 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 34.75           | - | 35.25 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 35.25           | - | 35.75 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 35.75           | - | 36.25 |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 36.25           | - | 36.75 |  |       |      |      |         |
| 2       | 0.10 | 4    | 0.20    | 36.75           | - | 37.25 |  |       |      |      |         |
| 3       | 0.15 | 7    | 0.35    | 37.25           | - | 37.75 |  |       |      |      |         |
| 1       | 0.05 | 8    | 0.40    | 37.75           | - | 38.25 |  |       |      |      |         |
| 7       | 0.35 | 15   | 0.76    | 38.25           | - | 38.75 |  |       |      |      |         |
| 10      | 0.50 | 25   | 1.26    | 38.75           | - | 39.25 |  |       |      |      |         |
| 18      | 0.91 | 43   | 2.17    | 39.25           | - | 39.75 |  |       |      |      |         |
| 40      | 2.01 | 83   | 4.18    | 39.75           | - | 40.25 |  | 1     | 0.02 | 1    | 0.02    |
| 58      | 2.92 | 141  | 7.10    | 40.25           | - | 40.75 |  | 0     | 0.00 | 1    | 0.02    |
| 75      | 3.78 | 216  | 10.88   | 40.75           | - | 41.25 |  | 2     | 0.05 | 3    | 0.07    |
| 102     | 5.14 | 318  | 16.01   | 41.25           | - | 41.75 |  | 5     | 0.12 | 8    | 0.20    |
| 120     | 6.04 | 438  | 22.05   | 41.75           | - | 42.25 |  | 5     | 0.12 | 13   | 0.32    |
| 175     | 8.81 | 613  | 30.87   | 42.25           | - | 42.75 |  | 20    | 0.49 | 33   | 0.81    |
| 181     | 9.11 | 794  | 39.98   | 42.75           | - | 43.25 |  | 29    | 0.71 | 62   | 1.52    |
| 178     | 8.96 | 972  | 48.94   | 43.25           | - | 43.75 |  | 43    | 1.05 | 105  | 2.57    |
| 181     | 9.11 | 1153 | 58.06   | 43.75           | - | 44.25 |  | 77    | 1.89 | 182  | 4.46    |
| 142     | 7.15 | 1295 | 65.21   | 44.25           | - | 44.75 |  | 121   | 2.96 | 303  | 7.42    |
| 139     | 7.00 | 1434 | 72.21   | 44.75           | - | 45.25 |  | 190   | 4.65 | 493  | 12.08   |
| 132     | 6.65 | 1566 | 78.85   | 45.25           | - | 45.75 |  | 196   | 4.80 | 689  | 16.88   |
| 84      | 4.23 | 1650 | 83.08   | 45.75           | - | 46.25 |  | 228   | 5.59 | 917  | 22.46   |
| 78      | 3.93 | 1728 | 87.01   | 46.25           | - | 46.75 |  | 299   | 7.32 | 1216 | 29.79   |
| 80      | 4.03 | 1808 | 91.04   | 46.75           | - | 47.25 |  | 318   | 7.79 | 1534 | 37.58   |
| 49      | 2.47 | 1857 | 93.50   | 47.25           | - | 47.75 |  | 351   | 8.60 | 1885 | 46.18   |
| 45      | 2.27 | 1902 | 95.77   | 47.75           | - | 48.25 |  | 345   | 8.45 | 2230 | 54.63   |
| 22      | 1.11 | 1924 | 96.88   | 48.25           | - | 48.75 |  | 352   | 8.62 | 2582 | 63.25   |
| 23      | 1.16 | 1947 | 98.04   | 48.75           | - | 49.25 |  | 326   | 7.99 | 2908 | 71.24   |
| 13      | 0.65 | 1960 | 98.69   | 49.25           | - | 49.75 |  | 291   | 7.13 | 3199 | 78.37   |
| 12      | 0.60 | 1972 | 99.30   | 49.75           | - | 50.25 |  | 227   | 5.56 | 3426 | 83.93   |
| 5       | 0.25 | 1977 | 99.55   | 50.25           | - | 50.75 |  | 194   | 4.75 | 3620 | 88.68   |
| 6       | 0.30 | 1983 | 99.85   | 50.75           | - | 51.25 |  | 125   | 3.06 | 3745 | 91.74   |
| 1       | 0.05 | 1984 | 99.90   | 51.25           | - | 51.75 |  | 95    | 2.33 | 3840 | 94.07   |
| 1       | 0.05 | 1985 | 99.95   | 51.75           | - | 52.25 |  | 75    | 1.84 | 3915 | 95.91   |
| 1       | 0.05 | 1986 | 100.00  | 52.25           | - | 52.75 |  | 52    | 1.27 | 3967 | 97.18   |
|         |      |      |         | 52.75           | - | 53.25 |  | 44    | 1.08 | 4011 | 98.26   |
|         |      |      |         | 53.25           | - | 53.75 |  | 16    | 0.39 | 4027 | 98.65   |
|         |      |      |         | 53.75           | - | 54.25 |  | 23    | 0.56 | 4050 | 99.22   |
|         |      |      |         | 54.25           | - | 54.75 |  | 13    | 0.32 | 4063 | 99.53   |
|         |      |      |         | 54.75           | - | 55.25 |  | 6     | 0.15 | 4069 | 99.68   |
|         |      |      |         | 55.25           | - | 55.75 |  | 5     | 0.12 | 4074 | 99.80   |
|         |      |      |         | 55.75           | - | 56.25 |  | 4     | 0.10 | 4078 | 99.90   |
|         |      |      |         | 56.25           | - | 56.75 |  | 0     | 0.00 | 4078 | 99.90   |
|         |      |      |         | 56.75           | - | 57.25 |  | 2     | 0.05 | 4080 | 99.95   |
|         |      |      |         | 57.25           | - | 57.75 |  | 2     | 0.05 | 4082 | 100.00  |

## (41) FUNCTIONAL LEG LENGTH

The straight-line distance between the plane of the bottom of the right foot with the leg extended and the back of the body of a seated participant is measured with an anthropometer passing over the trochanter landmark. The participant sits erect on a stool 45.8<sup>1</sup> cm high. The right leg is extended, and the foot is on the base plate of the anthropometer, which rests on the floor. The measurement is taken from the footrest surface of the base plate.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 91.80       | 36.14 | 1ST  | 100.00 | 39.37 |
| 93.50       | 36.81 | 2ND  | 101.70 | 40.04 |
| 94.80       | 37.32 | 3RD  | 102.70 | 40.43 |
| 96.00       | 37.80 | 5TH  | 104.10 | 40.98 |
| 97.60       | 38.43 | 10TH | 106.00 | 41.73 |
| 98.90       | 38.94 | 15TH | 107.10 | 42.17 |
| 99.90       | 39.33 | 20TH | 108.20 | 42.60 |
| 100.80      | 39.69 | 25TH | 109.10 | 42.95 |
| 101.60      | 40.00 | 30TH | 109.90 | 43.27 |
| 102.30      | 40.28 | 35TH | 110.80 | 43.62 |
| 102.80      | 40.47 | 40TH | 111.70 | 43.98 |
| 103.50      | 40.75 | 45TH | 112.40 | 44.25 |
| 104.20      | 41.02 | 50TH | 113.10 | 44.53 |
| 105.00      | 41.34 | 55TH | 113.70 | 44.76 |
| 105.50      | 41.54 | 60TH | 114.30 | 45.00 |
| 106.30      | 41.85 | 65TH | 115.00 | 45.28 |
| 107.20      | 42.20 | 70TH | 115.80 | 45.59 |
| 108.00      | 42.52 | 75TH | 116.60 | 45.91 |
| 109.00      | 42.91 | 80TH | 117.70 | 46.34 |
| 110.00      | 43.31 | 85TH | 118.80 | 46.77 |
| 111.40      | 43.86 | 90TH | 120.30 | 47.36 |
| 113.60      | 44.72 | 95TH | 122.40 | 48.19 |
| 114.70      | 45.16 | 97TH | 123.80 | 48.74 |
| 115.70      | 45.55 | 98TH | 124.90 | 49.17 |
| 117.20      | 46.14 | 99TH | 126.70 | 49.88 |

<sup>1</sup> The stool height in ANSUR was 40.8 cm.

## (41) FUNCTIONAL LEG LENGTH

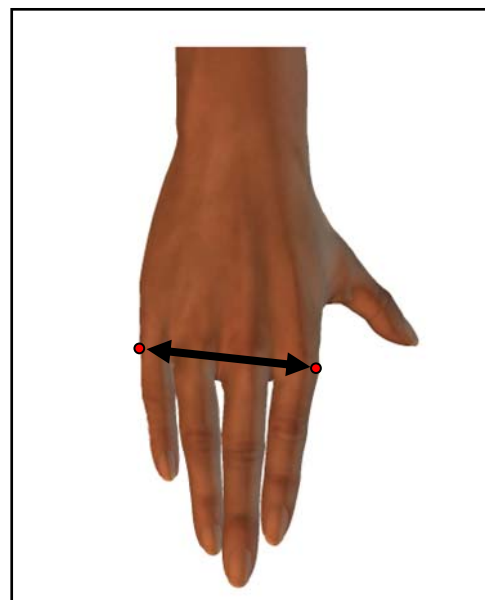
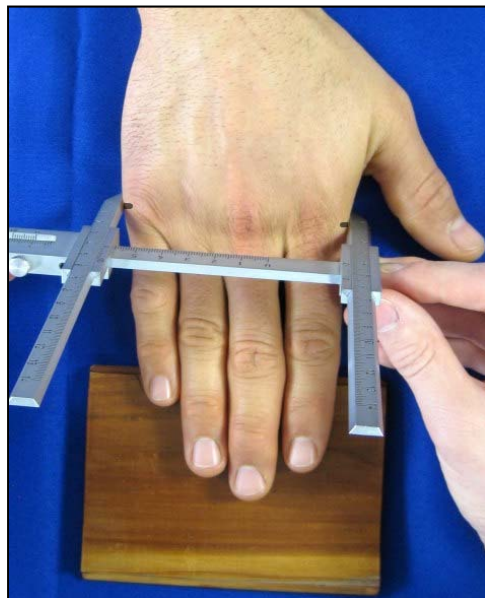
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 104.43                   | MEAN                | 41.11 |
| 0.12                     | STD ERROR (MEAN)    | 0.05  |
| 5.40                     | STANDARD DEVIATION  | 2.13  |
| 0.09                     | STD ERROR (STD DEV) | 0.03  |
| 83.50                    | MINIMUM             | 32.87 |
| 122.80                   | MAXIMUM             | 48.35 |
| SKEWNESS                 |                     | 0.08  |
| KURTOSIS                 |                     | 3.11  |
| COEFFICIENT OF VARIATION |                     | 5.2%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 113.02                   | MEAN                | 44.49 |
| 0.09                     | STD ERROR (MEAN)    | 0.03  |
| 5.61                     | STANDARD DEVIATION  | 2.21  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 94.30                    | MINIMUM             | 37.13 |
| 131.60                   | MAXIMUM             | 51.81 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.03  |
| COEFFICIENT OF VARIATION |                     | 5.0%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 82.55           | - | 83.55  |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 83.55           | - | 84.55  |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 84.55           | - | 85.55  |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 85.55           | - | 86.55  |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 86.55           | - | 87.55  |  |       |      |      |         |
| 1       | 0.05 | 4    | 0.20    | 87.55           | - | 88.55  |  |       |      |      |         |
| 1       | 0.05 | 5    | 0.25    | 88.55           | - | 89.55  |  |       |      |      |         |
| 5       | 0.25 | 10   | 0.50    | 89.55           | - | 90.55  |  |       |      |      |         |
| 8       | 0.40 | 18   | 0.91    | 90.55           | - | 91.55  |  |       |      |      |         |
| 6       | 0.30 | 24   | 1.21    | 91.55           | - | 92.55  |  |       |      |      |         |
| 16      | 0.81 | 40   | 2.01    | 92.55           | - | 93.55  |  |       |      |      |         |
| 14      | 0.70 | 54   | 2.72    | 93.55           | - | 94.55  |  | 1     | 0.02 | 1    | 0.02    |
| 30      | 1.51 | 84   | 4.23    | 94.55           | - | 95.55  |  | 1     | 0.02 | 2    | 0.05    |
| 43      | 2.17 | 127  | 6.39    | 95.55           | - | 96.55  |  | 2     | 0.05 | 4    | 0.10    |
| 67      | 3.37 | 194  | 9.77    | 96.55           | - | 97.55  |  | 3     | 0.07 | 7    | 0.17    |
| 78      | 3.93 | 272  | 13.70   | 97.55           | - | 98.55  |  | 12    | 0.29 | 19   | 0.47    |
| 92      | 4.63 | 364  | 18.33   | 98.55           | - | 99.55  |  | 16    | 0.39 | 35   | 0.86    |
| 110     | 5.54 | 474  | 23.87   | 99.55           | - | 100.55 |  | 13    | 0.32 | 48   | 1.18    |
| 118     | 5.94 | 592  | 29.81   | 100.55          | - | 101.55 |  | 29    | 0.71 | 77   | 1.89    |
| 144     | 7.25 | 736  | 37.06   | 101.55          | - | 102.55 |  | 38    | 0.93 | 115  | 2.82    |
| 159     | 8.01 | 895  | 45.07   | 102.55          | - | 103.55 |  | 50    | 1.22 | 165  | 4.04    |
| 139     | 7.00 | 1034 | 52.06   | 103.55          | - | 104.55 |  | 82    | 2.01 | 247  | 6.05    |
| 158     | 7.96 | 1192 | 60.02   | 104.55          | - | 105.55 |  | 105   | 2.57 | 352  | 8.62    |
| 128     | 6.45 | 1320 | 66.47   | 105.55          | - | 106.55 |  | 144   | 3.53 | 496  | 12.15   |
| 120     | 6.04 | 1440 | 72.51   | 106.55          | - | 107.55 |  | 210   | 5.14 | 706  | 17.30   |
| 108     | 5.44 | 1548 | 77.95   | 107.55          | - | 108.55 |  | 191   | 4.68 | 897  | 21.97   |
| 96      | 4.83 | 1644 | 82.78   | 108.55          | - | 109.55 |  | 223   | 5.46 | 1120 | 27.44   |
| 78      | 3.93 | 1722 | 86.71   | 109.55          | - | 110.55 |  | 237   | 5.81 | 1357 | 33.24   |
| 71      | 3.58 | 1793 | 90.28   | 110.55          | - | 111.55 |  | 251   | 6.15 | 1608 | 39.39   |
| 51      | 2.57 | 1844 | 92.85   | 111.55          | - | 112.55 |  | 280   | 6.86 | 1888 | 46.25   |
| 37      | 1.86 | 1881 | 94.71   | 112.55          | - | 113.55 |  | 313   | 7.67 | 2201 | 53.92   |
| 41      | 2.06 | 1922 | 96.78   | 113.55          | - | 114.55 |  | 322   | 7.89 | 2523 | 61.81   |
| 21      | 1.06 | 1943 | 97.83   | 114.55          | - | 115.55 |  | 277   | 6.79 | 2800 | 68.59   |
| 15      | 0.76 | 1958 | 98.59   | 115.55          | - | 116.55 |  | 241   | 5.90 | 3041 | 74.50   |
| 10      | 0.50 | 1968 | 99.09   | 116.55          | - | 117.55 |  | 204   | 5.00 | 3245 | 79.50   |
| 7       | 0.35 | 1975 | 99.45   | 117.55          | - | 118.55 |  | 181   | 4.43 | 3426 | 83.93   |
| 4       | 0.20 | 1979 | 99.65   | 118.55          | - | 119.55 |  | 150   | 3.67 | 3576 | 87.60   |
| 4       | 0.20 | 1983 | 99.85   | 119.55          | - | 120.55 |  | 131   | 3.21 | 3707 | 90.81   |
| 1       | 0.05 | 1984 | 99.90   | 120.55          | - | 121.55 |  | 103   | 2.52 | 3810 | 93.34   |
| 1       | 0.05 | 1985 | 99.95   | 121.55          | - | 122.55 |  | 81    | 1.98 | 3891 | 95.32   |
| 1       | 0.05 | 1986 | 100.00  | 122.55          | - | 123.55 |  | 61    | 1.49 | 3952 | 96.82   |
|         |      |      |         | 123.55          | - | 124.55 |  | 37    | 0.91 | 3989 | 97.72   |
|         |      |      |         | 124.55          | - | 125.55 |  | 30    | 0.73 | 4019 | 98.46   |
|         |      |      |         | 125.55          | - | 126.55 |  | 16    | 0.39 | 4035 | 98.85   |
|         |      |      |         | 126.55          | - | 127.55 |  | 16    | 0.39 | 4051 | 99.24   |
|         |      |      |         | 127.55          | - | 128.55 |  | 10    | 0.24 | 4061 | 99.49   |
|         |      |      |         | 128.55          | - | 129.55 |  | 9     | 0.22 | 4070 | 99.71   |
|         |      |      |         | 129.55          | - | 130.55 |  | 7     | 0.17 | 4077 | 99.88   |
|         |      |      |         | 130.55          | - | 131.55 |  | 3     | 0.07 | 4080 | 99.95   |
|         |      |      |         | 131.55          | - | 132.55 |  | 2     | 0.05 | 4082 | 100.00  |

## (42) HAND BREADTH

The breadth of the right hand between the landmarks at metacarpale II and metacarpale V is measured with a sliding caliper. The participant places the palm on a table with the fingers together and the thumb abducted. The middle finger is parallel to the long axis of the forearm. The two distal phalanges of the fingers lie on a flat surface 8 mm higher than the table.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 6.90        | 2.72 | 1ST  | 7.80  | 3.07 |
| 7.00        | 2.76 | 2ND  | 8.00  | 3.15 |
| 7.10        | 2.80 | 3RD  | 8.00  | 3.15 |
| 7.20        | 2.83 | 5TH  | 8.10  | 3.19 |
| 7.30        | 2.87 | 10TH | 8.30  | 3.27 |
| 7.40        | 2.91 | 15TH | 8.40  | 3.31 |
| 7.50        | 2.95 | 20TH | 8.50  | 3.35 |
| 7.50        | 2.95 | 25TH | 8.50  | 3.35 |
| 7.60        | 2.99 | 30TH | 8.60  | 3.39 |
| 7.70        | 3.03 | 35TH | 8.70  | 3.43 |
| 7.70        | 3.03 | 40TH | 8.70  | 3.43 |
| 7.80        | 3.07 | 45TH | 8.80  | 3.46 |
| 7.80        | 3.07 | 50TH | 8.80  | 3.46 |
| 7.80        | 3.07 | 55TH | 8.90  | 3.50 |
| 7.90        | 3.11 | 60TH | 8.90  | 3.50 |
| 8.00        | 3.15 | 65TH | 9.00  | 3.54 |
| 8.00        | 3.15 | 70TH | 9.00  | 3.54 |
| 8.00        | 3.15 | 75TH | 9.10  | 3.58 |
| 8.10        | 3.19 | 80TH | 9.20  | 3.62 |
| 8.20        | 3.23 | 85TH | 9.30  | 3.66 |
| 8.30        | 3.27 | 90TH | 9.40  | 3.70 |
| 8.50        | 3.35 | 95TH | 9.60  | 3.78 |
| 8.60        | 3.39 | 97TH | 9.70  | 3.82 |
| 8.70        | 3.43 | 98TH | 9.80  | 3.86 |
| 8.70        | 3.43 | 99TH | 9.90  | 3.90 |

## (42) HAND BREADTH

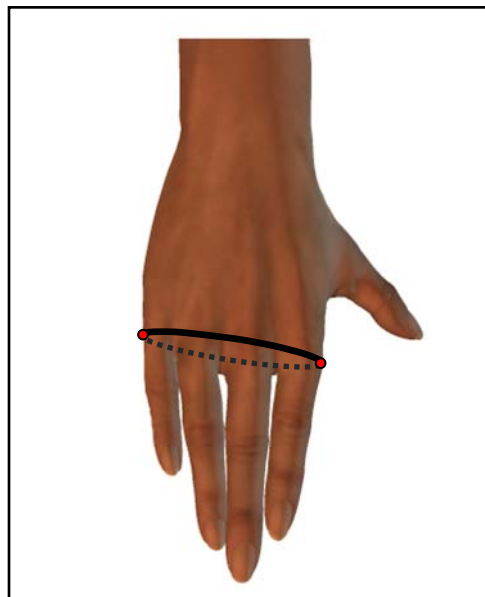
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 7.82                     | MEAN                | 3.08 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.38                     | STANDARD DEVIATION  | 0.15 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 6.70                     | MINIMUM             | 2.64 |
| 9.20                     | MAXIMUM             | 3.62 |
| SKEWNESS                 |                     | 0.16 |
| KURTOSIS                 |                     | 3.07 |
| COEFFICIENT OF VARIATION |                     | 4.9% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 8.83                     | MEAN                | 3.47 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.44                     | STANDARD DEVIATION  | 0.17 |
| 0.00                     | STD ERROR (STD DEV) | 0.00 |
| 7.40                     | MINIMUM             | 2.91 |
| 10.50                    | MAXIMUM             | 4.13 |
| SKEWNESS                 |                     | 0.14 |
| KURTOSIS                 |                     | 3.11 |
| COEFFICIENT OF VARIATION |                     | 5.0% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |       |      |         |       |   |       |  |       |       |      |         |
|-----------------|-------|------|---------|-------|---|-------|--|-------|-------|------|---------|
| FEMALES         |       |      |         |       |   |       |  | MALES |       |      |         |
| F               | FPct  | CumF | CumFPct | CM    |   |       |  | F     | FPct  | CumF | CumFPct |
| 4               | 0.20  | 4    | 0.20    | 6.65  | - | 6.75  |  |       |       |      |         |
| 6               | 0.30  | 10   | 0.50    | 6.75  | - | 6.85  |  |       |       |      |         |
| 10              | 0.50  | 20   | 1.01    | 6.85  | - | 6.95  |  |       |       |      |         |
| 20              | 1.01  | 40   | 2.01    | 6.95  | - | 7.05  |  |       |       |      |         |
| 29              | 1.46  | 69   | 3.47    | 7.05  | - | 7.15  |  |       |       |      |         |
| 58              | 2.92  | 127  | 6.39    | 7.15  | - | 7.25  |  |       |       |      |         |
| 74              | 3.73  | 201  | 10.12   | 7.25  | - | 7.35  |  |       |       |      |         |
| 143             | 7.20  | 344  | 17.32   | 7.35  | - | 7.45  |  | 2     | 0.05  | 2    | 0.05    |
| 165             | 8.31  | 509  | 25.63   | 7.45  | - | 7.55  |  | 2     | 0.05  | 4    | 0.10    |
| 133             | 6.70  | 642  | 32.33   | 7.55  | - | 7.65  |  | 4     | 0.10  | 8    | 0.20    |
| 226             | 11.38 | 868  | 43.71   | 7.65  | - | 7.75  |  | 10    | 0.24  | 18   | 0.44    |
| 250             | 12.59 | 1118 | 56.29   | 7.75  | - | 7.85  |  | 32    | 0.78  | 50   | 1.22    |
| 157             | 7.91  | 1275 | 64.20   | 7.85  | - | 7.95  |  | 29    | 0.71  | 79   | 1.94    |
| 216             | 10.88 | 1491 | 75.08   | 7.95  | - | 8.05  |  | 67    | 1.64  | 146  | 3.58    |
| 128             | 6.45  | 1619 | 81.52   | 8.05  | - | 8.15  |  | 89    | 2.18  | 235  | 5.76    |
| 97              | 4.88  | 1716 | 86.40   | 8.15  | - | 8.25  |  | 149   | 3.65  | 384  | 9.41    |
| 95              | 4.78  | 1811 | 91.19   | 8.25  | - | 8.35  |  | 156   | 3.82  | 540  | 13.23   |
| 66              | 3.32  | 1877 | 94.51   | 8.35  | - | 8.45  |  | 269   | 6.59  | 809  | 19.82   |
| 42              | 2.11  | 1919 | 96.63   | 8.45  | - | 8.55  |  | 282   | 6.91  | 1091 | 26.73   |
| 27              | 1.36  | 1946 | 97.99   | 8.55  | - | 8.65  |  | 276   | 6.76  | 1367 | 33.49   |
| 22              | 1.11  | 1968 | 99.09   | 8.65  | - | 8.75  |  | 384   | 9.41  | 1751 | 42.90   |
| 7               | 0.35  | 1975 | 99.45   | 8.75  | - | 8.85  |  | 477   | 11.69 | 2228 | 54.58   |
| 6               | 0.30  | 1981 | 99.75   | 8.85  | - | 8.95  |  | 284   | 6.96  | 2512 | 61.54   |
| 2               | 0.10  | 1983 | 99.85   | 8.95  | - | 9.05  |  | 398   | 9.75  | 2910 | 71.29   |
| 2               | 0.10  | 1985 | 99.95   | 9.05  | - | 9.15  |  | 255   | 6.25  | 3165 | 77.54   |
| 1               | 0.05  | 1986 | 100.00  | 9.15  | - | 9.25  |  | 239   | 5.85  | 3404 | 83.39   |
|                 |       |      |         | 9.25  | - | 9.35  |  | 199   | 4.88  | 3603 | 88.27   |
|                 |       |      |         | 9.35  | - | 9.45  |  | 182   | 4.46  | 3785 | 92.72   |
|                 |       |      |         | 9.45  | - | 9.55  |  | 84    | 2.06  | 3869 | 94.78   |
|                 |       |      |         | 9.55  | - | 9.65  |  | 70    | 1.71  | 3939 | 96.50   |
|                 |       |      |         | 9.65  | - | 9.75  |  | 42    | 1.03  | 3981 | 97.53   |
|                 |       |      |         | 9.75  | - | 9.85  |  | 45    | 1.10  | 4026 | 98.63   |
|                 |       |      |         | 9.85  | - | 9.95  |  | 20    | 0.49  | 4046 | 99.12   |
|                 |       |      |         | 9.95  | - | 10.05 |  | 17    | 0.42  | 4063 | 99.53   |
|                 |       |      |         | 10.05 | - | 10.15 |  | 8     | 0.20  | 4071 | 99.73   |
|                 |       |      |         | 10.15 | - | 10.25 |  | 8     | 0.20  | 4079 | 99.93   |
|                 |       |      |         | 10.25 | - | 10.35 |  | 2     | 0.05  | 4081 | 99.98   |
|                 |       |      |         | 10.35 | - | 10.45 |  | 0     | 0.00  | 4081 | 99.98   |
|                 |       |      |         | 10.45 | - | 10.55 |  | 1     | 0.02  | 4082 | 100.00  |

### (43) HAND CIRCUMFERENCE

The circumference of the right hand is measured with a tape passing over the landmarks at metacarpale II and metacarpale V. The participant places the palm on a table with the fingers together and the thumb abducted. The middle finger is parallel to the long axis of the forearm. The two distal phalanges of the fingers lie on a flat surface 8 mm higher than the table.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 16.70       | 6.57 | 1ST  | 18.90 | 7.44 |
| 16.90       | 6.65 | 2ND  | 19.20 | 7.56 |
| 17.00       | 6.69 | 3RD  | 19.30 | 7.60 |
| 17.30       | 6.81 | 5TH  | 19.50 | 7.68 |
| 17.50       | 6.89 | 10TH | 19.90 | 7.83 |
| 17.70       | 6.97 | 15TH | 20.20 | 7.95 |
| 17.90       | 7.05 | 20TH | 20.40 | 8.03 |
| 18.00       | 7.09 | 25TH | 20.60 | 8.11 |
| 18.20       | 7.17 | 30TH | 20.70 | 8.15 |
| 18.30       | 7.20 | 35TH | 20.80 | 8.19 |
| 18.40       | 7.24 | 40TH | 21.00 | 8.27 |
| 18.60       | 7.32 | 45TH | 21.10 | 8.31 |
| 18.70       | 7.36 | 50TH | 21.20 | 8.35 |
| 18.70       | 7.36 | 55TH | 21.30 | 8.39 |
| 18.80       | 7.40 | 60TH | 21.50 | 8.46 |
| 19.00       | 7.48 | 65TH | 21.60 | 8.50 |
| 19.10       | 7.52 | 70TH | 21.70 | 8.54 |
| 19.20       | 7.56 | 75TH | 21.90 | 8.62 |
| 19.40       | 7.64 | 80TH | 22.10 | 8.70 |
| 19.60       | 7.72 | 85TH | 22.30 | 8.78 |
| 19.80       | 7.80 | 90TH | 22.50 | 8.86 |
| 20.20       | 7.95 | 95TH | 23.00 | 9.06 |
| 20.40       | 8.03 | 97TH | 23.30 | 9.17 |
| 20.50       | 8.07 | 98TH | 23.40 | 9.21 |
| 20.70       | 8.15 | 99TH | 23.70 | 9.33 |

### (43) HAND CIRCUMFERENCE

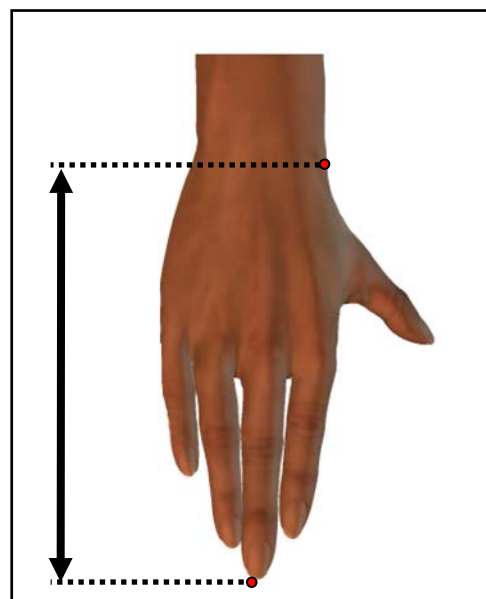
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 18.66                    |                     | 7.34 |
| 0.02                     | STD ERROR (MEAN)    | 0.01 |
| 0.88                     | STANDARD DEVIATION  | 0.35 |
| 0.01                     | STD ERROR (STD DEV) | 0.01 |
| 15.20                    | MINIMUM             | 5.98 |
| 21.40                    | MAXIMUM             | 8.43 |
| SKEWNESS                 |                     | 0.06 |
| KURTOSIS                 |                     | 3.00 |
| COEFFICIENT OF VARIATION |                     | 4.7% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 21.23                    |                     | 8.36 |
| 0.02                     | STD ERROR (MEAN)    | 0.01 |
| 1.02                     | STANDARD DEVIATION  | 0.40 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 17.90                    | MINIMUM             | 7.05 |
| 24.80                    | MAXIMUM             | 9.76 |
| SKEWNESS                 |                     | 0.08 |
| KURTOSIS                 |                     | 3.00 |
| COEFFICIENT OF VARIATION |                     | 4.8% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 15.15           | - | 15.35 |  |       |      |      |         |
| 0       | 0.00  | 1    | 0.05    | 15.35           | - | 15.55 |  |       |      |      |         |
| 0       | 0.00  | 1    | 0.05    | 15.55           | - | 15.75 |  |       |      |      |         |
| 0       | 0.00  | 1    | 0.05    | 15.75           | - | 15.95 |  |       |      |      |         |
| 1       | 0.05  | 2    | 0.10    | 15.95           | - | 16.15 |  |       |      |      |         |
| 6       | 0.30  | 8    | 0.40    | 16.15           | - | 16.35 |  |       |      |      |         |
| 9       | 0.45  | 17   | 0.86    | 16.35           | - | 16.55 |  |       |      |      |         |
| 9       | 0.45  | 26   | 1.31    | 16.55           | - | 16.75 |  |       |      |      |         |
| 21      | 1.06  | 47   | 2.37    | 16.75           | - | 16.95 |  |       |      |      |         |
| 31      | 1.56  | 78   | 3.93    | 16.95           | - | 17.15 |  |       |      |      |         |
| 57      | 2.87  | 135  | 6.80    | 17.15           | - | 17.35 |  |       |      |      |         |
| 68      | 3.42  | 203  | 10.22   | 17.35           | - | 17.55 |  |       |      |      |         |
| 122     | 6.14  | 325  | 16.36   | 17.55           | - | 17.75 |  |       |      |      |         |
| 105     | 5.29  | 430  | 21.65   | 17.75           | - | 17.95 |  | 1     | 0.02 | 1    | 0.02    |
| 114     | 5.74  | 544  | 27.39   | 17.95           | - | 18.15 |  | 1     | 0.02 | 2    | 0.05    |
| 198     | 9.97  | 742  | 37.36   | 18.15           | - | 18.35 |  | 4     | 0.10 | 6    | 0.15    |
| 136     | 6.85  | 878  | 44.21   | 18.35           | - | 18.55 |  | 5     | 0.12 | 11   | 0.27    |
| 234     | 11.78 | 1112 | 55.99   | 18.55           | - | 18.75 |  | 13    | 0.32 | 24   | 0.59    |
| 159     | 8.01  | 1271 | 64.00   | 18.75           | - | 18.95 |  | 19    | 0.47 | 43   | 1.05    |
| 149     | 7.50  | 1420 | 71.50   | 18.95           | - | 19.15 |  | 32    | 0.78 | 75   | 1.84    |
| 161     | 8.11  | 1581 | 79.61   | 19.15           | - | 19.35 |  | 74    | 1.81 | 149  | 3.65    |
| 99      | 4.98  | 1680 | 84.59   | 19.35           | - | 19.55 |  | 62    | 1.52 | 211  | 5.17    |
| 104     | 5.24  | 1784 | 89.83   | 19.55           | - | 19.75 |  | 116   | 2.84 | 327  | 8.01    |
| 46      | 2.32  | 1830 | 92.15   | 19.75           | - | 19.95 |  | 98    | 2.40 | 425  | 10.41   |
| 49      | 2.47  | 1879 | 94.61   | 19.95           | - | 20.15 |  | 161   | 3.94 | 586  | 14.36   |
| 42      | 2.11  | 1921 | 96.73   | 20.15           | - | 20.35 |  | 218   | 5.34 | 804  | 19.70   |
| 28      | 1.41  | 1949 | 98.14   | 20.35           | - | 20.55 |  | 212   | 5.19 | 1016 | 24.89   |
| 18      | 0.91  | 1967 | 99.04   | 20.55           | - | 20.75 |  | 314   | 7.69 | 1330 | 32.58   |
| 11      | 0.55  | 1978 | 99.60   | 20.75           | - | 20.95 |  | 246   | 6.03 | 1576 | 38.61   |
| 3       | 0.15  | 1981 | 99.75   | 20.95           | - | 21.15 |  | 290   | 7.10 | 1866 | 45.71   |
| 4       | 0.20  | 1985 | 99.95   | 21.15           | - | 21.35 |  | 394   | 9.65 | 2260 | 55.37   |
| 1       | 0.05  | 1986 | 100.00  | 21.35           | - | 21.55 |  | 314   | 7.69 | 2574 | 63.06   |
|         |       |      |         | 21.55           | - | 21.75 |  | 335   | 8.21 | 2909 | 71.26   |
|         |       |      |         | 21.75           | - | 21.95 |  | 190   | 4.65 | 3099 | 75.92   |
|         |       |      |         | 21.95           | - | 22.15 |  | 227   | 5.56 | 3326 | 81.48   |
|         |       |      |         | 22.15           | - | 22.35 |  | 231   | 5.66 | 3557 | 87.14   |
|         |       |      |         | 22.35           | - | 22.55 |  | 134   | 3.28 | 3691 | 90.42   |
|         |       |      |         | 22.55           | - | 22.75 |  | 118   | 2.89 | 3809 | 93.31   |
|         |       |      |         | 22.75           | - | 22.95 |  | 61    | 1.49 | 3870 | 94.81   |
|         |       |      |         | 22.95           | - | 23.15 |  | 64    | 1.57 | 3934 | 96.37   |
|         |       |      |         | 23.15           | - | 23.35 |  | 54    | 1.32 | 3988 | 97.70   |
|         |       |      |         | 23.35           | - | 23.55 |  | 32    | 0.78 | 4020 | 98.48   |
|         |       |      |         | 23.55           | - | 23.75 |  | 33    | 0.81 | 4053 | 99.29   |
|         |       |      |         | 23.75           | - | 23.95 |  | 8     | 0.20 | 4061 | 99.49   |
|         |       |      |         | 23.95           | - | 24.15 |  | 10    | 0.24 | 4071 | 99.73   |
|         |       |      |         | 24.15           | - | 24.35 |  | 5     | 0.12 | 4076 | 99.85   |
|         |       |      |         | 24.35           | - | 24.55 |  | 3     | 0.07 | 4079 | 99.93   |
|         |       |      |         | 24.55           | - | 24.75 |  | 2     | 0.05 | 4081 | 99.98   |
|         |       |      |         | 24.75           | - | 24.95 |  | 1     | 0.02 | 4082 | 100.00  |

## (44) HAND LENGTH

The length of the right hand between the stylium landmark on the wrist and the tip of the middle finger is measured with a Poech sliding caliper. The participant places the palm on a table with the fingers together and the thumb abducted. The middle finger is parallel to the long axis of the forearm. The two distal phalanges of the fingers lie on a flat surface 8 mm higher than the table.

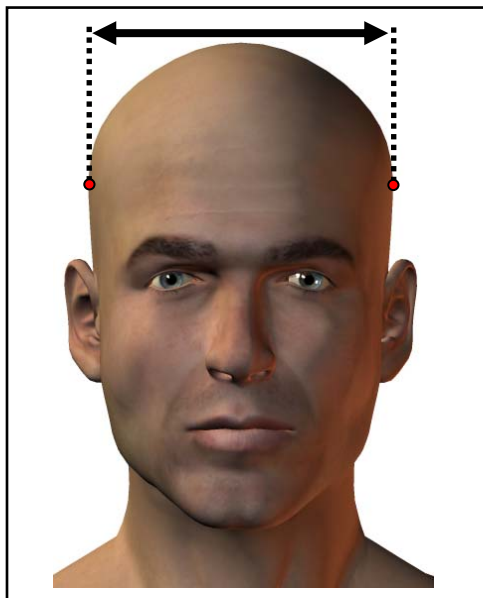


| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 16.00       | 6.30 | 1ST  | 17.20 | 6.77 |
| 16.20       | 6.38 | 2ND  | 17.40 | 6.85 |
| 16.30       | 6.42 | 3RD  | 17.50 | 6.89 |
| 16.50       | 6.50 | 5TH  | 17.70 | 6.97 |
| 16.90       | 6.65 | 10TH | 18.10 | 7.13 |
| 17.10       | 6.73 | 15TH | 18.30 | 7.20 |
| 17.30       | 6.81 | 20TH | 18.50 | 7.28 |
| 17.40       | 6.85 | 25TH | 18.70 | 7.36 |
| 17.60       | 6.93 | 30TH | 18.80 | 7.40 |
| 17.70       | 6.97 | 35TH | 19.00 | 7.48 |
| 17.80       | 7.01 | 40TH | 19.00 | 7.48 |
| 17.90       | 7.05 | 45TH | 19.20 | 7.56 |
| 18.00       | 7.09 | 50TH | 19.30 | 7.60 |
| 18.20       | 7.17 | 55TH | 19.40 | 7.64 |
| 18.30       | 7.20 | 60TH | 19.50 | 7.68 |
| 18.40       | 7.24 | 65TH | 19.70 | 7.76 |
| 18.60       | 7.32 | 70TH | 19.80 | 7.80 |
| 18.70       | 7.36 | 75TH | 20.00 | 7.87 |
| 18.90       | 7.44 | 80TH | 20.10 | 7.91 |
| 19.10       | 7.52 | 85TH | 20.30 | 7.99 |
| 19.40       | 7.64 | 90TH | 20.60 | 8.11 |
| 19.90       | 7.83 | 95TH | 21.00 | 8.27 |
| 20.20       | 7.95 | 97TH | 21.30 | 8.39 |
| 20.40       | 8.03 | 98TH | 21.50 | 8.46 |
| 20.70       | 8.15 | 99TH | 21.80 | 8.58 |



## (45) HEAD BREADTH\*

The maximum horizontal breadth of the head above the plane of attachment of the ears is measured with a spreading caliper. For female participants with braids or cornrows, the measurement includes the styled hair.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 13.60       | 5.35 | 1ST  | 14.20 | 5.59 |
| 13.70       | 5.39 | 2ND  | 14.40 | 5.67 |
| 13.80       | 5.43 | 3RD  | 14.40 | 5.67 |
| 14.00       | 5.51 | 5TH  | 14.60 | 5.75 |
| 14.10       | 5.55 | 10TH | 14.70 | 5.79 |
| 14.30       | 5.63 | 15TH | 14.90 | 5.87 |
| 14.40       | 5.67 | 20TH | 15.00 | 5.91 |
| 14.40       | 5.67 | 25TH | 15.10 | 5.94 |
| 14.50       | 5.71 | 30TH | 15.20 | 5.98 |
| 14.60       | 5.75 | 35TH | 15.20 | 5.98 |
| 14.60       | 5.75 | 40TH | 15.30 | 6.02 |
| 14.70       | 5.79 | 45TH | 15.30 | 6.02 |
| 14.70       | 5.79 | 50TH | 15.40 | 6.06 |
| 14.80       | 5.83 | 55TH | 15.50 | 6.10 |
| 14.90       | 5.87 | 60TH | 15.50 | 6.10 |
| 15.00       | 5.91 | 65TH | 15.60 | 6.14 |
| 15.00       | 5.91 | 70TH | 15.70 | 6.18 |
| 15.10       | 5.94 | 75TH | 15.80 | 6.22 |
| 15.20       | 5.98 | 80TH | 15.90 | 6.26 |
| 15.30       | 6.02 | 85TH | 16.00 | 6.30 |
| 15.40       | 6.06 | 90TH | 16.10 | 6.34 |
| 15.60       | 6.14 | 95TH | 16.30 | 6.42 |
| 15.80       | 6.22 | 97TH | 16.50 | 6.50 |
| 15.90       | 6.26 | 98TH | 16.70 | 6.57 |
| 16.00       | 6.30 | 99TH | 16.80 | 6.61 |

\* This measurement is not equivalent to ANSUR for females. See text on page 44 for details.

## (45) HEAD BREADTH

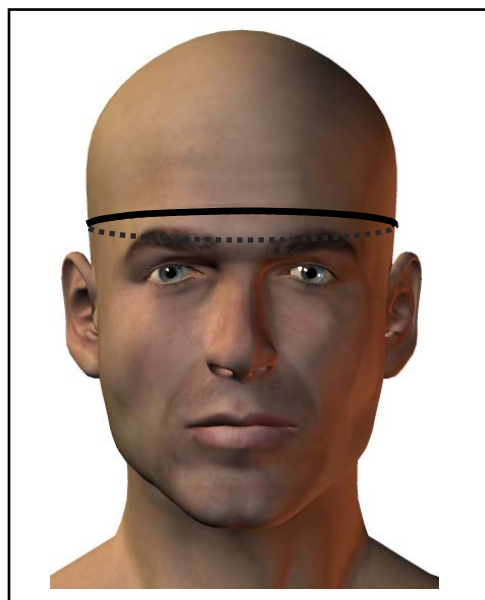
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 14.78                    | MEAN                | 5.82 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.52                     | STANDARD DEVIATION  | 0.20 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 13.10                    | MINIMUM             | 5.16 |
| 16.70                    | MAXIMUM             | 6.57 |
| SKEWNESS                 |                     | 0.15 |
| KURTOSIS                 |                     | 3.13 |
| COEFFICIENT OF VARIATION |                     | 3.5% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 15.43                    | MEAN                | 6.08 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.55                     | STANDARD DEVIATION  | 0.22 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 13.50                    | MINIMUM             | 5.31 |
| 18.00                    | MAXIMUM             | 7.09 |
| SKEWNESS                 |                     | 0.25 |
| KURTOSIS                 |                     | 3.54 |
| COEFFICIENT OF VARIATION |                     | 3.6% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |      |      |         |       |   |       |  |       |      |      |         |
|-----------------|------|------|---------|-------|---|-------|--|-------|------|------|---------|
| FEMALES         |      |      |         |       |   |       |  | MALES |      |      |         |
| F               | FPct | CumF | CumFPct | CM    |   |       |  | F     | FPct | CumF | CumFPct |
| 1               | 0.05 | 1    | 0.05    | 13.05 | - | 13.15 |  |       |      |      |         |
| 3               | 0.15 | 4    | 0.20    | 13.15 | - | 13.25 |  |       |      |      |         |
| 1               | 0.05 | 5    | 0.25    | 13.25 | - | 13.35 |  |       |      |      |         |
| 4               | 0.20 | 9    | 0.45    | 13.35 | - | 13.45 |  |       |      |      |         |
| 7               | 0.35 | 16   | 0.81    | 13.45 | - | 13.55 |  | 1     | 0.02 | 1    | 0.02    |
| 8               | 0.40 | 24   | 1.21    | 13.55 | - | 13.65 |  | 1     | 0.02 | 2    | 0.05    |
| 18              | 0.91 | 42   | 2.11    | 13.65 | - | 13.75 |  | 1     | 0.02 | 3    | 0.07    |
| 32              | 1.61 | 74   | 3.73    | 13.75 | - | 13.85 |  | 3     | 0.07 | 6    | 0.15    |
| 24              | 1.21 | 98   | 4.93    | 13.85 | - | 13.95 |  | 2     | 0.05 | 8    | 0.20    |
| 49              | 2.47 | 147  | 7.40    | 13.95 | - | 14.05 |  | 13    | 0.32 | 21   | 0.51    |
| 57              | 2.87 | 204  | 10.27   | 14.05 | - | 14.15 |  | 19    | 0.47 | 40   | 0.98    |
| 60              | 3.02 | 264  | 13.29   | 14.15 | - | 14.25 |  | 16    | 0.39 | 56   | 1.37    |
| 124             | 6.24 | 388  | 19.54   | 14.25 | - | 14.35 |  | 24    | 0.59 | 80   | 1.96    |
| 148             | 7.45 | 536  | 26.99   | 14.35 | - | 14.45 |  | 58    | 1.42 | 138  | 3.38    |
| 159             | 8.01 | 695  | 34.99   | 14.45 | - | 14.55 |  | 53    | 1.30 | 191  | 4.68    |
| 146             | 7.35 | 841  | 42.35   | 14.55 | - | 14.65 |  | 96    | 2.35 | 287  | 7.03    |
| 154             | 7.75 | 995  | 50.10   | 14.65 | - | 14.75 |  | 135   | 3.31 | 422  | 10.34   |
| 143             | 7.20 | 1138 | 57.30   | 14.75 | - | 14.85 |  | 163   | 3.99 | 585  | 14.33   |
| 117             | 5.89 | 1255 | 63.19   | 14.85 | - | 14.95 |  | 139   | 3.41 | 724  | 17.74   |
| 158             | 7.96 | 1413 | 71.15   | 14.95 | - | 15.05 |  | 279   | 6.83 | 1003 | 24.57   |
| 102             | 5.14 | 1515 | 76.28   | 15.05 | - | 15.15 |  | 216   | 5.29 | 1219 | 29.86   |
| 114             | 5.74 | 1629 | 82.02   | 15.15 | - | 15.25 |  | 263   | 6.44 | 1482 | 36.31   |
| 88              | 4.43 | 1717 | 86.46   | 15.25 | - | 15.35 |  | 359   | 8.79 | 1841 | 45.10   |
| 72              | 3.63 | 1789 | 90.08   | 15.35 | - | 15.45 |  | 334   | 8.18 | 2175 | 53.28   |
| 60              | 3.02 | 1849 | 93.10   | 15.45 | - | 15.55 |  | 293   | 7.18 | 2468 | 60.46   |
| 38              | 1.91 | 1887 | 95.02   | 15.55 | - | 15.65 |  | 253   | 6.20 | 2721 | 66.66   |
| 27              | 1.36 | 1914 | 96.37   | 15.65 | - | 15.75 |  | 262   | 6.42 | 2983 | 73.08   |
| 21              | 1.06 | 1935 | 97.43   | 15.75 | - | 15.85 |  | 262   | 6.42 | 3245 | 79.50   |
| 19              | 0.96 | 1954 | 98.39   | 15.85 | - | 15.95 |  | 136   | 3.33 | 3381 | 82.83   |
| 15              | 0.76 | 1969 | 99.14   | 15.95 | - | 16.05 |  | 197   | 4.83 | 3578 | 87.65   |
| 5               | 0.25 | 1974 | 99.40   | 16.05 | - | 16.15 |  | 125   | 3.06 | 3703 | 90.72   |
| 6               | 0.30 | 1980 | 99.70   | 16.15 | - | 16.25 |  | 86    | 2.11 | 3789 | 92.82   |
| 0               | 0.00 | 1980 | 99.70   | 16.25 | - | 16.35 |  | 90    | 2.20 | 3879 | 95.03   |
| 3               | 0.15 | 1983 | 99.85   | 16.35 | - | 16.45 |  | 53    | 1.30 | 3932 | 96.33   |
| 1               | 0.05 | 1984 | 99.90   | 16.45 | - | 16.55 |  | 35    | 0.86 | 3967 | 97.18   |
| 1               | 0.05 | 1985 | 99.95   | 16.55 | - | 16.65 |  | 33    | 0.81 | 4000 | 97.99   |
| 1               | 0.05 | 1986 | 100.00  | 16.65 | - | 16.75 |  | 20    | 0.49 | 4020 | 98.48   |
|                 |      |      |         | 16.75 | - | 16.85 |  | 22    | 0.54 | 4042 | 99.02   |
|                 |      |      |         | 16.85 | - | 16.95 |  | 8     | 0.20 | 4050 | 99.22   |
|                 |      |      |         | 16.95 | - | 17.05 |  | 11    | 0.27 | 4061 | 99.49   |
|                 |      |      |         | 17.05 | - | 17.15 |  | 5     | 0.12 | 4066 | 99.61   |
|                 |      |      |         | 17.15 | - | 17.25 |  | 4     | 0.10 | 4070 | 99.71   |
|                 |      |      |         | 17.25 | - | 17.35 |  | 3     | 0.07 | 4073 | 99.78   |
|                 |      |      |         | 17.35 | - | 17.45 |  | 2     | 0.05 | 4075 | 99.83   |
|                 |      |      |         | 17.45 | - | 17.55 |  | 1     | 0.02 | 4076 | 99.85   |
|                 |      |      |         | 17.55 | - | 17.65 |  | 2     | 0.05 | 4078 | 99.90   |
|                 |      |      |         | 17.65 | - | 17.75 |  | 3     | 0.07 | 4081 | 99.98   |
|                 |      |      |         | 17.75 | - | 17.85 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 17.85 | - | 17.95 |  | 0     | 0.00 | 4081 | 99.98   |
|                 |      |      |         | 17.95 | - | 18.05 |  | 1     | 0.02 | 4082 | 100.00  |

## (46) HEAD CIRCUMFERENCE\*

The maximum circumference of the head above the attachment of the ears is measured with a tape passing just above the ridges of the eyebrows and around the back of the head. For female participants with braids or cornrows, the measurement includes the styled hair.



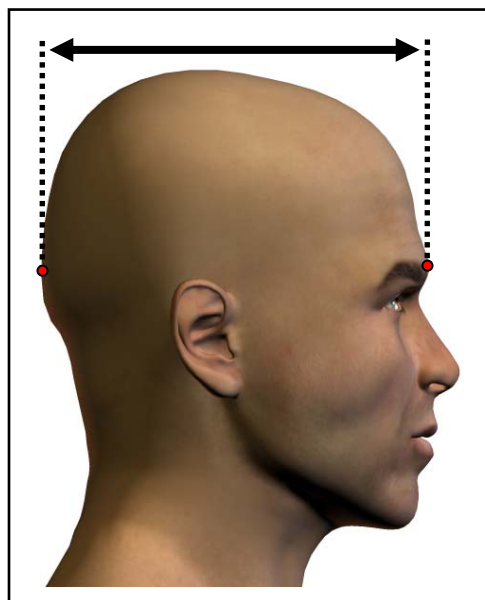
| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 52.10       | 20.51 | 1ST  | 53.80 | 21.18 |
| 52.50       | 20.67 | 2ND  | 54.30 | 21.38 |
| 52.80       | 20.79 | 3RD  | 54.50 | 21.46 |
| 53.20       | 20.94 | 5TH  | 54.80 | 21.57 |
| 53.80       | 21.18 | 10TH | 55.40 | 21.81 |
| 54.20       | 21.34 | 15TH | 55.80 | 21.97 |
| 54.50       | 21.46 | 20TH | 56.10 | 22.09 |
| 54.80       | 21.57 | 25TH | 56.30 | 22.17 |
| 55.00       | 21.65 | 30TH | 56.60 | 22.28 |
| 55.30       | 21.77 | 35TH | 56.80 | 22.36 |
| 55.50       | 21.85 | 40TH | 57.00 | 22.44 |
| 55.70       | 21.93 | 45TH | 57.30 | 22.56 |
| 56.00       | 22.05 | 50TH | 57.40 | 22.60 |
| 56.20       | 22.13 | 55TH | 57.60 | 22.68 |
| 56.40       | 22.20 | 60TH | 57.80 | 22.76 |
| 56.70       | 22.32 | 65TH | 58.00 | 22.83 |
| 57.00       | 22.44 | 70TH | 58.30 | 22.95 |
| 57.30       | 22.56 | 75TH | 58.50 | 23.03 |
| 57.60       | 22.68 | 80TH | 58.70 | 23.11 |
| 58.00       | 22.83 | 85TH | 59.00 | 23.23 |
| 58.70       | 23.11 | 90TH | 59.50 | 23.43 |
| 59.70       | 23.50 | 95TH | 60.10 | 23.66 |
| 60.20       | 23.70 | 97TH | 60.50 | 23.82 |
| 60.70       | 23.90 | 98TH | 60.80 | 23.94 |
| 61.10       | 24.06 | 99TH | 61.50 | 24.21 |

\* This measurement is not equivalent to ANSUR for females. See text on page 44 for details.



## (47) HEAD LENGTH\*

The distance from the glabella landmark to the opisthocranion landmark is measured with a spreading caliper. For female participants with braids or cornrows, the measurement includes the styled hair.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 17.10       | 6.73 | 1ST  | 18.20 | 7.17 |
| 17.40       | 6.85 | 2ND  | 18.40 | 7.24 |
| 17.60       | 6.93 | 3RD  | 18.60 | 7.32 |
| 17.80       | 7.01 | 5TH  | 18.80 | 7.40 |
| 18.00       | 7.09 | 10TH | 19.10 | 7.52 |
| 18.20       | 7.17 | 15TH | 19.20 | 7.56 |
| 18.30       | 7.20 | 20TH | 19.40 | 7.64 |
| 18.50       | 7.28 | 25TH | 19.50 | 7.68 |
| 18.60       | 7.32 | 30TH | 19.60 | 7.72 |
| 18.70       | 7.36 | 35TH | 19.70 | 7.76 |
| 18.80       | 7.40 | 40TH | 19.80 | 7.80 |
| 18.90       | 7.44 | 45TH | 19.90 | 7.83 |
| 19.00       | 7.48 | 50TH | 20.00 | 7.87 |
| 19.10       | 7.52 | 55TH | 20.00 | 7.87 |
| 19.20       | 7.56 | 60TH | 20.10 | 7.91 |
| 19.30       | 7.60 | 65TH | 20.20 | 7.95 |
| 19.40       | 7.64 | 70TH | 20.30 | 7.99 |
| 19.50       | 7.68 | 75TH | 20.40 | 8.03 |
| 19.60       | 7.72 | 80TH | 20.50 | 8.07 |
| 19.70       | 7.76 | 85TH | 20.70 | 8.15 |
| 19.90       | 7.83 | 90TH | 20.80 | 8.19 |
| 20.20       | 7.95 | 95TH | 21.10 | 8.31 |
| 20.50       | 8.07 | 97TH | 21.30 | 8.39 |
| 20.60       | 8.11 | 98TH | 21.40 | 8.43 |
| 20.80       | 8.19 | 99TH | 21.50 | 8.46 |

\* This measurement is not equivalent to ANSUR for females. See text on page 44 for details.



## (48) HEEL-ANKLE CIRCUMFERENCE

The circumference of the right foot is measured with a tape passing over the point at which the heel first contacts the table and over the dorsal juncture of the foot and leg landmark at the front of the ankle. The participant stands with the feet about 10 cm apart and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 27.70       | 10.91 | 1ST  | 30.70 | 12.09 |
| 27.90       | 10.98 | 2ND  | 31.10 | 12.24 |
| 28.30       | 11.14 | 3RD  | 31.30 | 12.32 |
| 28.70       | 11.30 | 5TH  | 31.70 | 12.48 |
| 29.20       | 11.50 | 10TH | 32.30 | 12.72 |
| 29.50       | 11.61 | 15TH | 32.70 | 12.87 |
| 29.70       | 11.69 | 20TH | 33.00 | 12.99 |
| 30.00       | 11.81 | 25TH | 33.30 | 13.11 |
| 30.20       | 11.89 | 30TH | 33.50 | 13.19 |
| 30.40       | 11.97 | 35TH | 33.70 | 13.27 |
| 30.60       | 12.05 | 40TH | 33.80 | 13.31 |
| 30.80       | 12.13 | 45TH | 34.10 | 13.43 |
| 31.00       | 12.20 | 50TH | 34.30 | 13.50 |
| 31.20       | 12.28 | 55TH | 34.50 | 13.58 |
| 31.30       | 12.32 | 60TH | 34.70 | 13.66 |
| 31.60       | 12.44 | 65TH | 34.90 | 13.74 |
| 31.80       | 12.52 | 70TH | 35.20 | 13.86 |
| 32.00       | 12.60 | 75TH | 35.40 | 13.94 |
| 32.30       | 12.72 | 80TH | 35.70 | 14.06 |
| 32.60       | 12.83 | 85TH | 36.00 | 14.17 |
| 33.00       | 12.99 | 90TH | 36.50 | 14.37 |
| 33.70       | 13.27 | 95TH | 37.20 | 14.65 |
| 34.20       | 13.46 | 97TH | 37.60 | 14.80 |
| 34.50       | 13.58 | 98TH | 37.80 | 14.88 |
| 34.80       | 13.70 | 99TH | 38.50 | 15.16 |

## (48) HEEL-ANKLE CIRCUMFERENCE

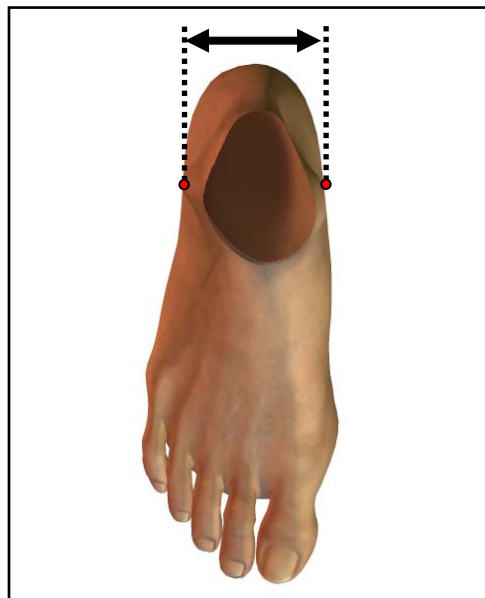
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 31.03                    |                     | 12.22 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.53                     | STANDARD DEVIATION  | 0.60  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 26.40                    | MINIMUM             | 10.39 |
| 37.60                    | MAXIMUM             | 14.80 |
| SKEWNESS                 |                     | 0.25  |
| KURTOSIS                 |                     | 3.07  |
| COEFFICIENT OF VARIATION |                     | 4.9%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 34.35                    |                     | 13.52 |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.66                     | STANDARD DEVIATION  | 0.65  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 25.80                    | MINIMUM             | 10.16 |
| 40.30                    | MAXIMUM             | 15.87 |
| SKEWNESS                 |                     | 0.15  |
| KURTOSIS                 |                     | 3.25  |
| COEFFICIENT OF VARIATION |                     | 4.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 25.75           | - | 26.10 |  | 1     | 0.02 | 1    | 0.02    |
| 0       | 0.00  | 1    | 0.05    | 26.10           | - | 26.45 |  | 0     | 0.00 | 1    | 0.02    |
| 2       | 0.10  | 3    | 0.15    | 26.45           | - | 26.80 |  | 0     | 0.00 | 1    | 0.02    |
| 6       | 0.30  | 9    | 0.45    | 26.80           | - | 27.15 |  | 0     | 0.00 | 1    | 0.02    |
| 23      | 1.16  | 32   | 1.61    | 27.15           | - | 27.50 |  | 0     | 0.00 | 1    | 0.02    |
| 20      | 1.01  | 52   | 2.62    | 27.50           | - | 27.85 |  | 0     | 0.00 | 1    | 0.02    |
| 39      | 1.96  | 91   | 4.58    | 27.85           | - | 28.20 |  | 0     | 0.00 | 1    | 0.02    |
| 45      | 2.27  | 136  | 6.85    | 28.20           | - | 28.55 |  | 0     | 0.00 | 1    | 0.02    |
| 74      | 3.73  | 210  | 10.57   | 28.55           | - | 28.90 |  | 0     | 0.00 | 1    | 0.02    |
| 126     | 6.34  | 336  | 16.92   | 28.90           | - | 29.25 |  | 3     | 0.07 | 4    | 0.10    |
| 158     | 7.96  | 494  | 24.87   | 29.25           | - | 29.60 |  | 5     | 0.12 | 9    | 0.22    |
| 116     | 5.84  | 610  | 30.72   | 29.60           | - | 29.95 |  | 3     | 0.07 | 12   | 0.29    |
| 198     | 9.97  | 808  | 40.68   | 29.95           | - | 30.30 |  | 4     | 0.10 | 16   | 0.39    |
| 167     | 8.41  | 975  | 49.09   | 30.30           | - | 30.65 |  | 23    | 0.56 | 39   | 0.96    |
| 229     | 11.53 | 1204 | 60.62   | 30.65           | - | 31.00 |  | 20    | 0.49 | 59   | 1.45    |
| 126     | 6.34  | 1330 | 66.97   | 31.00           | - | 31.35 |  | 67    | 1.64 | 126  | 3.09    |
| 176     | 8.86  | 1506 | 75.83   | 31.35           | - | 31.70 |  | 70    | 1.71 | 196  | 4.80    |
| 107     | 5.39  | 1613 | 81.22   | 31.70           | - | 32.05 |  | 121   | 2.96 | 317  | 7.77    |
| 121     | 6.09  | 1734 | 87.31   | 32.05           | - | 32.40 |  | 123   | 3.01 | 440  | 10.78   |
| 61      | 3.07  | 1795 | 90.38   | 32.40           | - | 32.75 |  | 242   | 5.93 | 682  | 16.71   |
| 70      | 3.52  | 1865 | 93.91   | 32.75           | - | 33.10 |  | 203   | 4.97 | 885  | 21.68   |
| 30      | 1.51  | 1895 | 95.42   | 33.10           | - | 33.45 |  | 336   | 8.23 | 1221 | 29.91   |
| 29      | 1.46  | 1924 | 96.88   | 33.45           | - | 33.80 |  | 294   | 7.20 | 1515 | 37.11   |
| 17      | 0.86  | 1941 | 97.73   | 33.80           | - | 34.15 |  | 366   | 8.97 | 1881 | 46.08   |
| 26      | 1.31  | 1967 | 99.04   | 34.15           | - | 34.50 |  | 330   | 8.08 | 2211 | 54.16   |
| 8       | 0.40  | 1975 | 99.45   | 34.50           | - | 34.85 |  | 396   | 9.70 | 2607 | 63.87   |
| 8       | 0.40  | 1983 | 99.85   | 34.85           | - | 35.20 |  | 212   | 5.19 | 2819 | 69.06   |
| 1       | 0.05  | 1984 | 99.90   | 35.20           | - | 35.55 |  | 343   | 8.40 | 3162 | 77.46   |
| 1       | 0.05  | 1985 | 99.95   | 35.55           | - | 35.90 |  | 203   | 4.97 | 3365 | 82.44   |
| 0       | 0.00  | 1985 | 99.95   | 35.90           | - | 36.25 |  | 191   | 4.68 | 3556 | 87.11   |
| 0       | 0.00  | 1985 | 99.95   | 36.25           | - | 36.60 |  | 137   | 3.36 | 3693 | 90.47   |
| 0       | 0.00  | 1985 | 99.95   | 36.60           | - | 36.95 |  | 114   | 2.79 | 3807 | 93.26   |
| 0       | 0.00  | 1985 | 99.95   | 36.95           | - | 37.30 |  | 84    | 2.06 | 3891 | 95.32   |
| 1       | 0.05  | 1986 | 100.00  | 37.30           | - | 37.65 |  | 74    | 1.81 | 3965 | 97.13   |
|         |       |      |         | 37.65           | - | 38.00 |  | 44    | 1.08 | 4009 | 98.21   |
|         |       |      |         | 38.00           | - | 38.35 |  | 23    | 0.56 | 4032 | 98.78   |
|         |       |      |         | 38.35           | - | 38.70 |  | 17    | 0.42 | 4049 | 99.19   |
|         |       |      |         | 38.70           | - | 39.05 |  | 11    | 0.27 | 4060 | 99.46   |
|         |       |      |         | 39.05           | - | 39.40 |  | 9     | 0.22 | 4069 | 99.68   |
|         |       |      |         | 39.40           | - | 39.75 |  | 8     | 0.20 | 4077 | 99.88   |
|         |       |      |         | 39.75           | - | 40.10 |  | 3     | 0.07 | 4080 | 99.95   |
|         |       |      |         | 40.10           | - | 40.45 |  | 2     | 0.05 | 4082 | 100.00  |

## (49) HEEL BREADTH

The maximum horizontal distance between the medial and lateral points of the right heel, at or posterior to the lateral malleolus landmark, is measured with a Holtain caliper. The measurement is taken just above the level of the standing surface at the most protruding points of the curvature of the heel. The participant stands with the feet about 10 cm apart and the weight distributed equally on both feet.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 5.70        | 2.24 | 1ST  | 6.10  | 2.40 |
| 5.80        | 2.28 | 2ND  | 6.20  | 2.44 |
| 5.90        | 2.32 | 3RD  | 6.30  | 2.48 |
| 6.00        | 2.36 | 5TH  | 6.40  | 2.52 |
| 6.10        | 2.40 | 10TH | 6.60  | 2.60 |
| 6.20        | 2.44 | 15TH | 6.70  | 2.64 |
| 6.30        | 2.48 | 20TH | 6.80  | 2.68 |
| 6.40        | 2.52 | 25TH | 6.90  | 2.72 |
| 6.40        | 2.52 | 30TH | 7.00  | 2.76 |
| 6.50        | 2.56 | 35TH | 7.00  | 2.76 |
| 6.60        | 2.60 | 40TH | 7.10  | 2.80 |
| 6.60        | 2.60 | 45TH | 7.10  | 2.80 |
| 6.70        | 2.64 | 50TH | 7.20  | 2.83 |
| 6.70        | 2.64 | 55TH | 7.30  | 2.87 |
| 6.80        | 2.68 | 60TH | 7.40  | 2.91 |
| 6.90        | 2.72 | 65TH | 7.40  | 2.91 |
| 7.00        | 2.76 | 70TH | 7.50  | 2.95 |
| 7.00        | 2.76 | 75TH | 7.60  | 2.99 |
| 7.10        | 2.80 | 80TH | 7.70  | 3.03 |
| 7.20        | 2.83 | 85TH | 7.80  | 3.07 |
| 7.40        | 2.91 | 90TH | 8.00  | 3.15 |
| 7.60        | 2.99 | 95TH | 8.20  | 3.23 |
| 7.80        | 3.07 | 97TH | 8.40  | 3.31 |
| 7.90        | 3.11 | 98TH | 8.50  | 3.35 |
| 8.10        | 3.19 | 99TH | 8.70  | 3.43 |

## (49) HEEL BREADTH

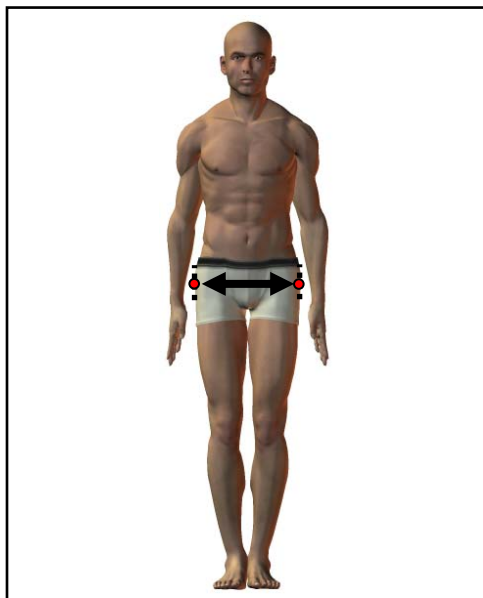
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 6.72                     | MEAN                | 2.64 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.52                     | STANDARD DEVIATION  | 0.20 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 5.30                     | MINIMUM             | 2.09 |
| 8.90                     | MAXIMUM             | 3.50 |
| SKEWNESS                 |                     | 0.40 |
| KURTOSIS                 |                     | 3.16 |
| COEFFICIENT OF VARIATION |                     | 7.7% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 7.25                     | MEAN                | 2.85 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.55                     | STANDARD DEVIATION  | 0.21 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 4.80                     | MINIMUM             | 1.89 |
| 9.30                     | MAXIMUM             | 3.66 |
| SKEWNESS                 |                     | 0.35 |
| KURTOSIS                 |                     | 3.39 |
| COEFFICIENT OF VARIATION |                     | 7.5% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FEMALES |      |      |         | FREQUENCY TABLE |    |      |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|----|------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct |                 | CM |      |  | F     | FPct | CumF | CumFPct |
|         |      |      |         | 4.75            | -  | 4.85 |  | 1     | 0.02 | 1    | 0.02    |
|         |      |      |         | 4.85            | -  | 4.95 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 4.95            | -  | 5.05 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 5.05            | -  | 5.15 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 5.15            | -  | 5.25 |  | 0     | 0.00 | 1    | 0.02    |
| 2       | 0.10 | 2    | 0.10    | 5.25            | -  | 5.35 |  | 1     | 0.02 | 2    | 0.05    |
| 4       | 0.20 | 6    | 0.30    | 5.35            | -  | 5.45 |  | 1     | 0.02 | 3    | 0.07    |
| 1       | 0.05 | 7    | 0.35    | 5.45            | -  | 5.55 |  | 0     | 0.00 | 3    | 0.07    |
| 12      | 0.60 | 19   | 0.96    | 5.55            | -  | 5.65 |  | 0     | 0.00 | 3    | 0.07    |
| 14      | 0.70 | 33   | 1.66    | 5.65            | -  | 5.75 |  | 3     | 0.07 | 6    | 0.15    |
| 21      | 1.06 | 54   | 2.72    | 5.75            | -  | 5.85 |  | 4     | 0.10 | 10   | 0.24    |
| 38      | 1.91 | 92   | 4.63    | 5.85            | -  | 5.95 |  | 3     | 0.07 | 13   | 0.32    |
| 85      | 4.28 | 177  | 8.91    | 5.95            | -  | 6.05 |  | 19    | 0.47 | 32   | 0.78    |
| 105     | 5.29 | 282  | 14.20   | 6.05            | -  | 6.15 |  | 37    | 0.91 | 69   | 1.69    |
| 91      | 4.58 | 373  | 18.78   | 6.15            | -  | 6.25 |  | 21    | 0.51 | 90   | 2.20    |
| 99      | 4.98 | 472  | 23.77   | 6.25            | -  | 6.35 |  | 45    | 1.10 | 135  | 3.31    |
| 174     | 8.76 | 646  | 32.53   | 6.35            | -  | 6.45 |  | 74    | 1.81 | 209  | 5.12    |
| 145     | 7.30 | 791  | 39.83   | 6.45            | -  | 6.55 |  | 137   | 3.36 | 346  | 8.48    |
| 155     | 7.80 | 946  | 47.63   | 6.55            | -  | 6.65 |  | 163   | 3.99 | 509  | 12.47   |
| 164     | 8.26 | 1110 | 55.89   | 6.65            | -  | 6.75 |  | 224   | 5.49 | 733  | 17.96   |
| 140     | 7.05 | 1250 | 62.94   | 6.75            | -  | 6.85 |  | 247   | 6.05 | 980  | 24.01   |
| 119     | 5.99 | 1369 | 68.93   | 6.85            | -  | 6.95 |  | 212   | 5.19 | 1192 | 29.20   |
| 141     | 7.10 | 1510 | 76.03   | 6.95            | -  | 7.05 |  | 364   | 8.92 | 1556 | 38.12   |
| 104     | 5.24 | 1614 | 81.27   | 7.05            | -  | 7.15 |  | 335   | 8.21 | 1891 | 46.33   |
| 75      | 3.78 | 1689 | 85.05   | 7.15            | -  | 7.25 |  | 292   | 7.15 | 2183 | 53.48   |
| 52      | 2.62 | 1741 | 87.66   | 7.25            | -  | 7.35 |  | 188   | 4.61 | 2371 | 58.08   |
| 61      | 3.07 | 1802 | 90.74   | 7.35            | -  | 7.45 |  | 345   | 8.45 | 2716 | 66.54   |
| 48      | 2.42 | 1850 | 93.15   | 7.45            | -  | 7.55 |  | 239   | 5.85 | 2955 | 72.39   |
| 43      | 2.17 | 1893 | 95.32   | 7.55            | -  | 7.65 |  | 215   | 5.27 | 3170 | 77.66   |
| 32      | 1.61 | 1925 | 96.93   | 7.65            | -  | 7.75 |  | 205   | 5.02 | 3375 | 82.68   |
| 15      | 0.76 | 1940 | 97.68   | 7.75            | -  | 7.85 |  | 170   | 4.16 | 3545 | 86.84   |
| 15      | 0.76 | 1955 | 98.44   | 7.85            | -  | 7.95 |  | 91    | 2.23 | 3636 | 89.07   |
| 11      | 0.55 | 1966 | 98.99   | 7.95            | -  | 8.05 |  | 139   | 3.41 | 3775 | 92.48   |
| 8       | 0.40 | 1974 | 99.40   | 8.05            | -  | 8.15 |  | 92    | 2.25 | 3867 | 94.73   |
| 4       | 0.20 | 1978 | 99.60   | 8.15            | -  | 8.25 |  | 50    | 1.22 | 3917 | 95.96   |
| 3       | 0.15 | 1981 | 99.75   | 8.25            | -  | 8.35 |  | 29    | 0.71 | 3946 | 96.67   |
| 3       | 0.15 | 1984 | 99.90   | 8.35            | -  | 8.45 |  | 33    | 0.81 | 3979 | 97.48   |
| 0       | 0.00 | 1984 | 99.90   | 8.45            | -  | 8.55 |  | 27    | 0.66 | 4006 | 98.14   |
| 0       | 0.00 | 1984 | 99.90   | 8.55            | -  | 8.65 |  | 29    | 0.71 | 4035 | 98.85   |
| 1       | 0.05 | 1985 | 99.95   | 8.65            | -  | 8.75 |  | 11    | 0.27 | 4046 | 99.12   |
| 0       | 0.00 | 1985 | 99.95   | 8.75            | -  | 8.85 |  | 13    | 0.32 | 4059 | 99.44   |
| 1       | 0.05 | 1986 | 100.00  | 8.85            | -  | 8.95 |  | 7     | 0.17 | 4066 | 99.61   |
|         |      |      |         | 8.95            | -  | 9.05 |  | 6     | 0.15 | 4072 | 99.76   |
|         |      |      |         | 9.05            | -  | 9.15 |  | 2     | 0.05 | 4074 | 99.80   |
|         |      |      |         | 9.15            | -  | 9.25 |  | 4     | 0.10 | 4078 | 99.90   |
|         |      |      |         | 9.25            | -  | 9.35 |  | 4     | 0.10 | 4082 | 100.00  |

## (50) HIP BREADTH

The horizontal distance between the lateral buttock landmarks is measured with a beam caliper. The participant stands erect with the heels together and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 29.30       | 11.54 | 1ST  | 29.50 | 11.61 |
| 30.10       | 11.85 | 2ND  | 30.00 | 11.81 |
| 30.60       | 12.05 | 3RD  | 30.30 | 11.93 |
| 31.10       | 12.24 | 5TH  | 30.80 | 12.13 |
| 32.00       | 12.60 | 10TH | 31.60 | 12.44 |
| 32.70       | 12.87 | 15TH | 32.10 | 12.64 |
| 33.20       | 13.07 | 20TH | 32.60 | 12.83 |
| 33.60       | 13.23 | 25TH | 32.90 | 12.95 |
| 34.00       | 13.39 | 30TH | 33.30 | 13.11 |
| 34.30       | 13.50 | 35TH | 33.60 | 13.23 |
| 34.60       | 13.62 | 40TH | 33.90 | 13.35 |
| 35.00       | 13.78 | 45TH | 34.20 | 13.46 |
| 35.30       | 13.90 | 50TH | 34.40 | 13.54 |
| 35.60       | 14.02 | 55TH | 34.70 | 13.66 |
| 36.00       | 14.17 | 60TH | 35.10 | 13.82 |
| 36.30       | 14.29 | 65TH | 35.30 | 13.90 |
| 36.60       | 14.41 | 70TH | 35.70 | 14.06 |
| 37.00       | 14.57 | 75TH | 36.10 | 14.21 |
| 37.40       | 14.72 | 80TH | 36.50 | 14.37 |
| 38.00       | 14.96 | 85TH | 37.00 | 14.57 |
| 38.70       | 15.24 | 90TH | 37.70 | 14.84 |
| 40.00       | 15.75 | 95TH | 38.70 | 15.24 |
| 40.80       | 16.06 | 97TH | 39.60 | 15.59 |
| 41.30       | 16.26 | 98TH | 40.10 | 15.79 |
| 42.30       | 16.65 | 99TH | 40.90 | 16.10 |

## (50) HIP BREADTH

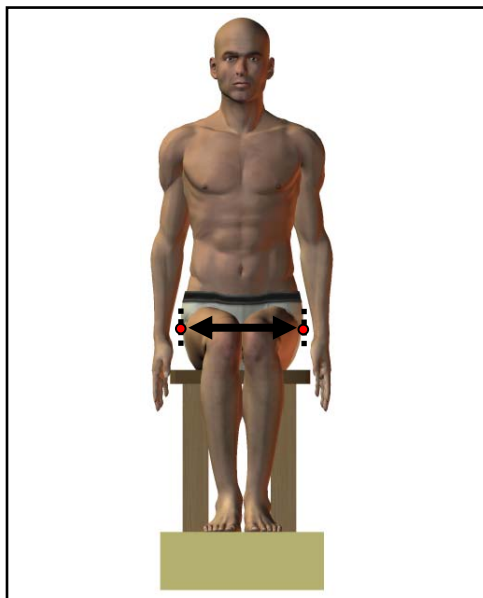
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 35.38                    | MEAN                | 13.93 |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 2.67                     | STANDARD DEVIATION  | 1.05  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 27.60                    | MINIMUM             | 10.87 |
| 47.30                    | MAXIMUM             | 18.62 |
| SKEWNESS                 |                     | 0.32  |
| KURTOSIS                 |                     | 3.53  |
| COEFFICIENT OF VARIATION |                     | 7.5%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 34.57                    | MEAN                | 13.61 |
| 0.04                     | STD ERROR (MEAN)    | 0.01  |
| 2.42                     | STANDARD DEVIATION  | 0.95  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 26.40                    | MINIMUM             | 10.39 |
| 45.20                    | MAXIMUM             | 17.80 |
| SKEWNESS                 |                     | 0.37  |
| KURTOSIS                 |                     | 3.47  |
| COEFFICIENT OF VARIATION |                     | 7.0%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |    |       |     | MALES |      |         |  |
|---------|------|------|---------|-----------------|----|-------|-----|-------|------|---------|--|
| F       | FPct | CumF | CumFPct |                 | CM |       | F   | FPct  | CumF | CumFPct |  |
|         |      |      |         | 26.25           | -  | 26.75 | 2   | 0.05  | 2    | 0.05    |  |
|         |      |      |         | 26.75           | -  | 27.25 | 1   | 0.02  | 3    | 0.07    |  |
| 1       | 0.05 | 1    | 0.05    | 27.25           | -  | 27.75 | 1   | 0.02  | 4    | 0.10    |  |
| 1       | 0.05 | 2    | 0.10    | 27.75           | -  | 28.25 | 1   | 0.02  | 5    | 0.12    |  |
| 5       | 0.25 | 7    | 0.35    | 28.25           | -  | 28.75 | 11  | 0.27  | 16   | 0.39    |  |
| 10      | 0.50 | 17   | 0.86    | 28.75           | -  | 29.25 | 14  | 0.34  | 30   | 0.73    |  |
| 10      | 0.50 | 27   | 1.36    | 29.25           | -  | 29.75 | 28  | 0.69  | 58   | 1.42    |  |
| 15      | 0.76 | 42   | 2.11    | 29.75           | -  | 30.25 | 56  | 1.37  | 114  | 2.79    |  |
| 27      | 1.36 | 69   | 3.47    | 30.25           | -  | 30.75 | 69  | 1.69  | 183  | 4.48    |  |
| 39      | 1.96 | 108  | 5.44    | 30.75           | -  | 31.25 | 112 | 2.74  | 295  | 7.23    |  |
| 41      | 2.06 | 149  | 7.50    | 31.25           | -  | 31.75 | 171 | 4.19  | 466  | 11.42   |  |
| 72      | 3.63 | 221  | 11.13   | 31.75           | -  | 32.25 | 209 | 5.12  | 675  | 16.54   |  |
| 78      | 3.93 | 299  | 15.06   | 32.25           | -  | 32.75 | 241 | 5.90  | 916  | 22.44   |  |
| 106     | 5.34 | 405  | 20.39   | 32.75           | -  | 33.25 | 300 | 7.35  | 1216 | 29.79   |  |
| 139     | 7.00 | 544  | 27.39   | 33.25           | -  | 33.75 | 323 | 7.91  | 1539 | 37.70   |  |
| 140     | 7.05 | 684  | 34.44   | 33.75           | -  | 34.25 | 368 | 9.02  | 1907 | 46.72   |  |
| 150     | 7.55 | 834  | 41.99   | 34.25           | -  | 34.75 | 364 | 8.92  | 2271 | 55.63   |  |
| 144     | 7.25 | 978  | 49.24   | 34.75           | -  | 35.25 | 315 | 7.72  | 2586 | 63.35   |  |
| 146     | 7.35 | 1124 | 56.60   | 35.25           | -  | 35.75 | 307 | 7.52  | 2893 | 70.87   |  |
| 149     | 7.50 | 1273 | 64.10   | 35.75           | -  | 36.25 | 265 | 6.49  | 3158 | 77.36   |  |
| 141     | 7.10 | 1414 | 71.20   | 36.25           | -  | 36.75 | 234 | 5.73  | 3392 | 83.10   |  |
| 139     | 7.00 | 1553 | 78.20   | 36.75           | -  | 37.25 | 171 | 4.19  | 3563 | 87.29   |  |
| 92      | 4.63 | 1645 | 82.83   | 37.25           | -  | 37.75 | 121 | 2.96  | 3684 | 90.25   |  |
| 81      | 4.08 | 1726 | 86.91   | 37.75           | -  | 38.25 | 105 | 2.57  | 3789 | 92.82   |  |
| 64      | 3.22 | 1790 | 90.13   | 38.25           | -  | 38.75 | 90  | 2.20  | 3879 | 95.03   |  |
| 44      | 2.22 | 1834 | 92.35   | 38.75           | -  | 39.25 | 57  | 1.40  | 3936 | 96.42   |  |
| 35      | 1.76 | 1869 | 94.11   | 39.25           | -  | 39.75 | 39  | 0.96  | 3975 | 97.38   |  |
| 37      | 1.86 | 1906 | 95.97   | 39.75           | -  | 40.25 | 34  | 0.83  | 4009 | 98.21   |  |
| 20      | 1.01 | 1926 | 96.98   | 40.25           | -  | 40.75 | 27  | 0.66  | 4036 | 98.87   |  |
| 19      | 0.96 | 1945 | 97.94   | 40.75           | -  | 41.25 | 14  | 0.34  | 4050 | 99.22   |  |
| 10      | 0.50 | 1955 | 98.44   | 41.25           | -  | 41.75 | 9   | 0.22  | 4059 | 99.44   |  |
| 9       | 0.45 | 1964 | 98.89   | 41.75           | -  | 42.25 | 8   | 0.20  | 4067 | 99.63   |  |
| 8       | 0.40 | 1972 | 99.30   | 42.25           | -  | 42.75 | 5   | 0.12  | 4072 | 99.76   |  |
| 5       | 0.25 | 1977 | 99.55   | 42.75           | -  | 43.25 | 4   | 0.10  | 4076 | 99.85   |  |
| 1       | 0.05 | 1978 | 99.60   | 43.25           | -  | 43.75 | 1   | 0.02  | 4077 | 99.88   |  |
| 3       | 0.15 | 1981 | 99.75   | 43.75           | -  | 44.25 | 1   | 0.02  | 4078 | 99.90   |  |
| 1       | 0.05 | 1982 | 99.80   | 44.25           | -  | 44.75 | 2   | 0.05  | 4080 | 99.95   |  |
| 1       | 0.05 | 1983 | 99.85   | 44.75           | -  | 45.25 | 2   | 0.05  | 4082 | 100.00  |  |
| 1       | 0.05 | 1984 | 99.90   | 45.25           | -  | 45.75 |     |       |      |         |  |
| 0       | 0.00 | 1984 | 99.90   | 45.75           | -  | 46.25 |     |       |      |         |  |
| 0       | 0.00 | 1984 | 99.90   | 46.25           | -  | 46.75 |     |       |      |         |  |
| 1       | 0.05 | 1985 | 99.95   | 46.75           | -  | 47.25 |     |       |      |         |  |
| 1       | 0.05 | 1986 | 100.00  | 47.25           | -  | 47.75 |     |       |      |         |  |

## (51) HIP BREADTH, SITTING

The distance between the lateral points of the hips or thighs (whichever are broader) is measured with a beam caliper. The participant sits erect with the feet and knees together.

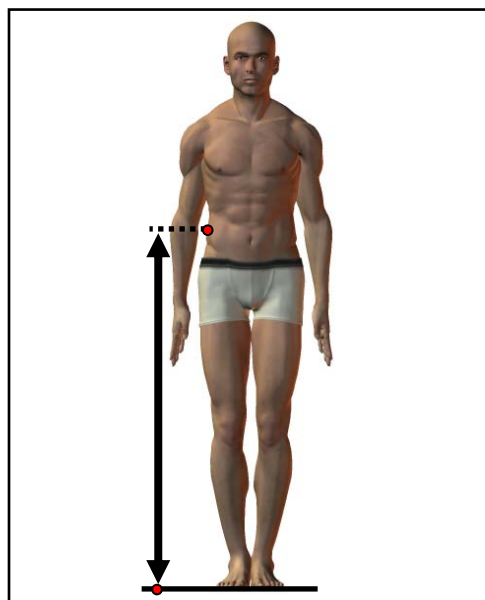
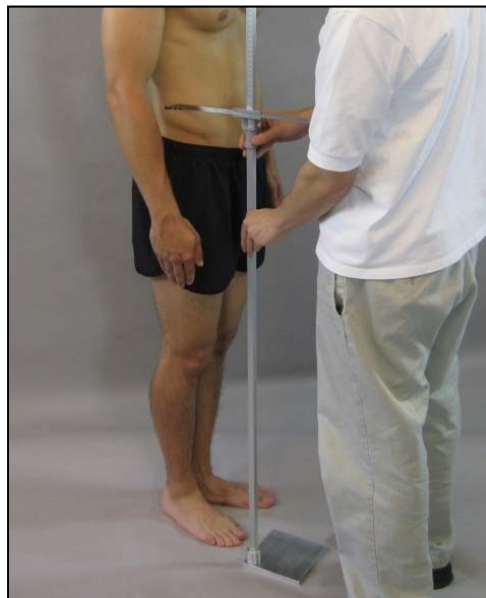


| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 33.10       | 13.03 | 1ST  | 31.70 | 12.48 |
| 33.70       | 13.27 | 2ND  | 32.30 | 12.72 |
| 34.10       | 13.43 | 3RD  | 32.80 | 12.91 |
| 34.80       | 13.70 | 5TH  | 33.30 | 13.11 |
| 35.90       | 14.13 | 10TH | 34.20 | 13.46 |
| 36.60       | 14.41 | 15TH | 34.80 | 13.70 |
| 37.20       | 14.65 | 20TH | 35.40 | 13.94 |
| 37.70       | 14.84 | 25TH | 35.80 | 14.09 |
| 38.10       | 15.00 | 30TH | 36.30 | 14.29 |
| 38.50       | 15.16 | 35TH | 36.70 | 14.45 |
| 38.90       | 15.31 | 40TH | 37.00 | 14.57 |
| 39.30       | 15.47 | 45TH | 37.40 | 14.72 |
| 39.70       | 15.63 | 50TH | 37.80 | 14.88 |
| 40.20       | 15.83 | 55TH | 38.20 | 15.04 |
| 40.70       | 16.02 | 60TH | 38.50 | 15.16 |
| 41.00       | 16.14 | 65TH | 38.90 | 15.31 |
| 41.40       | 16.30 | 70TH | 39.30 | 15.47 |
| 41.90       | 16.50 | 75TH | 39.70 | 15.63 |
| 42.50       | 16.73 | 80TH | 40.30 | 15.87 |
| 43.20       | 17.01 | 85TH | 41.00 | 16.14 |
| 44.00       | 17.32 | 90TH | 41.80 | 16.46 |
| 45.60       | 17.95 | 95TH | 43.10 | 16.97 |
| 46.40       | 18.27 | 97TH | 44.00 | 17.32 |
| 47.50       | 18.70 | 98TH | 44.90 | 17.68 |
| 48.50       | 19.09 | 99TH | 46.20 | 18.19 |



## (52) ILIOCRISTALE HEIGHT

The vertical distance between a standing surface and the right ilioCRistale landmark is measured with an anthropometer. The participant stands erect with the heels together and the weight distributed equally on both feet. The shoulders and upper extremities are relaxed.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 87.90       | 34.61 | 1ST  | 94.70  | 37.28 |
| 90.00       | 35.43 | 2ND  | 96.00  | 37.80 |
| 90.50       | 35.63 | 3RD  | 96.80  | 38.11 |
| 91.80       | 36.14 | 5TH  | 97.70  | 38.46 |
| 93.40       | 36.77 | 10TH | 99.60  | 39.21 |
| 94.50       | 37.20 | 15TH | 100.80 | 39.69 |
| 95.60       | 37.64 | 20TH | 101.80 | 40.08 |
| 96.30       | 37.91 | 25TH | 102.80 | 40.47 |
| 97.00       | 38.19 | 30TH | 103.40 | 40.71 |
| 97.50       | 38.39 | 35TH | 104.10 | 40.98 |
| 98.00       | 38.58 | 40TH | 104.70 | 41.22 |
| 98.70       | 38.86 | 45TH | 105.40 | 41.50 |
| 99.30       | 39.09 | 50TH | 106.10 | 41.77 |
| 100.00      | 39.37 | 55TH | 106.70 | 42.01 |
| 100.70      | 39.65 | 60TH | 107.40 | 42.28 |
| 101.40      | 39.92 | 65TH | 108.10 | 42.56 |
| 102.10      | 40.20 | 70TH | 108.70 | 42.80 |
| 102.80      | 40.47 | 75TH | 109.50 | 43.11 |
| 103.80      | 40.87 | 80TH | 110.40 | 43.46 |
| 105.00      | 41.34 | 85TH | 111.40 | 43.86 |
| 106.00      | 41.73 | 90TH | 112.80 | 44.41 |
| 108.00      | 42.52 | 95TH | 114.80 | 45.20 |
| 109.30      | 43.03 | 97TH | 116.40 | 45.83 |
| 110.00      | 43.31 | 98TH | 117.30 | 46.18 |
| 111.40      | 43.86 | 99TH | 119.30 | 46.97 |

## (52) ILIOCRISTALE HEIGHT

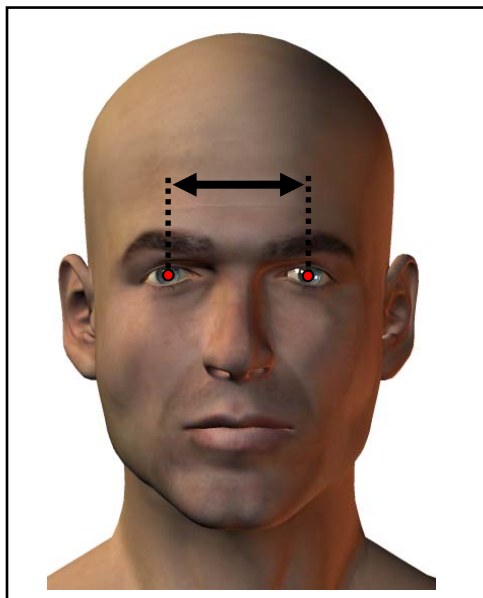
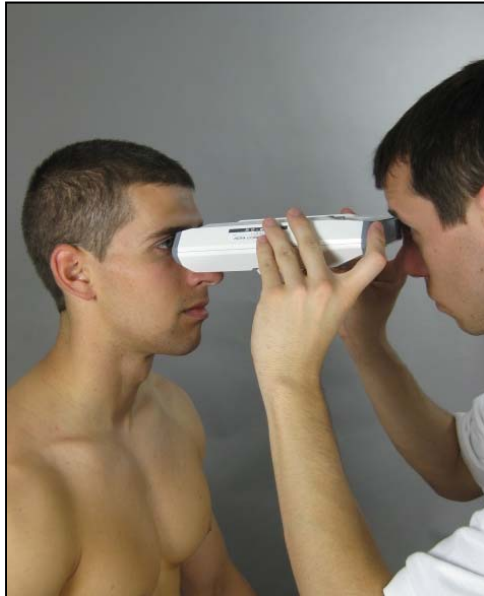
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 99.57                    | MEAN                | 39.20 |
| 0.11                     | STD ERROR (MEAN)    | 0.04  |
| 4.97                     | STANDARD DEVIATION  | 1.96  |
| 0.08                     | STD ERROR (STD DEV) | 0.03  |
| 81.60                    | MINIMUM             | 32.13 |
| 116.30                   | MAXIMUM             | 45.79 |
| SKEWNESS                 |                     | 0.08  |
| KURTOSIS                 |                     | 3.09  |
| COEFFICIENT OF VARIATION |                     | 5.0%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 106.16                   | MEAN                | 41.80 |
| 0.08                     | STD ERROR (MEAN)    | 0.03  |
| 5.20                     | STANDARD DEVIATION  | 2.05  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 85.40                    | MINIMUM             | 33.62 |
| 125.30                   | MAXIMUM             | 49.33 |
| SKEWNESS                 |                     | 0.15  |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 4.9%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10 | 2    | 0.10    | 81.55           | - | 82.55  |  |       |      |      |         |
| 2       | 0.10 | 4    | 0.20    | 82.55           | - | 83.55  |  |       |      |      |         |
| 1       | 0.05 | 5    | 0.25    | 83.55           | - | 84.55  |  |       |      |      |         |
| 0       | 0.00 | 5    | 0.25    | 84.55           | - | 85.55  |  | 1     | 0.02 | 1    | 0.02    |
| 6       | 0.30 | 11   | 0.55    | 85.55           | - | 86.55  |  | 0     | 0.00 | 1    | 0.02    |
| 5       | 0.25 | 16   | 0.81    | 86.55           | - | 87.55  |  | 0     | 0.00 | 1    | 0.02    |
| 8       | 0.40 | 24   | 1.21    | 87.55           | - | 88.55  |  | 0     | 0.00 | 1    | 0.02    |
| 8       | 0.40 | 32   | 1.61    | 88.55           | - | 89.55  |  | 0     | 0.00 | 1    | 0.02    |
| 30      | 1.51 | 62   | 3.12    | 89.55           | - | 90.55  |  | 0     | 0.00 | 1    | 0.02    |
| 24      | 1.21 | 86   | 4.33    | 90.55           | - | 91.55  |  | 7     | 0.17 | 8    | 0.20    |
| 56      | 2.82 | 142  | 7.15    | 91.55           | - | 92.55  |  | 7     | 0.17 | 15   | 0.37    |
| 68      | 3.42 | 210  | 10.57   | 92.55           | - | 93.55  |  | 12    | 0.29 | 27   | 0.66    |
| 95      | 4.78 | 305  | 15.36   | 93.55           | - | 94.55  |  | 12    | 0.29 | 39   | 0.96    |
| 92      | 4.63 | 397  | 19.99   | 94.55           | - | 95.55  |  | 20    | 0.49 | 59   | 1.45    |
| 125     | 6.29 | 522  | 26.28   | 95.55           | - | 96.55  |  | 49    | 1.20 | 108  | 2.65    |
| 182     | 9.16 | 704  | 35.45   | 96.55           | - | 97.55  |  | 83    | 2.03 | 191  | 4.68    |
| 172     | 8.66 | 876  | 44.11   | 97.55           | - | 98.55  |  | 94    | 2.30 | 285  | 6.98    |
| 149     | 7.50 | 1025 | 51.61   | 98.55           | - | 99.55  |  | 122   | 2.99 | 407  | 9.97    |
| 150     | 7.55 | 1175 | 59.16   | 99.55           | - | 100.55 |  | 170   | 4.16 | 577  | 14.14   |
| 134     | 6.75 | 1309 | 65.91   | 100.55          | - | 101.55 |  | 194   | 4.75 | 771  | 18.89   |
| 147     | 7.40 | 1456 | 73.31   | 101.55          | - | 102.55 |  | 203   | 4.97 | 974  | 23.86   |
| 107     | 5.39 | 1563 | 78.70   | 102.55          | - | 103.55 |  | 282   | 6.91 | 1256 | 30.77   |
| 96      | 4.83 | 1659 | 83.53   | 103.55          | - | 104.55 |  | 316   | 7.74 | 1572 | 38.51   |
| 88      | 4.43 | 1747 | 87.97   | 104.55          | - | 105.55 |  | 307   | 7.52 | 1879 | 46.03   |
| 72      | 3.63 | 1819 | 91.59   | 105.55          | - | 106.55 |  | 311   | 7.62 | 2190 | 53.65   |
| 48      | 2.42 | 1867 | 94.01   | 106.55          | - | 107.55 |  | 317   | 7.77 | 2507 | 61.42   |
| 39      | 1.96 | 1906 | 95.97   | 107.55          | - | 108.55 |  | 308   | 7.55 | 2815 | 68.96   |
| 32      | 1.61 | 1938 | 97.58   | 108.55          | - | 109.55 |  | 262   | 6.42 | 3077 | 75.38   |
| 19      | 0.96 | 1957 | 98.54   | 109.55          | - | 110.55 |  | 224   | 5.49 | 3301 | 80.87   |
| 12      | 0.60 | 1969 | 99.14   | 110.55          | - | 111.55 |  | 193   | 4.73 | 3494 | 85.60   |
| 8       | 0.40 | 1977 | 99.55   | 111.55          | - | 112.55 |  | 142   | 3.48 | 3636 | 89.07   |
| 3       | 0.15 | 1980 | 99.70   | 112.55          | - | 113.55 |  | 130   | 3.18 | 3766 | 92.26   |
| 2       | 0.10 | 1982 | 99.80   | 113.55          | - | 114.55 |  | 81    | 1.98 | 3847 | 94.24   |
| 3       | 0.15 | 1985 | 99.95   | 114.55          | - | 115.55 |  | 68    | 1.67 | 3915 | 95.91   |
| 1       | 0.05 | 1986 | 100.00  | 115.55          | - | 116.55 |  | 49    | 1.20 | 3964 | 97.11   |
|         |      |      |         | 116.55          | - | 117.55 |  | 41    | 1.00 | 4005 | 98.11   |
|         |      |      |         | 117.55          | - | 118.55 |  | 20    | 0.49 | 4025 | 98.60   |
|         |      |      |         | 118.55          | - | 119.55 |  | 20    | 0.49 | 4045 | 99.09   |
|         |      |      |         | 119.55          | - | 120.55 |  | 14    | 0.34 | 4059 | 99.44   |
|         |      |      |         | 120.55          | - | 121.55 |  | 10    | 0.24 | 4069 | 99.68   |
|         |      |      |         | 121.55          | - | 122.55 |  | 7     | 0.17 | 4076 | 99.85   |
|         |      |      |         | 122.55          | - | 123.55 |  | 3     | 0.07 | 4079 | 99.93   |
|         |      |      |         | 123.55          | - | 124.55 |  | 1     | 0.02 | 4080 | 99.95   |
|         |      |      |         | 124.55          | - | 125.55 |  | 2     | 0.05 | 4082 | 100.00  |

## (53) INTERPUPILLARY BREADTH

The distance between the two pupils is measured with a pupillometer.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 5.35        | 2.11 | 1ST  | 5.60  | 2.20 |
| 5.40        | 2.13 | 2ND  | 5.70  | 2.24 |
| 5.45        | 2.15 | 3RD  | 5.75  | 2.26 |
| 5.55        | 2.19 | 5TH  | 5.85  | 2.30 |
| 5.70        | 2.24 | 10TH | 6.00  | 2.36 |
| 5.80        | 2.28 | 15TH | 6.05  | 2.38 |
| 5.85        | 2.30 | 20TH | 6.15  | 2.42 |
| 5.95        | 2.34 | 25TH | 6.15  | 2.42 |
| 6.00        | 2.36 | 30TH | 6.20  | 2.44 |
| 6.05        | 2.38 | 35TH | 6.25  | 2.46 |
| 6.10        | 2.40 | 40TH | 6.30  | 2.48 |
| 6.15        | 2.42 | 45TH | 6.35  | 2.50 |
| 6.20        | 2.44 | 50TH | 6.40  | 2.52 |
| 6.20        | 2.44 | 55TH | 6.45  | 2.54 |
| 6.25        | 2.46 | 60TH | 6.45  | 2.54 |
| 6.30        | 2.48 | 65TH | 6.50  | 2.56 |
| 6.35        | 2.50 | 70TH | 6.55  | 2.58 |
| 6.40        | 2.52 | 75TH | 6.60  | 2.60 |
| 6.45        | 2.54 | 80TH | 6.70  | 2.64 |
| 6.55        | 2.58 | 85TH | 6.75  | 2.66 |
| 6.65        | 2.62 | 90TH | 6.85  | 2.70 |
| 6.75        | 2.66 | 95TH | 7.00  | 2.76 |
| 6.85        | 2.70 | 97TH | 7.05  | 2.78 |
| 6.95        | 2.74 | 98TH | 7.15  | 2.81 |
| 7.05        | 2.78 | 99TH | 7.25  | 2.85 |

## (53) INTERPUPILLARY BREADTH

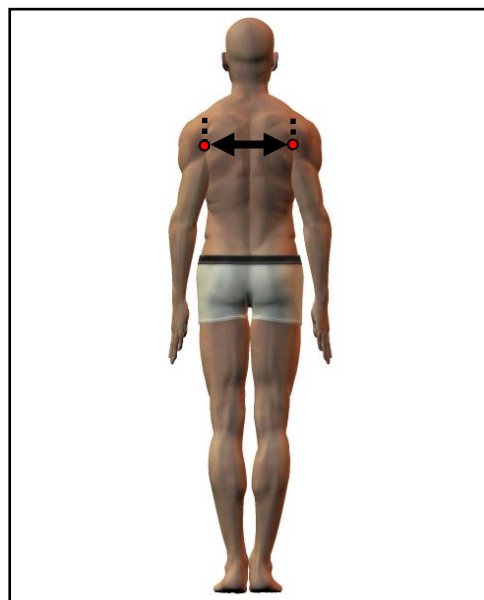
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 6.17                     | MEAN                | 2.43 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.36                     | STANDARD DEVIATION  | 0.14 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 5.10                     | MINIMUM             | 2.01 |
| 7.45                     | MAXIMUM             | 2.93 |
| SKEWNESS                 |                     | 0.01 |
| KURTOSIS                 |                     | 3.00 |
| COEFFICIENT OF VARIATION |                     | 5.9% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 6.40                     | MEAN                | 2.52 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.34                     | STANDARD DEVIATION  | 0.14 |
| 0.00                     | STD ERROR (STD DEV) | 0.00 |
| 5.30                     | MINIMUM             | 2.09 |
| 7.70                     | MAXIMUM             | 3.03 |
| SKEWNESS                 |                     | 0.14 |
| KURTOSIS                 |                     | 3.30 |
| COEFFICIENT OF VARIATION |                     | 5.3% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |       |      |         |      |   |       |      |       |         |        |  |
|-----------------|-------|------|---------|------|---|-------|------|-------|---------|--------|--|
| FEMALES         |       |      |         |      |   | MALES |      |       |         |        |  |
| F               | FPct  | CumF | CumFPct | CM   |   | F     | FPct | CumF  | CumFPct |        |  |
| 1               | 0.05  | 1    | 0.05    | 5.05 | - | 5.15  |      |       |         |        |  |
| 5               | 0.25  | 6    | 0.30    | 5.15 | - | 5.25  |      |       |         |        |  |
| 6               | 0.30  | 12   | 0.60    | 5.25 | - | 5.35  | 3    | 0.07  | 3       | 0.07   |  |
| 33              | 1.66  | 45   | 2.27    | 5.35 | - | 5.45  | 6    | 0.15  | 9       | 0.22   |  |
| 33              | 1.66  | 78   | 3.93    | 5.45 | - | 5.55  | 15   | 0.37  | 24      | 0.59   |  |
| 62              | 3.12  | 140  | 7.05    | 5.55 | - | 5.65  | 31   | 0.76  | 55      | 1.35   |  |
| 83              | 4.18  | 223  | 11.23   | 5.65 | - | 5.75  | 36   | 0.88  | 91      | 2.23   |  |
| 106             | 5.34  | 329  | 16.57   | 5.75 | - | 5.85  | 81   | 1.98  | 172     | 4.21   |  |
| 151             | 7.60  | 480  | 24.17   | 5.85 | - | 5.95  | 118  | 2.89  | 290     | 7.10   |  |
| 198             | 9.97  | 678  | 34.14   | 5.95 | - | 6.05  | 209  | 5.12  | 499     | 12.22  |  |
| 193             | 9.72  | 871  | 43.86   | 6.05 | - | 6.15  | 309  | 7.57  | 808     | 19.79  |  |
| 243             | 12.24 | 1114 | 56.09   | 6.15 | - | 6.25  | 442  | 10.83 | 1250    | 30.62  |  |
| 208             | 10.47 | 1322 | 66.57   | 6.25 | - | 6.35  | 448  | 10.98 | 1698    | 41.60  |  |
| 191             | 9.62  | 1513 | 76.18   | 6.35 | - | 6.45  | 512  | 12.54 | 2210    | 54.14  |  |
| 160             | 8.06  | 1673 | 84.24   | 6.45 | - | 6.55  | 478  | 11.71 | 2688    | 65.85  |  |
| 112             | 5.64  | 1785 | 89.88   | 6.55 | - | 6.65  | 393  | 9.63  | 3081    | 75.48  |  |
| 80              | 4.03  | 1865 | 93.91   | 6.65 | - | 6.75  | 324  | 7.94  | 3405    | 83.41  |  |
| 51              | 2.57  | 1916 | 96.48   | 6.75 | - | 6.85  | 250  | 6.12  | 3655    | 89.54  |  |
| 28              | 1.41  | 1944 | 97.89   | 6.85 | - | 6.95  | 143  | 3.50  | 3798    | 93.04  |  |
| 21              | 1.06  | 1965 | 98.94   | 6.95 | - | 7.05  | 123  | 3.01  | 3921    | 96.06  |  |
| 12              | 0.60  | 1977 | 99.55   | 7.05 | - | 7.15  | 74   | 1.81  | 3995    | 97.87  |  |
| 5               | 0.25  | 1982 | 99.80   | 7.15 | - | 7.25  | 36   | 0.88  | 4031    | 98.75  |  |
| 3               | 0.15  | 1985 | 99.95   | 7.25 | - | 7.35  | 25   | 0.61  | 4056    | 99.36  |  |
| 0               | 0.00  | 1985 | 99.95   | 7.35 | - | 7.45  | 13   | 0.32  | 4069    | 99.68  |  |
| 1               | 0.05  | 1986 | 100.00  | 7.45 | - | 7.55  | 6    | 0.15  | 4075    | 99.83  |  |
|                 |       |      |         | 7.55 | - | 7.65  | 4    | 0.10  | 4079    | 99.93  |  |
|                 |       |      |         | 7.65 | - | 7.75  | 3    | 0.07  | 4082    | 100.00 |  |

## (54) INTERSCYE I

The distance across the back between the right and left posterior axillary fold landmarks is measured with a tape. The tape is held on the skin surface except where the tape spans the hollow of the back. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 30.60       | 12.05 | 1ST  | 35.20 | 13.86 |
| 31.50       | 12.40 | 2ND  | 36.20 | 14.25 |
| 32.00       | 12.60 | 3RD  | 36.70 | 14.45 |
| 32.60       | 12.83 | 5TH  | 37.40 | 14.72 |
| 33.50       | 13.19 | 10TH | 38.60 | 15.20 |
| 34.20       | 13.46 | 15TH | 39.40 | 15.51 |
| 34.80       | 13.70 | 20TH | 40.00 | 15.75 |
| 35.20       | 13.86 | 25TH | 40.60 | 15.98 |
| 35.60       | 14.02 | 30TH | 41.10 | 16.18 |
| 36.10       | 14.21 | 35TH | 41.60 | 16.38 |
| 36.50       | 14.37 | 40TH | 42.10 | 16.57 |
| 37.00       | 14.57 | 45TH | 42.50 | 16.73 |
| 37.30       | 14.69 | 50TH | 43.00 | 16.93 |
| 37.70       | 14.84 | 55TH | 43.50 | 17.13 |
| 38.00       | 14.96 | 60TH | 44.00 | 17.32 |
| 38.50       | 15.16 | 65TH | 44.40 | 17.48 |
| 39.00       | 15.35 | 70TH | 45.00 | 17.72 |
| 39.30       | 15.47 | 75TH | 45.50 | 17.91 |
| 39.80       | 15.67 | 80TH | 46.00 | 18.11 |
| 40.30       | 15.87 | 85TH | 46.70 | 18.39 |
| 41.10       | 16.18 | 90TH | 47.60 | 18.74 |
| 42.30       | 16.65 | 95TH | 49.10 | 19.33 |
| 43.10       | 16.97 | 97TH | 50.00 | 19.69 |
| 43.90       | 17.28 | 98TH | 50.60 | 19.92 |
| 44.60       | 17.56 | 99TH | 51.50 | 20.28 |

(54) INTERSCYE I

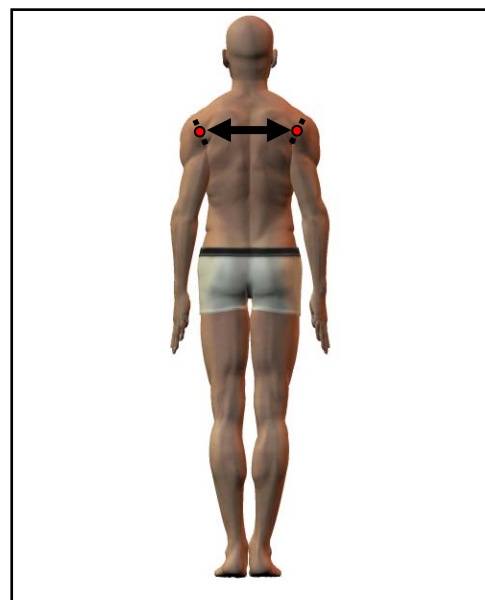
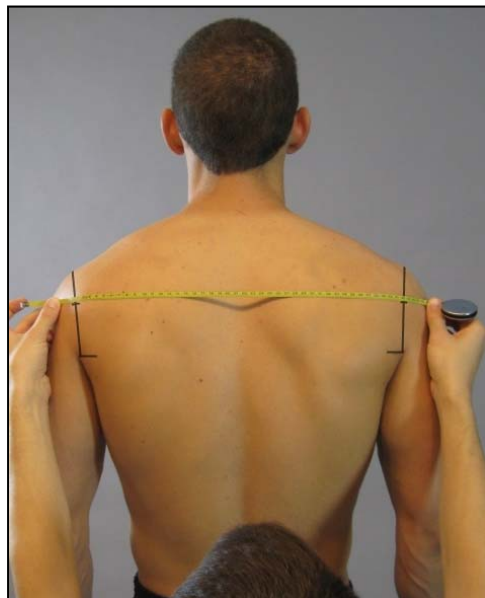
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 37.34                    |                     | 14.70 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 2.98                     | STANDARD DEVIATION  | 1.17  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 27.00                    | MINIMUM             | 10.63 |
| 48.10                    | MAXIMUM             | 18.94 |
| SKEWNESS                 |                     | 0.13  |
| KURTOSIS                 |                     | 3.04  |
| COEFFICIENT OF VARIATION |                     | 8.0%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 43.09                    |                     | 16.96 |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 3.52                     | STANDARD DEVIATION  | 1.39  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 32.80                    | MINIMUM             | 12.91 |
| 56.20                    | MAXIMUM             | 22.13 |
| SKEWNESS                 |                     | 0.14  |
| KURTOSIS                 |                     | 2.93  |
| COEFFICIENT OF VARIATION |                     | 8.2%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 26.75           | - | 27.50 |  |       |      |      |         |
| 1       | 0.05  | 2    | 0.10    | 27.50           | - | 28.25 |  |       |      |      |         |
| 1       | 0.05  | 3    | 0.15    | 28.25           | - | 29.00 |  |       |      |      |         |
| 5       | 0.25  | 8    | 0.40    | 29.00           | - | 29.75 |  |       |      |      |         |
| 6       | 0.30  | 14   | 0.70    | 29.75           | - | 30.50 |  |       |      |      |         |
| 21      | 1.06  | 35   | 1.76    | 30.50           | - | 31.25 |  |       |      |      |         |
| 16      | 0.81  | 51   | 2.57    | 31.25           | - | 32.00 |  |       |      |      |         |
| 53      | 2.67  | 104  | 5.24    | 32.00           | - | 32.75 |  |       |      |      |         |
| 72      | 3.63  | 176  | 8.86    | 32.75           | - | 33.50 |  | 5     | 0.12 | 5    | 0.12    |
| 139     | 7.00  | 315  | 15.86   | 33.50           | - | 34.25 |  | 7     | 0.17 | 12   | 0.29    |
| 97      | 4.88  | 412  | 20.75   | 34.25           | - | 35.00 |  | 15    | 0.37 | 27   | 0.66    |
| 202     | 10.17 | 614  | 30.92   | 35.00           | - | 35.75 |  | 33    | 0.81 | 60   | 1.47    |
| 147     | 7.40  | 761  | 38.32   | 35.75           | - | 36.50 |  | 39    | 0.96 | 99   | 2.43    |
| 230     | 11.58 | 991  | 49.90   | 36.50           | - | 37.25 |  | 92    | 2.25 | 191  | 4.68    |
| 131     | 6.60  | 1122 | 56.50   | 37.25           | - | 38.00 |  | 81    | 1.98 | 272  | 6.66    |
| 245     | 12.34 | 1367 | 68.83   | 38.00           | - | 38.75 |  | 168   | 4.12 | 440  | 10.78   |
| 147     | 7.40  | 1514 | 76.23   | 38.75           | - | 39.50 |  | 173   | 4.24 | 613  | 15.02   |
| 168     | 8.46  | 1682 | 84.69   | 39.50           | - | 40.25 |  | 267   | 6.54 | 880  | 21.56   |
| 73      | 3.68  | 1755 | 88.37   | 40.25           | - | 41.00 |  | 239   | 5.85 | 1119 | 27.41   |
| 81      | 4.08  | 1836 | 92.45   | 41.00           | - | 41.75 |  | 355   | 8.70 | 1474 | 36.11   |
| 55      | 2.77  | 1891 | 95.22   | 41.75           | - | 42.50 |  | 303   | 7.42 | 1777 | 43.53   |
| 39      | 1.96  | 1930 | 97.18   | 42.50           | - | 43.25 |  | 378   | 9.26 | 2155 | 52.79   |
| 17      | 0.86  | 1947 | 98.04   | 43.25           | - | 44.00 |  | 265   | 6.49 | 2420 | 59.28   |
| 21      | 1.06  | 1968 | 99.09   | 44.00           | - | 44.75 |  | 378   | 9.26 | 2798 | 68.54   |
| 10      | 0.50  | 1978 | 99.60   | 44.75           | - | 45.50 |  | 259   | 6.34 | 3057 | 74.89   |
| 4       | 0.20  | 1982 | 99.80   | 45.50           | - | 46.25 |  | 287   | 7.03 | 3344 | 81.92   |
| 1       | 0.05  | 1983 | 99.85   | 46.25           | - | 47.00 |  | 170   | 4.16 | 3514 | 86.09   |
| 1       | 0.05  | 1984 | 99.90   | 47.00           | - | 47.75 |  | 178   | 4.36 | 3692 | 90.45   |
| 2       | 0.10  | 1986 | 100.00  | 47.75           | - | 48.50 |  | 119   | 2.92 | 3811 | 93.36   |
|         |       |      |         | 48.50           | - | 49.25 |  | 80    | 1.96 | 3891 | 95.32   |
|         |       |      |         | 49.25           | - | 50.00 |  | 57    | 1.40 | 3948 | 96.72   |
|         |       |      |         | 50.00           | - | 50.75 |  | 61    | 1.49 | 4009 | 98.21   |
|         |       |      |         | 50.75           | - | 51.50 |  | 28    | 0.69 | 4037 | 98.90   |
|         |       |      |         | 51.50           | - | 52.25 |  | 21    | 0.51 | 4058 | 99.41   |
|         |       |      |         | 52.25           | - | 53.00 |  | 8     | 0.20 | 4066 | 99.61   |
|         |       |      |         | 53.00           | - | 53.75 |  | 10    | 0.24 | 4076 | 99.85   |
|         |       |      |         | 53.75           | - | 54.50 |  | 1     | 0.02 | 4077 | 99.88   |
|         |       |      |         | 54.50           | - | 55.25 |  | 3     | 0.07 | 4080 | 99.95   |
|         |       |      |         | 55.25           | - | 56.00 |  | 1     | 0.02 | 4081 | 99.98   |
|         |       |      |         | 56.00           | - | 56.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (55) INTERSCYE II

The distance across the back between the right and left midscye landmarks is measured with a tape. The tape is held on the skin surface except where it spans the hollow of the back. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 33.10       | 13.03 | 1ST  | 38.10 | 15.00 |
| 34.20       | 13.46 | 2ND  | 39.00 | 15.35 |
| 34.60       | 13.62 | 3RD  | 39.40 | 15.51 |
| 35.40       | 13.94 | 5TH  | 40.00 | 15.75 |
| 36.40       | 14.33 | 10TH | 41.10 | 16.18 |
| 37.00       | 14.57 | 15TH | 42.00 | 16.54 |
| 37.50       | 14.76 | 20TH | 42.40 | 16.69 |
| 37.90       | 14.92 | 25TH | 43.00 | 16.93 |
| 38.20       | 15.04 | 30TH | 43.50 | 17.13 |
| 38.60       | 15.20 | 35TH | 43.90 | 17.28 |
| 39.00       | 15.35 | 40TH | 44.30 | 17.44 |
| 39.20       | 15.43 | 45TH | 44.60 | 17.56 |
| 39.60       | 15.59 | 50TH | 45.00 | 17.72 |
| 40.00       | 15.75 | 55TH | 45.40 | 17.87 |
| 40.20       | 15.83 | 60TH | 45.70 | 17.99 |
| 40.60       | 15.98 | 65TH | 46.20 | 18.19 |
| 41.00       | 16.14 | 70TH | 46.60 | 18.35 |
| 41.20       | 16.22 | 75TH | 47.10 | 18.54 |
| 41.60       | 16.38 | 80TH | 47.50 | 18.70 |
| 42.10       | 16.57 | 85TH | 48.10 | 18.94 |
| 42.70       | 16.81 | 90TH | 49.00 | 19.29 |
| 43.80       | 17.24 | 95TH | 50.10 | 19.72 |
| 44.40       | 17.48 | 97TH | 50.80 | 20.00 |
| 45.00       | 17.72 | 98TH | 51.40 | 20.24 |
| 45.80       | 18.03 | 99TH | 52.40 | 20.63 |

## (55) INTERSCYE II

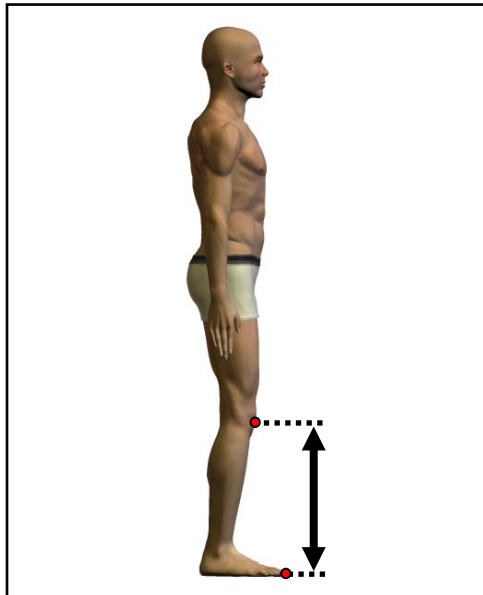
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 39.57                    |                     | 15.58 |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 2.57                     | STANDARD DEVIATION  | 1.01  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 30.60                    | MINIMUM             | 12.05 |
| 49.30                    | MAXIMUM             | 19.41 |
| SKEWNESS                 |                     | -0.02 |
| KURTOSIS                 |                     | 3.27  |
| COEFFICIENT OF VARIATION |                     | 6.5%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 45.02                    |                     | 17.72 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 3.05                     | STANDARD DEVIATION  | 1.20  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 34.50                    | MINIMUM             | 13.58 |
| 57.70                    | MAXIMUM             | 22.72 |
| SKEWNESS                 |                     | 0.06  |
| KURTOSIS                 |                     | 3.02  |
| COEFFICIENT OF VARIATION |                     | 6.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |       |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 30.25           | - | 31.00 |  |       |       |      |         |
| 3       | 0.15  | 4    | 0.20    | 31.00           | - | 31.75 |  |       |       |      |         |
| 5       | 0.25  | 9    | 0.45    | 31.75           | - | 32.50 |  |       |       |      |         |
| 15      | 0.76  | 24   | 1.21    | 32.50           | - | 33.25 |  |       |       |      |         |
| 7       | 0.35  | 31   | 1.56    | 33.25           | - | 34.00 |  |       |       |      |         |
| 32      | 1.61  | 63   | 3.17    | 34.00           | - | 34.75 |  | 1     | 0.02  | 1    | 0.02    |
| 38      | 1.91  | 101  | 5.09    | 34.75           | - | 35.50 |  | 3     | 0.07  | 4    | 0.10    |
| 79      | 3.98  | 180  | 9.06    | 35.50           | - | 36.25 |  | 3     | 0.07  | 7    | 0.17    |
| 88      | 4.43  | 268  | 13.49   | 36.25           | - | 37.00 |  | 1     | 0.02  | 8    | 0.20    |
| 206     | 10.37 | 474  | 23.87   | 37.00           | - | 37.75 |  | 22    | 0.54  | 30   | 0.73    |
| 158     | 7.96  | 632  | 31.82   | 37.75           | - | 38.50 |  | 23    | 0.56  | 53   | 1.30    |
| 270     | 13.60 | 902  | 45.42   | 38.50           | - | 39.25 |  | 61    | 1.49  | 114  | 2.79    |
| 179     | 9.01  | 1081 | 54.43   | 39.25           | - | 40.00 |  | 71    | 1.74  | 185  | 4.53    |
| 253     | 12.74 | 1334 | 67.17   | 40.00           | - | 40.75 |  | 134   | 3.28  | 319  | 7.81    |
| 192     | 9.67  | 1526 | 76.84   | 40.75           | - | 41.50 |  | 180   | 4.41  | 499  | 12.22   |
| 196     | 9.87  | 1722 | 86.71   | 41.50           | - | 42.25 |  | 262   | 6.42  | 761  | 18.64   |
| 79      | 3.98  | 1801 | 90.68   | 42.25           | - | 43.00 |  | 232   | 5.68  | 993  | 24.33   |
| 85      | 4.28  | 1886 | 94.96   | 43.00           | - | 43.75 |  | 396   | 9.70  | 1389 | 34.03   |
| 42      | 2.11  | 1928 | 97.08   | 43.75           | - | 44.50 |  | 322   | 7.89  | 1711 | 41.92   |
| 28      | 1.41  | 1956 | 98.49   | 44.50           | - | 45.25 |  | 485   | 11.88 | 2196 | 53.80   |
| 12      | 0.60  | 1968 | 99.09   | 45.25           | - | 46.00 |  | 315   | 7.72  | 2511 | 61.51   |
| 12      | 0.60  | 1980 | 99.70   | 46.00           | - | 46.75 |  | 414   | 10.14 | 2925 | 71.66   |
| 2       | 0.10  | 1982 | 99.80   | 46.75           | - | 47.50 |  | 275   | 6.74  | 3200 | 78.39   |
| 2       | 0.10  | 1984 | 99.90   | 47.50           | - | 48.25 |  | 321   | 7.86  | 3521 | 86.26   |
| 1       | 0.05  | 1985 | 99.95   | 48.25           | - | 49.00 |  | 137   | 3.36  | 3658 | 89.61   |
| 1       | 0.05  | 1986 | 100.00  | 49.00           | - | 49.75 |  | 180   | 4.41  | 3838 | 94.02   |
|         |       |      |         | 49.75           | - | 50.50 |  | 80    | 1.96  | 3918 | 95.98   |
|         |       |      |         | 50.50           | - | 51.25 |  | 69    | 1.69  | 3987 | 97.67   |
|         |       |      |         | 51.25           | - | 52.00 |  | 38    | 0.93  | 4025 | 98.60   |
|         |       |      |         | 52.00           | - | 52.75 |  | 31    | 0.76  | 4056 | 99.36   |
|         |       |      |         | 52.75           | - | 53.50 |  | 10    | 0.24  | 4066 | 99.61   |
|         |       |      |         | 53.50           | - | 54.25 |  | 9     | 0.22  | 4075 | 99.83   |
|         |       |      |         | 54.25           | - | 55.00 |  | 4     | 0.10  | 4079 | 99.93   |
|         |       |      |         | 55.00           | - | 55.75 |  | 2     | 0.05  | 4081 | 99.98   |
|         |       |      |         | 55.75           | - | 56.50 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 56.50           | - | 57.25 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 57.25           | - | 58.00 |  | 1     | 0.02  | 4082 | 100.00  |

## (56) KNEE HEIGHT, MIDPATELLA

The vertical distance between a standing surface and the midpatella landmark is measured with an anthropometer. The participant stands erect with the heels together and the weight distributed equally on both feet.

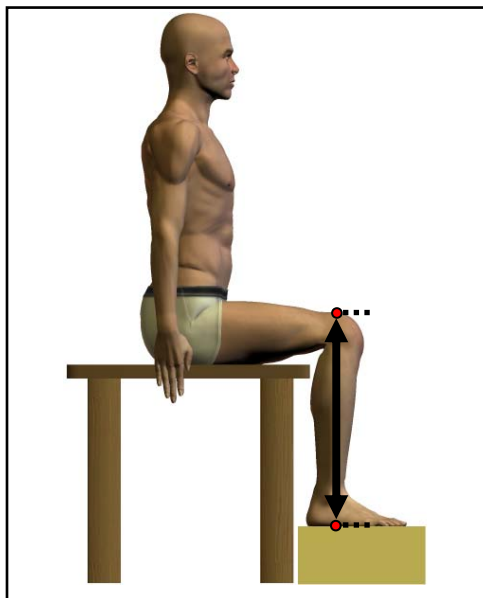


| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 39.00       | 15.35 | 1ST  | 42.80 | 16.85 |
| 39.60       | 15.59 | 2ND  | 43.40 | 17.09 |
| 40.20       | 15.83 | 3RD  | 43.80 | 17.24 |
| 40.80       | 16.06 | 5TH  | 44.30 | 17.44 |
| 41.70       | 16.42 | 10TH | 45.20 | 17.80 |
| 42.40       | 16.69 | 15TH | 46.00 | 18.11 |
| 42.80       | 16.85 | 20TH | 46.50 | 18.31 |
| 43.20       | 17.01 | 25TH | 46.90 | 18.46 |
| 43.50       | 17.13 | 30TH | 47.30 | 18.62 |
| 43.80       | 17.24 | 35TH | 47.70 | 18.78 |
| 44.20       | 17.40 | 40TH | 48.10 | 18.94 |
| 44.50       | 17.52 | 45TH | 48.40 | 19.06 |
| 44.80       | 17.64 | 50TH | 48.70 | 19.17 |
| 45.10       | 17.76 | 55TH | 49.10 | 19.33 |
| 45.40       | 17.87 | 60TH | 49.50 | 19.49 |
| 45.80       | 18.03 | 65TH | 49.80 | 19.61 |
| 46.20       | 18.19 | 70TH | 50.20 | 19.76 |
| 46.60       | 18.35 | 75TH | 50.70 | 19.96 |
| 47.10       | 18.54 | 80TH | 51.20 | 20.16 |
| 47.70       | 18.78 | 85TH | 51.70 | 20.35 |
| 48.20       | 18.98 | 90TH | 52.50 | 20.67 |
| 49.30       | 19.41 | 95TH | 53.60 | 21.10 |
| 49.90       | 19.65 | 97TH | 54.40 | 21.42 |
| 50.50       | 19.88 | 98TH | 55.00 | 21.65 |
| 51.40       | 20.24 | 99TH | 55.70 | 21.93 |



## (57) KNEE HEIGHT, SITTING

The vertical distance between a footrest surface and the suprapatella landmark is measured with an anthropometer. The participant sits with the thighs parallel, the knees flexed 90°, and the feet in line with the thighs.

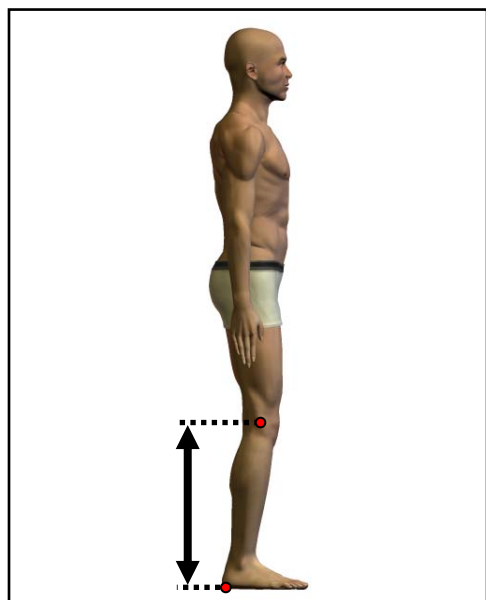


| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 45.10       | 17.76 | 1ST  | 49.30 | 19.41 |
| 45.70       | 17.99 | 2ND  | 49.90 | 19.65 |
| 46.30       | 18.23 | 3RD  | 50.40 | 19.84 |
| 46.90       | 18.46 | 5TH  | 50.90 | 20.04 |
| 47.80       | 18.82 | 10TH | 51.80 | 20.39 |
| 48.50       | 19.09 | 15TH | 52.60 | 20.71 |
| 48.90       | 19.25 | 20TH | 53.10 | 20.91 |
| 49.30       | 19.41 | 25TH | 53.50 | 21.06 |
| 49.70       | 19.57 | 30TH | 54.00 | 21.26 |
| 50.00       | 19.69 | 35TH | 54.30 | 21.38 |
| 50.30       | 19.80 | 40TH | 54.70 | 21.54 |
| 50.70       | 19.96 | 45TH | 55.00 | 21.65 |
| 51.00       | 20.08 | 50TH | 55.30 | 21.77 |
| 51.30       | 20.20 | 55TH | 55.70 | 21.93 |
| 51.70       | 20.35 | 60TH | 56.10 | 22.09 |
| 52.00       | 20.47 | 65TH | 56.40 | 22.20 |
| 52.40       | 20.63 | 70TH | 56.80 | 22.36 |
| 52.90       | 20.83 | 75TH | 57.20 | 22.52 |
| 53.40       | 21.02 | 80TH | 57.70 | 22.72 |
| 53.90       | 21.22 | 85TH | 58.30 | 22.95 |
| 54.70       | 21.54 | 90TH | 59.00 | 23.23 |
| 55.70       | 21.93 | 95TH | 60.20 | 23.70 |
| 56.60       | 22.28 | 97TH | 60.90 | 23.98 |
| 57.30       | 22.56 | 98TH | 61.50 | 24.21 |
| 58.00       | 22.83 | 99TH | 62.50 | 24.61 |



## (58) LATERAL FEMORAL EPICONDYLE HEIGHT

The vertical distance between a standing surface and the standing lateral femoral epicondyle landmark is measured with an anthropometer. The participant stands erect with the heels together and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 40.50       | 15.94 | 1ST  | 43.30 | 17.05 |
| 41.30       | 16.26 | 2ND  | 44.00 | 17.32 |
| 41.70       | 16.42 | 3RD  | 44.40 | 17.48 |
| 42.20       | 16.61 | 5TH  | 44.90 | 17.68 |
| 43.40       | 17.09 | 10TH | 45.80 | 18.03 |
| 43.90       | 17.28 | 15TH | 46.40 | 18.27 |
| 44.40       | 17.48 | 20TH | 46.90 | 18.46 |
| 44.70       | 17.60 | 25TH | 47.30 | 18.62 |
| 45.10       | 17.76 | 30TH | 47.70 | 18.78 |
| 45.50       | 17.91 | 35TH | 48.10 | 18.94 |
| 45.80       | 18.03 | 40TH | 48.40 | 19.06 |
| 46.20       | 18.19 | 45TH | 48.80 | 19.21 |
| 46.50       | 18.31 | 50TH | 49.10 | 19.33 |
| 46.90       | 18.46 | 55TH | 49.40 | 19.45 |
| 47.20       | 18.58 | 60TH | 49.80 | 19.61 |
| 47.50       | 18.70 | 65TH | 50.10 | 19.72 |
| 47.90       | 18.86 | 70TH | 50.50 | 19.88 |
| 48.30       | 19.02 | 75TH | 50.90 | 20.04 |
| 48.90       | 19.25 | 80TH | 51.40 | 20.24 |
| 49.40       | 19.45 | 85TH | 51.90 | 20.43 |
| 50.10       | 19.72 | 90TH | 52.60 | 20.71 |
| 51.10       | 20.12 | 95TH | 53.70 | 21.14 |
| 51.80       | 20.39 | 97TH | 54.30 | 21.38 |
| 52.30       | 20.59 | 98TH | 54.80 | 21.57 |
| 53.40       | 21.02 | 99TH | 55.70 | 21.93 |

## (58) LATERAL FEMORAL EPICONDYLE HEIGHT

| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 46.59                    | MEAN                | 18.34 |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 2.71                     | STANDARD DEVIATION  | 1.07  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 35.20                    | MINIMUM             | 13.86 |
| 58.00                    | MAXIMUM             | 22.83 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.37  |
| COEFFICIENT OF VARIATION |                     | 5.8%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 49.17                    | MEAN                | 19.36 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.66                     | STANDARD DEVIATION  | 1.05  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 40.70                    | MINIMUM             | 16.02 |
| 59.40                    | MAXIMUM             | 23.39 |
| SKEWNESS                 |                     | 0.16  |
| KURTOSIS                 |                     | 3.08  |
| COEFFICIENT OF VARIATION |                     | 5.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |       |   |       |  |       |      |      |         |
|-----------------|------|------|---------|-------|---|-------|--|-------|------|------|---------|
| FEMALES         |      |      |         |       |   |       |  | MALES |      |      |         |
| F               | FPct | CumF | CumFPct | CM    |   |       |  | F     | FPct | CumF | CumFPct |
| 1               | 0.05 | 1    | 0.05    | 34.75 | - | 35.25 |  |       |      |      |         |
| 0               | 0.00 | 1    | 0.05    | 35.25 | - | 35.75 |  |       |      |      |         |
| 0               | 0.00 | 1    | 0.05    | 35.75 | - | 36.25 |  |       |      |      |         |
| 0               | 0.00 | 1    | 0.05    | 36.25 | - | 36.75 |  |       |      |      |         |
| 2               | 0.10 | 3    | 0.15    | 36.75 | - | 37.25 |  |       |      |      |         |
| 1               | 0.05 | 4    | 0.20    | 37.25 | - | 37.75 |  |       |      |      |         |
| 1               | 0.05 | 5    | 0.25    | 37.75 | - | 38.25 |  |       |      |      |         |
| 1               | 0.05 | 6    | 0.30    | 38.25 | - | 38.75 |  |       |      |      |         |
| 0               | 0.00 | 6    | 0.30    | 38.75 | - | 39.25 |  |       |      |      |         |
| 6               | 0.30 | 12   | 0.60    | 39.25 | - | 39.75 |  |       |      |      |         |
| 6               | 0.30 | 18   | 0.91    | 39.75 | - | 40.25 |  |       |      |      |         |
| 7               | 0.35 | 25   | 1.26    | 40.25 | - | 40.75 |  | 1     | 0.02 | 1    | 0.02    |
| 14              | 0.70 | 39   | 1.96    | 40.75 | - | 41.25 |  | 2     | 0.05 | 3    | 0.07    |
| 24              | 1.21 | 63   | 3.17    | 41.25 | - | 41.75 |  | 5     | 0.12 | 8    | 0.20    |
| 40              | 2.01 | 103  | 5.19    | 41.75 | - | 42.25 |  | 6     | 0.15 | 14   | 0.34    |
| 41              | 2.06 | 144  | 7.25    | 42.25 | - | 42.75 |  | 7     | 0.17 | 21   | 0.51    |
| 43              | 2.17 | 187  | 9.42    | 42.75 | - | 43.25 |  | 15    | 0.37 | 36   | 0.88    |
| 74              | 3.73 | 261  | 13.14   | 43.25 | - | 43.75 |  | 25    | 0.61 | 61   | 1.49    |
| 113             | 5.69 | 374  | 18.83   | 43.75 | - | 44.25 |  | 46    | 1.13 | 107  | 2.62    |
| 132             | 6.65 | 506  | 25.48   | 44.25 | - | 44.75 |  | 72    | 1.76 | 179  | 4.39    |
| 118             | 5.94 | 624  | 31.42   | 44.75 | - | 45.25 |  | 100   | 2.45 | 279  | 6.83    |
| 146             | 7.35 | 770  | 38.77   | 45.25 | - | 45.75 |  | 114   | 2.79 | 393  | 9.63    |
| 128             | 6.45 | 898  | 45.22   | 45.75 | - | 46.25 |  | 170   | 4.16 | 563  | 13.79   |
| 160             | 8.06 | 1058 | 53.27   | 46.25 | - | 46.75 |  | 187   | 4.58 | 750  | 18.37   |
| 141             | 7.10 | 1199 | 60.37   | 46.75 | - | 47.25 |  | 231   | 5.66 | 981  | 24.03   |
| 147             | 7.40 | 1346 | 67.77   | 47.25 | - | 47.75 |  | 248   | 6.08 | 1229 | 30.11   |
| 121             | 6.09 | 1467 | 73.87   | 47.75 | - | 48.25 |  | 293   | 7.18 | 1522 | 37.29   |
| 97              | 4.88 | 1564 | 78.75   | 48.25 | - | 48.75 |  | 302   | 7.40 | 1824 | 44.68   |
| 95              | 4.78 | 1659 | 83.53   | 48.75 | - | 49.25 |  | 320   | 7.84 | 2144 | 52.52   |
| 73              | 3.68 | 1732 | 87.21   | 49.25 | - | 49.75 |  | 290   | 7.10 | 2434 | 59.63   |
| 77              | 3.88 | 1809 | 91.09   | 49.75 | - | 50.25 |  | 286   | 7.01 | 2720 | 66.63   |
| 52              | 2.62 | 1861 | 93.71   | 50.25 | - | 50.75 |  | 267   | 6.54 | 2987 | 73.17   |
| 35              | 1.76 | 1896 | 95.47   | 50.75 | - | 51.25 |  | 218   | 5.34 | 3205 | 78.52   |
| 29              | 1.46 | 1925 | 96.93   | 51.25 | - | 51.75 |  | 217   | 5.32 | 3422 | 83.83   |
| 20              | 1.01 | 1945 | 97.94   | 51.75 | - | 52.25 |  | 182   | 4.46 | 3604 | 88.29   |
| 14              | 0.70 | 1959 | 98.64   | 52.25 | - | 52.75 |  | 112   | 2.74 | 3716 | 91.03   |
| 6               | 0.30 | 1965 | 98.94   | 52.75 | - | 53.25 |  | 89    | 2.18 | 3805 | 93.21   |
| 8               | 0.40 | 1973 | 99.35   | 53.25 | - | 53.75 |  | 76    | 1.86 | 3881 | 95.08   |
| 5               | 0.25 | 1978 | 99.60   | 53.75 | - | 54.25 |  | 74    | 1.81 | 3955 | 96.89   |
| 4               | 0.20 | 1982 | 99.80   | 54.25 | - | 54.75 |  | 39    | 0.96 | 3994 | 97.84   |
| 1               | 0.05 | 1983 | 99.85   | 54.75 | - | 55.25 |  | 33    | 0.81 | 4027 | 98.65   |
| 1               | 0.05 | 1984 | 99.90   | 55.25 | - | 55.75 |  | 18    | 0.44 | 4045 | 99.09   |
| 0               | 0.00 | 1984 | 99.90   | 55.75 | - | 56.25 |  | 12    | 0.29 | 4057 | 99.39   |
| 1               | 0.05 | 1985 | 99.95   | 56.25 | - | 56.75 |  | 9     | 0.22 | 4066 | 99.61   |
| 0               | 0.00 | 1985 | 99.95   | 56.75 | - | 57.25 |  | 4     | 0.10 | 4070 | 99.71   |
| 0               | 0.00 | 1985 | 99.95   | 57.25 | - | 57.75 |  | 5     | 0.12 | 4075 | 99.83   |
| 1               | 0.05 | 1986 | 100.00  | 57.75 | - | 58.25 |  | 2     | 0.05 | 4077 | 99.88   |
|                 |      |      |         | 58.25 | - | 58.75 |  | 1     | 0.02 | 4078 | 99.90   |
|                 |      |      |         | 58.75 | - | 59.25 |  | 3     | 0.07 | 4081 | 99.98   |
|                 |      |      |         | 59.25 | - | 59.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (59) LATERAL MALLEOLUS HEIGHT

The vertical distance between a standing surface and the lateral malleolus landmark is measured with a modified height gauge. The participant stands erect with the heels together and the weight distributed equally on both feet.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 5.10        | 2.01 | 1ST  | 6.00  | 2.36 |
| 5.30        | 2.09 | 2ND  | 6.20  | 2.44 |
| 5.30        | 2.09 | 3RD  | 6.30  | 2.48 |
| 5.40        | 2.13 | 5TH  | 6.40  | 2.52 |
| 5.70        | 2.24 | 10TH | 6.60  | 2.60 |
| 5.70        | 2.24 | 15TH | 6.70  | 2.64 |
| 5.80        | 2.28 | 20TH | 6.80  | 2.68 |
| 5.90        | 2.32 | 25TH | 6.90  | 2.72 |
| 6.00        | 2.36 | 30TH | 7.00  | 2.76 |
| 6.10        | 2.40 | 35TH | 7.10  | 2.80 |
| 6.10        | 2.40 | 40TH | 7.10  | 2.80 |
| 6.20        | 2.44 | 45TH | 7.20  | 2.83 |
| 6.30        | 2.48 | 50TH | 7.30  | 2.87 |
| 6.30        | 2.48 | 55TH | 7.40  | 2.91 |
| 6.40        | 2.52 | 60TH | 7.40  | 2.91 |
| 6.50        | 2.56 | 65TH | 7.50  | 2.95 |
| 6.50        | 2.56 | 70TH | 7.60  | 2.99 |
| 6.60        | 2.60 | 75TH | 7.70  | 3.03 |
| 6.70        | 2.64 | 80TH | 7.70  | 3.03 |
| 6.80        | 2.68 | 85TH | 7.90  | 3.11 |
| 6.90        | 2.72 | 90TH | 8.00  | 3.15 |
| 7.10        | 2.80 | 95TH | 8.30  | 3.27 |
| 7.30        | 2.87 | 97TH | 8.40  | 3.31 |
| 7.30        | 2.87 | 98TH | 8.50  | 3.35 |
| 7.50        | 2.95 | 99TH | 8.70  | 3.43 |

## (59) LATERAL MALLEOLUS HEIGHT

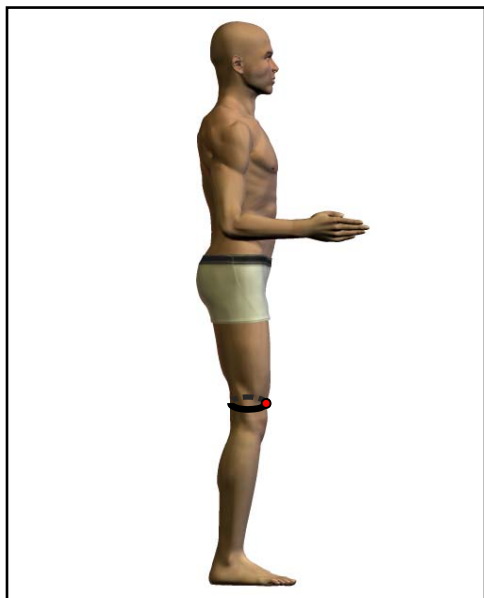
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 6.27                     | MEAN                | 2.47 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.51                     | STANDARD DEVIATION  | 0.20 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 4.30                     | MINIMUM             | 1.69 |
| 7.90                     | MAXIMUM             | 3.11 |
| SKEWNESS                 |                     | 0.01 |
| KURTOSIS                 |                     | 2.95 |
| COEFFICIENT OF VARIATION |                     | 8.1% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 7.29                     | MEAN                | 2.87 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.57                     | STANDARD DEVIATION  | 0.22 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 5.40                     | MINIMUM             | 2.13 |
| 9.30                     | MAXIMUM             | 3.66 |
| SKEWNESS                 |                     | 0.13 |
| KURTOSIS                 |                     | 3.03 |
| COEFFICIENT OF VARIATION |                     | 7.8% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FEMALES |      |      |         | FREQUENCY TABLE |   |      |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |      |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 4.25            | - | 4.35 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 4.35            | - | 4.45 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 4.45            | - | 4.55 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 4.55            | - | 4.65 |  |       |      |      |         |
| 2       | 0.10 | 3    | 0.15    | 4.65            | - | 4.75 |  |       |      |      |         |
| 1       | 0.05 | 4    | 0.20    | 4.75            | - | 4.85 |  |       |      |      |         |
| 5       | 0.25 | 9    | 0.45    | 4.85            | - | 4.95 |  |       |      |      |         |
| 5       | 0.25 | 14   | 0.70    | 4.95            | - | 5.05 |  |       |      |      |         |
| 10      | 0.50 | 24   | 1.21    | 5.05            | - | 5.15 |  |       |      |      |         |
| 13      | 0.65 | 37   | 1.86    | 5.15            | - | 5.25 |  |       |      |      |         |
| 35      | 1.76 | 72   | 3.63    | 5.25            | - | 5.35 |  |       |      |      |         |
| 33      | 1.66 | 105  | 5.29    | 5.35            | - | 5.45 |  | 1     | 0.02 | 1    | 0.02    |
| 46      | 2.32 | 151  | 7.60    | 5.45            | - | 5.55 |  | 3     | 0.07 | 4    | 0.10    |
| 46      | 2.32 | 197  | 9.92    | 5.55            | - | 5.65 |  | 0     | 0.00 | 4    | 0.10    |
| 118     | 5.94 | 315  | 15.86   | 5.65            | - | 5.75 |  | 3     | 0.07 | 7    | 0.17    |
| 96      | 4.83 | 411  | 20.69   | 5.75            | - | 5.85 |  | 9     | 0.22 | 16   | 0.39    |
| 125     | 6.29 | 536  | 26.99   | 5.85            | - | 5.95 |  | 16    | 0.39 | 32   | 0.78    |
| 158     | 7.96 | 694  | 34.94   | 5.95            | - | 6.05 |  | 23    | 0.56 | 55   | 1.35    |
| 101     | 5.09 | 795  | 40.03   | 6.05            | - | 6.15 |  | 23    | 0.56 | 78   | 1.91    |
| 141     | 7.10 | 936  | 47.13   | 6.15            | - | 6.25 |  | 41    | 1.00 | 119  | 2.92    |
| 170     | 8.56 | 1106 | 55.69   | 6.25            | - | 6.35 |  | 65    | 1.59 | 184  | 4.51    |
| 149     | 7.50 | 1255 | 63.19   | 6.35            | - | 6.45 |  | 74    | 1.81 | 258  | 6.32    |
| 144     | 7.25 | 1399 | 70.44   | 6.45            | - | 6.55 |  | 126   | 3.09 | 384  | 9.41    |
| 101     | 5.09 | 1500 | 75.53   | 6.55            | - | 6.65 |  | 94    | 2.30 | 478  | 11.71   |
| 147     | 7.40 | 1647 | 82.93   | 6.65            | - | 6.75 |  | 215   | 5.27 | 693  | 16.98   |
| 88      | 4.43 | 1735 | 87.36   | 6.75            | - | 6.85 |  | 216   | 5.29 | 909  | 22.27   |
| 70      | 3.52 | 1805 | 90.89   | 6.85            | - | 6.95 |  | 203   | 4.97 | 1112 | 27.24   |
| 63      | 3.17 | 1868 | 94.06   | 6.95            | - | 7.05 |  | 308   | 7.55 | 1420 | 34.79   |
| 28      | 1.41 | 1896 | 95.47   | 7.05            | - | 7.15 |  | 234   | 5.73 | 1654 | 40.52   |
| 30      | 1.51 | 1926 | 96.98   | 7.15            | - | 7.25 |  | 281   | 6.88 | 1935 | 47.40   |
| 25      | 1.26 | 1951 | 98.24   | 7.25            | - | 7.35 |  | 297   | 7.28 | 2232 | 54.68   |
| 11      | 0.55 | 1962 | 98.79   | 7.35            | - | 7.45 |  | 318   | 7.79 | 2550 | 62.47   |
| 12      | 0.60 | 1974 | 99.40   | 7.45            | - | 7.55 |  | 291   | 7.13 | 2841 | 69.60   |
| 3       | 0.15 | 1977 | 99.55   | 7.55            | - | 7.65 |  | 167   | 4.09 | 3008 | 73.69   |
| 7       | 0.35 | 1984 | 99.90   | 7.65            | - | 7.75 |  | 271   | 6.64 | 3279 | 80.33   |
| 0       | 0.00 | 1984 | 99.90   | 7.75            | - | 7.85 |  | 170   | 4.16 | 3449 | 84.49   |
| 2       | 0.10 | 1986 | 100.00  | 7.85            | - | 7.95 |  | 145   | 3.55 | 3594 | 88.05   |
|         |      |      |         | 7.95            | - | 8.05 |  | 116   | 2.84 | 3710 | 90.89   |
|         |      |      |         | 8.05            | - | 8.15 |  | 70    | 1.71 | 3780 | 92.60   |
|         |      |      |         | 8.15            | - | 8.25 |  | 84    | 2.06 | 3864 | 94.66   |
|         |      |      |         | 8.25            | - | 8.35 |  | 63    | 1.54 | 3927 | 96.20   |
|         |      |      |         | 8.35            | - | 8.45 |  | 49    | 1.20 | 3976 | 97.40   |
|         |      |      |         | 8.45            | - | 8.55 |  | 30    | 0.73 | 4006 | 98.14   |
|         |      |      |         | 8.55            | - | 8.65 |  | 26    | 0.64 | 4032 | 98.78   |
|         |      |      |         | 8.65            | - | 8.75 |  | 24    | 0.59 | 4056 | 99.36   |
|         |      |      |         | 8.75            | - | 8.85 |  | 11    | 0.27 | 4067 | 99.63   |
|         |      |      |         | 8.85            | - | 8.95 |  | 7     | 0.17 | 4074 | 99.80   |
|         |      |      |         | 8.95            | - | 9.05 |  | 6     | 0.15 | 4080 | 99.95   |
|         |      |      |         | 9.05            | - | 9.15 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 9.15            | - | 9.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 9.25            | - | 9.35 |  | 1     | 0.02 | 4082 | 100.00  |

## (60) LOWER THIGH CIRCUMFERENCE

The horizontal circumference of the right thigh at the level of the suprapatella landmark is measured with a tape. The participant stands erect with the feet about 10 cm apart and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 32.90       | 12.95 | 1ST  | 34.30 | 13.50 |
| 33.60       | 13.23 | 2ND  | 34.70 | 13.66 |
| 34.10       | 13.43 | 3RD  | 35.30 | 13.90 |
| 34.70       | 13.66 | 5TH  | 35.90 | 14.13 |
| 35.80       | 14.09 | 10TH | 37.00 | 14.57 |
| 36.60       | 14.41 | 15TH | 37.70 | 14.84 |
| 37.20       | 14.65 | 20TH | 38.20 | 15.04 |
| 37.70       | 14.84 | 25TH | 38.70 | 15.24 |
| 38.10       | 15.00 | 30TH | 39.20 | 15.43 |
| 38.60       | 15.20 | 35TH | 39.70 | 15.63 |
| 39.00       | 15.35 | 40TH | 40.10 | 15.79 |
| 39.40       | 15.51 | 45TH | 40.40 | 15.91 |
| 39.80       | 15.67 | 50TH | 40.80 | 16.06 |
| 40.30       | 15.87 | 55TH | 41.20 | 16.22 |
| 40.70       | 16.02 | 60TH | 41.70 | 16.42 |
| 41.10       | 16.18 | 65TH | 42.00 | 16.54 |
| 41.60       | 16.38 | 70TH | 42.40 | 16.69 |
| 42.20       | 16.61 | 75TH | 42.90 | 16.89 |
| 42.70       | 16.81 | 80TH | 43.50 | 17.13 |
| 43.50       | 17.13 | 85TH | 44.20 | 17.40 |
| 44.50       | 17.52 | 90TH | 45.00 | 17.72 |
| 46.50       | 18.31 | 95TH | 46.30 | 18.23 |
| 47.50       | 18.70 | 97TH | 47.40 | 18.66 |
| 48.10       | 18.94 | 98TH | 48.00 | 18.90 |
| 50.20       | 19.76 | 99TH | 49.30 | 19.41 |

## (60) LOWER THIGH CIRCUMFERENCE

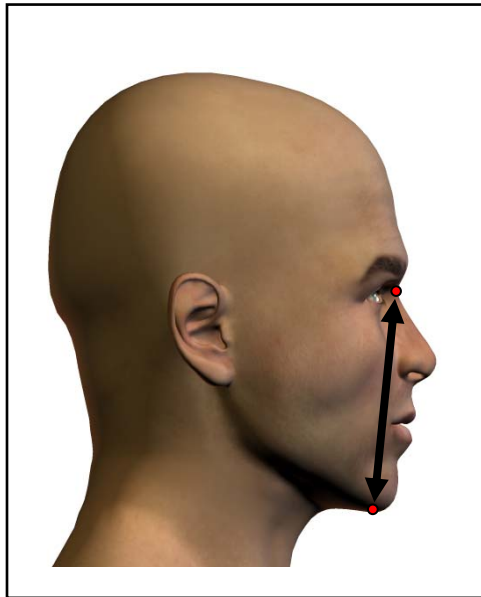
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 40.07                    |                     | 15.78 |
| 0.08                     | STD ERROR (MEAN)    | 0.03  |
| 3.52                     | STANDARD DEVIATION  | 1.38  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 30.20                    | MINIMUM             | 11.89 |
| 60.00                    | MAXIMUM             | 23.62 |
| SKEWNESS                 |                     | 0.55  |
| KURTOSIS                 |                     | 3.97  |
| COEFFICIENT OF VARIATION |                     | 8.8%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 40.93                    |                     | 16.11 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 3.19                     | STANDARD DEVIATION  | 1.25  |
| 0.04                     | STD ERROR (STD DEV) | 0.01  |
| 29.00                    | MINIMUM             | 11.42 |
| 54.00                    | MAXIMUM             | 21.26 |
| SKEWNESS                 |                     | 0.25  |
| KURTOSIS                 |                     | 3.24  |
| COEFFICIENT OF VARIATION |                     | 7.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | MALES         |     |       |      |
|---------|------|------|---------|---------------|-----|-------|------|
| F       | FPct | CumF | CumFPct | CM            | F   | FPct  | CumF |
| 1       | 0.05 | 1    | 0.05    | 28.75 - 29.50 | 1   | 0.02  | 1    |
| 0       | 0.00 | 1    | 0.05    | 29.50 - 30.25 | 1   | 0.02  | 2    |
| 4       | 0.20 | 5    | 0.25    | 30.25 - 31.00 | 0   | 0.00  | 2    |
| 8       | 0.40 | 13   | 0.65    | 31.00 - 31.75 | 3   | 0.07  | 5    |
| 14      | 0.70 | 27   | 1.36    | 31.75 - 32.50 | 2   | 0.05  | 7    |
| 25      | 1.26 | 52   | 2.62    | 32.50 - 33.25 | 13  | 0.32  | 20   |
| 53      | 2.67 | 105  | 5.29    | 33.25 - 34.00 | 12  | 0.29  | 32   |
| 53      | 2.67 | 158  | 7.96    | 34.00 - 34.75 | 52  | 1.27  | 84   |
| 99      | 4.98 | 257  | 12.94   | 34.75 - 35.50 | 61  | 1.49  | 145  |
| 91      | 4.58 | 348  | 17.52   | 35.50 - 36.25 | 113 | 2.77  | 258  |
| 168     | 8.46 | 516  | 25.98   | 36.25 - 37.00 | 150 | 3.67  | 408  |
| 149     | 7.50 | 665  | 33.48   | 37.00 - 37.75 | 250 | 6.12  | 658  |
| 172     | 8.66 | 837  | 42.15   | 37.75 - 38.50 | 252 | 6.17  | 910  |
| 183     | 9.21 | 1020 | 51.36   | 38.50 - 39.25 | 315 | 7.72  | 1225 |
| 191     | 9.62 | 1211 | 60.98   | 39.25 - 40.00 | 341 | 8.35  | 1566 |
| 148     | 7.45 | 1359 | 68.43   | 40.00 - 40.75 | 455 | 11.15 | 2021 |
| 152     | 7.65 | 1511 | 76.08   | 40.75 - 41.50 | 340 | 8.33  | 2361 |
| 97      | 4.88 | 1608 | 80.97   | 41.50 - 42.25 | 391 | 9.58  | 2752 |
| 110     | 5.54 | 1718 | 86.51   | 42.25 - 43.00 | 316 | 7.74  | 3068 |
| 68      | 3.42 | 1786 | 89.93   | 43.00 - 43.75 | 293 | 7.18  | 3361 |
| 53      | 2.67 | 1839 | 92.60   | 43.75 - 44.50 | 190 | 4.65  | 3551 |
| 32      | 1.61 | 1871 | 94.21   | 44.50 - 45.25 | 164 | 4.02  | 3715 |
| 31      | 1.56 | 1902 | 95.77   | 45.25 - 46.00 | 114 | 2.79  | 3829 |
| 23      | 1.16 | 1925 | 96.93   | 46.00 - 46.75 | 86  | 2.11  | 3915 |
| 24      | 1.21 | 1949 | 98.14   | 46.75 - 47.50 | 48  | 1.18  | 3963 |
| 7       | 0.35 | 1956 | 98.49   | 47.50 - 48.25 | 54  | 1.32  | 4017 |
| 7       | 0.35 | 1963 | 98.84   | 48.25 - 49.00 | 19  | 0.47  | 4036 |
| 6       | 0.30 | 1969 | 99.14   | 49.00 - 49.75 | 20  | 0.49  | 4056 |
| 7       | 0.35 | 1976 | 99.50   | 49.75 - 50.50 | 11  | 0.27  | 4067 |
| 4       | 0.20 | 1980 | 99.70   | 50.50 - 51.25 | 3   | 0.07  | 4070 |
| 2       | 0.10 | 1982 | 99.80   | 51.25 - 52.00 | 7   | 0.17  | 4077 |
| 1       | 0.05 | 1983 | 99.85   | 52.00 - 52.75 | 3   | 0.07  | 4080 |
| 2       | 0.10 | 1985 | 99.95   | 52.75 - 53.50 | 1   | 0.02  | 4081 |
| 0       | 0.00 | 1985 | 99.95   | 53.50 - 54.25 | 1   | 0.02  | 4082 |
| 0       | 0.00 | 1985 | 99.95   | 54.25 - 55.00 |     |       |      |
| 0       | 0.00 | 1985 | 99.95   | 55.00 - 55.75 |     |       |      |
| 0       | 0.00 | 1985 | 99.95   | 55.75 - 56.50 |     |       |      |
| 0       | 0.00 | 1985 | 99.95   | 56.50 - 57.25 |     |       |      |
| 0       | 0.00 | 1985 | 99.95   | 57.25 - 58.00 |     |       |      |
| 0       | 0.00 | 1985 | 99.95   | 58.00 - 58.75 |     |       |      |
| 0       | 0.00 | 1985 | 99.95   | 58.75 - 59.50 |     |       |      |
| 0       | 0.00 | 1985 | 99.95   | 59.50 - 60.25 |     |       |      |
| 0       | 0.00 | 1985 | 99.95   | 59.75 - 60.75 |     |       |      |
| 1       | 0.05 | 1986 | 100.00  |               |     |       |      |

## (61) MENTON-SELLION LENGTH

The distance between the menton landmark and the sellion landmark is measured with a sliding caliper. The teeth are lightly occluded.

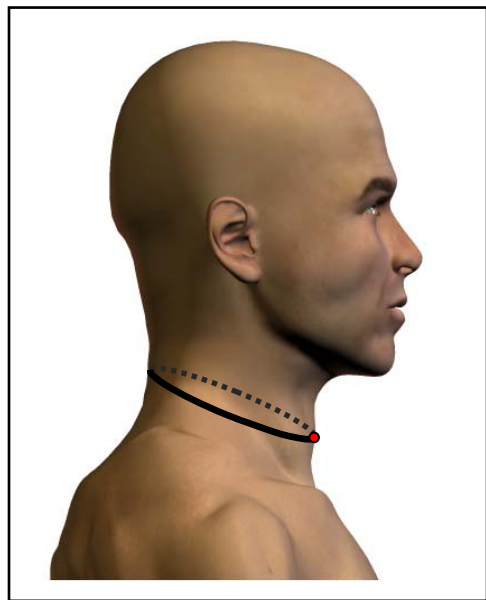


| PERCENTILES |           |      |           |           |
|-------------|-----------|------|-----------|-----------|
| FEMALES     |           |      | MALES     |           |
| <u>CM</u>   | <u>IN</u> |      | <u>CM</u> | <u>IN</u> |
| 10.00       | 3.94      | 1ST  | 10.70     | 4.21      |
| 10.10       | 3.98      | 2ND  | 10.90     | 4.29      |
| 10.20       | 4.02      | 3RD  | 11.00     | 4.33      |
| 10.40       | 4.09      | 5TH  | 11.20     | 4.41      |
| 10.50       | 4.13      | 10TH | 11.40     | 4.49      |
| 10.70       | 4.21      | 15TH | 11.60     | 4.57      |
| 10.80       | 4.25      | 20TH | 11.70     | 4.61      |
| 10.90       | 4.29      | 25TH | 11.80     | 4.65      |
| 11.00       | 4.33      | 30TH | 11.90     | 4.69      |
| 11.10       | 4.37      | 35TH | 12.00     | 4.72      |
| 11.10       | 4.37      | 40TH | 12.10     | 4.76      |
| 11.20       | 4.41      | 45TH | 12.20     | 4.80      |
| 11.30       | 4.45      | 50TH | 12.30     | 4.84      |
| 11.40       | 4.49      | 55TH | 12.30     | 4.84      |
| 11.50       | 4.53      | 60TH | 12.40     | 4.88      |
| 11.50       | 4.53      | 65TH | 12.50     | 4.92      |
| 11.60       | 4.57      | 70TH | 12.60     | 4.96      |
| 11.70       | 4.61      | 75TH | 12.70     | 5.00      |
| 11.80       | 4.65      | 80TH | 12.80     | 5.04      |
| 11.90       | 4.69      | 85TH | 13.00     | 5.12      |
| 12.10       | 4.76      | 90TH | 13.10     | 5.16      |
| 12.30       | 4.84      | 95TH | 13.40     | 5.28      |
| 12.50       | 4.92      | 97TH | 13.50     | 5.31      |
| 12.60       | 4.96      | 98TH | 13.70     | 5.39      |
| 12.80       | 5.04      | 99TH | 13.80     | 5.43      |



## (62) NECK CIRCUMFERENCE

The circumference of the neck at the level of the infrathyroid landmark (Adam's apple) is measured with a tape. The plane of the measurement is perpendicular to the long axis of the neck. The participant stands erect with the head in the Frankfurt plane. The shoulders and upper extremities are relaxed.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 29.10       | 11.46 | 1ST  | 34.60 | 13.62 |
| 29.60       | 11.65 | 2ND  | 35.20 | 13.86 |
| 29.90       | 11.77 | 3RD  | 35.50 | 13.98 |
| 30.20       | 11.89 | 5TH  | 36.00 | 14.17 |
| 30.70       | 12.09 | 10TH | 36.70 | 14.45 |
| 31.00       | 12.20 | 15TH | 37.20 | 14.65 |
| 31.30       | 12.32 | 20TH | 37.50 | 14.76 |
| 31.60       | 12.44 | 25TH | 37.90 | 14.92 |
| 31.90       | 12.56 | 30TH | 38.30 | 15.08 |
| 32.10       | 12.64 | 35TH | 38.60 | 15.20 |
| 32.40       | 12.76 | 40TH | 38.90 | 15.31 |
| 32.60       | 12.83 | 45TH | 39.20 | 15.43 |
| 32.80       | 12.91 | 50TH | 39.50 | 15.55 |
| 33.00       | 12.99 | 55TH | 39.90 | 15.71 |
| 33.30       | 13.11 | 60TH | 40.20 | 15.83 |
| 33.60       | 13.23 | 65TH | 40.50 | 15.94 |
| 33.80       | 13.31 | 70TH | 41.00 | 16.14 |
| 34.20       | 13.46 | 75TH | 41.40 | 16.30 |
| 34.50       | 13.58 | 80TH | 41.80 | 16.46 |
| 35.00       | 13.78 | 85TH | 42.40 | 16.69 |
| 35.50       | 13.98 | 90TH | 43.20 | 17.01 |
| 36.30       | 14.29 | 95TH | 44.30 | 17.44 |
| 36.90       | 14.53 | 97TH | 45.10 | 17.76 |
| 37.50       | 14.76 | 98TH | 45.80 | 18.03 |
| 38.50       | 15.16 | 99TH | 46.80 | 18.43 |

## (62) NECK CIRCUMFERENCE

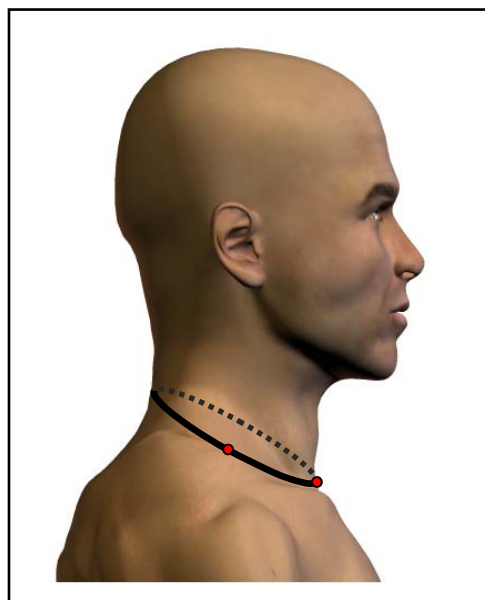
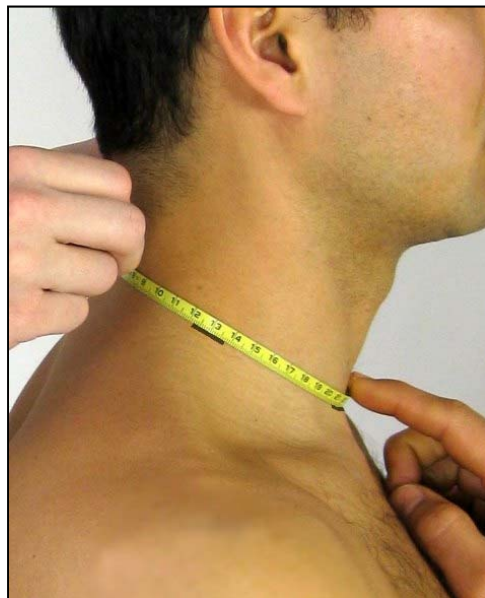
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 32.98                    |                     | 12.98 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 1.92                     | STANDARD DEVIATION  | 0.76  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 27.50                    | MINIMUM             | 10.83 |
| 42.40                    | MAXIMUM             | 16.69 |
| SKEWNESS                 |                     | 0.58  |
| KURTOSIS                 |                     | 3.79  |
| COEFFICIENT OF VARIATION |                     | 5.8%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 39.76                    |                     | 15.66 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.58                     | STANDARD DEVIATION  | 1.01  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 31.10                    | MINIMUM             | 12.24 |
| 51.40                    | MAXIMUM             | 20.24 |
| SKEWNESS                 |                     | 0.48  |
| KURTOSIS                 |                     | 3.38  |
| COEFFICIENT OF VARIATION |                     | 6.5%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 27.25           | - | 27.75 |  |       |      |      |         |
| 4       | 0.20  | 5    | 0.25    | 27.75           | - | 28.25 |  |       |      |      |         |
| 4       | 0.20  | 9    | 0.45    | 28.25           | - | 28.75 |  |       |      |      |         |
| 15      | 0.76  | 24   | 1.21    | 28.75           | - | 29.25 |  |       |      |      |         |
| 28      | 1.41  | 52   | 2.62    | 29.25           | - | 29.75 |  |       |      |      |         |
| 52      | 2.62  | 104  | 5.24    | 29.75           | - | 30.25 |  |       |      |      |         |
| 103     | 5.19  | 207  | 10.42   | 30.25           | - | 30.75 |  |       |      |      |         |
| 168     | 8.46  | 375  | 18.88   | 30.75           | - | 31.25 |  | 1     | 0.02 | 1    | 0.02    |
| 179     | 9.01  | 554  | 27.90   | 31.25           | - | 31.75 |  | 0     | 0.00 | 1    | 0.02    |
| 203     | 10.22 | 757  | 38.12   | 31.75           | - | 32.25 |  | 0     | 0.00 | 1    | 0.02    |
| 220     | 11.08 | 977  | 49.19   | 32.25           | - | 32.75 |  | 2     | 0.05 | 3    | 0.07    |
| 192     | 9.67  | 1169 | 58.86   | 32.75           | - | 33.25 |  | 5     | 0.12 | 8    | 0.20    |
| 188     | 9.47  | 1357 | 68.33   | 33.25           | - | 33.75 |  | 4     | 0.10 | 12   | 0.29    |
| 171     | 8.61  | 1528 | 76.94   | 33.75           | - | 34.25 |  | 11    | 0.27 | 23   | 0.56    |
| 118     | 5.94  | 1646 | 82.88   | 34.25           | - | 34.75 |  | 24    | 0.59 | 47   | 1.15    |
| 95      | 4.78  | 1741 | 87.66   | 34.75           | - | 35.25 |  | 47    | 1.15 | 94   | 2.30    |
| 90      | 4.53  | 1831 | 92.20   | 35.25           | - | 35.75 |  | 68    | 1.67 | 162  | 3.97    |
| 51      | 2.57  | 1882 | 94.76   | 35.75           | - | 36.25 |  | 106   | 2.60 | 268  | 6.57    |
| 35      | 1.76  | 1917 | 96.53   | 36.25           | - | 36.75 |  | 183   | 4.48 | 451  | 11.05   |
| 25      | 1.26  | 1942 | 97.78   | 36.75           | - | 37.25 |  | 214   | 5.24 | 665  | 16.29   |
| 8       | 0.40  | 1950 | 98.19   | 37.25           | - | 37.75 |  | 256   | 6.27 | 921  | 22.56   |
| 13      | 0.65  | 1963 | 98.84   | 37.75           | - | 38.25 |  | 287   | 7.03 | 1208 | 29.59   |
| 7       | 0.35  | 1970 | 99.19   | 38.25           | - | 38.75 |  | 330   | 8.08 | 1538 | 37.68   |
| 8       | 0.40  | 1978 | 99.60   | 38.75           | - | 39.25 |  | 299   | 7.32 | 1837 | 45.00   |
| 1       | 0.05  | 1979 | 99.65   | 39.25           | - | 39.75 |  | 329   | 8.06 | 2166 | 53.06   |
| 2       | 0.10  | 1981 | 99.75   | 39.75           | - | 40.25 |  | 314   | 7.69 | 2480 | 60.75   |
| 2       | 0.10  | 1983 | 99.85   | 40.25           | - | 40.75 |  | 284   | 6.96 | 2764 | 67.71   |
| 2       | 0.10  | 1985 | 99.95   | 40.75           | - | 41.25 |  | 258   | 6.32 | 3022 | 74.03   |
| 0       | 0.00  | 1985 | 99.95   | 41.25           | - | 41.75 |  | 230   | 5.63 | 3252 | 79.67   |
| 0       | 0.00  | 1985 | 99.95   | 41.75           | - | 42.25 |  | 173   | 4.24 | 3425 | 83.90   |
| 1       | 0.05  | 1986 | 100.00  | 42.25           | - | 42.75 |  | 136   | 3.33 | 3561 | 87.24   |
|         |       |      |         | 42.75           | - | 43.25 |  | 118   | 2.89 | 3679 | 90.13   |
|         |       |      |         | 43.25           | - | 43.75 |  | 101   | 2.47 | 3780 | 92.60   |
|         |       |      |         | 43.75           | - | 44.25 |  | 95    | 2.33 | 3875 | 94.93   |
|         |       |      |         | 44.25           | - | 44.75 |  | 49    | 1.20 | 3924 | 96.13   |
|         |       |      |         | 44.75           | - | 45.25 |  | 48    | 1.18 | 3972 | 97.31   |
|         |       |      |         | 45.25           | - | 45.75 |  | 27    | 0.66 | 3999 | 97.97   |
|         |       |      |         | 45.75           | - | 46.25 |  | 19    | 0.47 | 4018 | 98.43   |
|         |       |      |         | 46.25           | - | 46.75 |  | 23    | 0.56 | 4041 | 99.00   |
|         |       |      |         | 46.75           | - | 47.25 |  | 17    | 0.42 | 4058 | 99.41   |
|         |       |      |         | 47.25           | - | 47.75 |  | 9     | 0.22 | 4067 | 99.63   |
|         |       |      |         | 47.75           | - | 48.25 |  | 3     | 0.07 | 4070 | 99.71   |
|         |       |      |         | 48.25           | - | 48.75 |  | 7     | 0.17 | 4077 | 99.88   |
|         |       |      |         | 48.75           | - | 49.25 |  | 1     | 0.02 | 4078 | 99.90   |
|         |       |      |         | 49.25           | - | 49.75 |  | 0     | 0.00 | 4078 | 99.90   |
|         |       |      |         | 49.75           | - | 50.25 |  | 2     | 0.05 | 4080 | 99.95   |
|         |       |      |         | 50.25           | - | 50.75 |  | 1     | 0.02 | 4081 | 99.98   |
|         |       |      |         | 50.75           | - | 51.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |       |      |         | 51.25           | - | 51.75 |  | 1     | 0.02 | 4082 | 100.00  |

### (63) NECK CIRCUMFERENCE, BASE

The circumference of the base of the neck is measured with a tape, passing over the drawn lateral and anterior neck landmarks. The participant stands erect with the head in the Frankfurt plane. The shoulders and upper extremities are relaxed.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 32.90       | 12.95 | 1ST  | 38.00 | 14.96 |
| 33.50       | 13.19 | 2ND  | 38.70 | 15.24 |
| 33.70       | 13.27 | 3RD  | 39.00 | 15.35 |
| 34.00       | 13.39 | 5TH  | 39.50 | 15.55 |
| 34.70       | 13.66 | 10TH | 40.30 | 15.87 |
| 35.10       | 13.82 | 15TH | 40.80 | 16.06 |
| 35.50       | 13.98 | 20TH | 41.30 | 16.26 |
| 35.80       | 14.09 | 25TH | 41.70 | 16.42 |
| 36.10       | 14.21 | 30TH | 42.10 | 16.57 |
| 36.30       | 14.29 | 35TH | 42.40 | 16.69 |
| 36.50       | 14.37 | 40TH | 42.70 | 16.81 |
| 36.80       | 14.49 | 45TH | 43.00 | 16.93 |
| 37.00       | 14.57 | 50TH | 43.30 | 17.05 |
| 37.30       | 14.69 | 55TH | 43.70 | 17.20 |
| 37.50       | 14.76 | 60TH | 44.00 | 17.32 |
| 37.70       | 14.84 | 65TH | 44.30 | 17.44 |
| 38.00       | 14.96 | 70TH | 44.70 | 17.60 |
| 38.30       | 15.08 | 75TH | 45.10 | 17.76 |
| 38.70       | 15.24 | 80TH | 45.50 | 17.91 |
| 39.10       | 15.39 | 85TH | 46.00 | 18.11 |
| 39.50       | 15.55 | 90TH | 46.80 | 18.43 |
| 40.50       | 15.94 | 95TH | 47.90 | 18.86 |
| 41.10       | 16.18 | 97TH | 48.70 | 19.17 |
| 41.50       | 16.34 | 98TH | 49.20 | 19.37 |
| 42.30       | 16.65 | 99TH | 50.20 | 19.76 |

## (63) NECK CIRCUMFERENCE, BASE

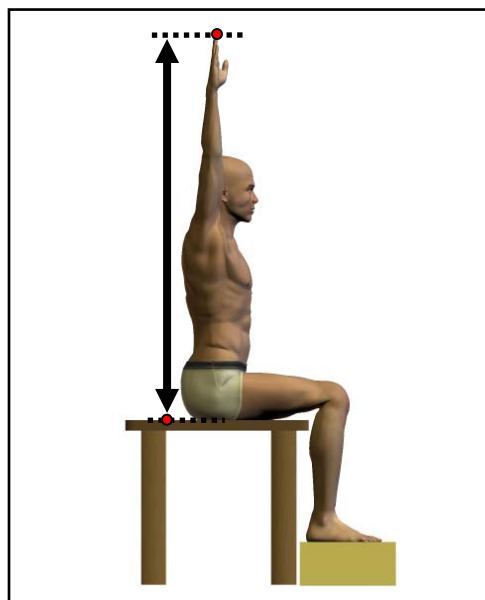
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 37.12                    | MEAN                | 14.61 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 1.97                     | STANDARD DEVIATION  | 0.77  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 30.20                    | MINIMUM             | 11.89 |
| 45.70                    | MAXIMUM             | 17.99 |
| SKEWNESS                 |                     | 0.39  |
| KURTOSIS                 |                     | 3.71  |
| COEFFICIENT OF VARIATION |                     | 5.3%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 43.46                    | MEAN                | 17.11 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.57                     | STANDARD DEVIATION  | 1.01  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 35.00                    | MINIMUM             | 13.78 |
| 54.50                    | MAXIMUM             | 21.46 |
| SKEWNESS                 |                     | 0.34  |
| KURTOSIS                 |                     | 3.25  |
| COEFFICIENT OF VARIATION |                     | 5.9%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |       |      |         |               |     |      |      |         |
|-----------------|-------|------|---------|---------------|-----|------|------|---------|
| FEMALES         |       |      |         | MALES         |     |      |      |         |
| F               | FPct  | CumF | CumFPct | CM            | F   | FPct | CumF | CumFPct |
| 1               | 0.05  | 1    | 0.05    | 29.75 - 30.25 |     |      |      |         |
| 0               | 0.00  | 1    | 0.05    | 30.25 - 30.75 |     |      |      |         |
| 1               | 0.05  | 2    | 0.10    | 30.75 - 31.25 |     |      |      |         |
| 0               | 0.00  | 2    | 0.10    | 31.25 - 31.75 |     |      |      |         |
| 3               | 0.15  | 5    | 0.25    | 31.75 - 32.25 |     |      |      |         |
| 10              | 0.50  | 15   | 0.76    | 32.25 - 32.75 |     |      |      |         |
| 16              | 0.81  | 31   | 1.56    | 32.75 - 33.25 |     |      |      |         |
| 33              | 1.66  | 64   | 3.22    | 33.25 - 33.75 |     |      |      |         |
| 71              | 3.58  | 135  | 6.80    | 33.75 - 34.25 |     |      |      |         |
| 71              | 3.58  | 206  | 10.37   | 34.25 - 34.75 |     |      |      |         |
| 128             | 6.45  | 334  | 16.82   | 34.75 - 35.25 | 1   | 0.02 | 1    | 0.02    |
| 147             | 7.40  | 481  | 24.22   | 35.25 - 35.75 | 1   | 0.02 | 2    | 0.05    |
| 185             | 9.32  | 666  | 33.53   | 35.75 - 36.25 | 1   | 0.02 | 3    | 0.07    |
| 209             | 10.52 | 875  | 44.06   | 36.25 - 36.75 | 5   | 0.12 | 8    | 0.20    |
| 213             | 10.73 | 1088 | 54.78   | 36.75 - 37.25 | 2   | 0.05 | 10   | 0.24    |
| 205             | 10.32 | 1293 | 65.11   | 37.25 - 37.75 | 13  | 0.32 | 23   | 0.56    |
| 191             | 9.62  | 1484 | 74.72   | 37.75 - 38.25 | 28  | 0.69 | 51   | 1.25    |
| 119             | 5.99  | 1603 | 80.72   | 38.25 - 38.75 | 39  | 0.96 | 90   | 2.20    |
| 128             | 6.45  | 1731 | 87.16   | 38.75 - 39.25 | 62  | 1.52 | 152  | 3.72    |
| 82              | 4.13  | 1813 | 91.29   | 39.25 - 39.75 | 105 | 2.57 | 257  | 6.30    |
| 52              | 2.62  | 1865 | 93.91   | 39.75 - 40.25 | 138 | 3.38 | 395  | 9.68    |
| 41              | 2.06  | 1906 | 95.97   | 40.25 - 40.75 | 197 | 4.83 | 592  | 14.50   |
| 31              | 1.56  | 1937 | 97.53   | 40.75 - 41.25 | 223 | 5.46 | 815  | 19.97   |
| 16              | 0.81  | 1953 | 98.34   | 41.25 - 41.75 | 231 | 5.66 | 1046 | 25.62   |
| 12              | 0.60  | 1965 | 98.94   | 41.75 - 42.25 | 305 | 7.47 | 1351 | 33.10   |
| 8               | 0.40  | 1973 | 99.35   | 42.25 - 42.75 | 339 | 8.30 | 1690 | 41.40   |
| 3               | 0.15  | 1976 | 99.50   | 42.75 - 43.25 | 324 | 7.94 | 2014 | 49.34   |
| 1               | 0.05  | 1977 | 99.55   | 43.25 - 43.75 | 283 | 6.93 | 2297 | 56.27   |
| 3               | 0.15  | 1980 | 99.70   | 43.75 - 44.25 | 312 | 7.64 | 2609 | 63.91   |
| 1               | 0.05  | 1981 | 99.75   | 44.25 - 44.75 | 275 | 6.74 | 2884 | 70.65   |
| 3               | 0.15  | 1984 | 99.90   | 44.75 - 45.25 | 260 | 6.37 | 3144 | 77.02   |
| 2               | 0.10  | 1986 | 100.00  | 45.25 - 45.75 | 219 | 5.37 | 3363 | 82.39   |
|                 |       |      |         | 45.75 - 46.25 | 164 | 4.02 | 3527 | 86.40   |
|                 |       |      |         | 46.25 - 46.75 | 127 | 3.11 | 3654 | 89.51   |
|                 |       |      |         | 46.75 - 47.25 | 105 | 2.57 | 3759 | 92.09   |
|                 |       |      |         | 47.25 - 47.75 | 96  | 2.35 | 3855 | 94.44   |
|                 |       |      |         | 47.75 - 48.25 | 67  | 1.64 | 3922 | 96.08   |
|                 |       |      |         | 48.25 - 48.75 | 44  | 1.08 | 3966 | 97.16   |
|                 |       |      |         | 48.75 - 49.25 | 37  | 0.91 | 4003 | 98.06   |
|                 |       |      |         | 49.25 - 49.75 | 24  | 0.59 | 4027 | 98.65   |
|                 |       |      |         | 49.75 - 50.25 | 18  | 0.44 | 4045 | 99.09   |
|                 |       |      |         | 50.25 - 50.75 | 13  | 0.32 | 4058 | 99.41   |
|                 |       |      |         | 50.75 - 51.25 | 5   | 0.12 | 4063 | 99.53   |
|                 |       |      |         | 51.25 - 51.75 | 8   | 0.20 | 4071 | 99.73   |
|                 |       |      |         | 51.75 - 52.25 | 4   | 0.10 | 4075 | 99.83   |
|                 |       |      |         | 52.25 - 52.75 | 2   | 0.05 | 4077 | 99.88   |
|                 |       |      |         | 52.75 - 53.25 | 3   | 0.07 | 4080 | 99.95   |
|                 |       |      |         | 53.25 - 53.75 | 1   | 0.02 | 4081 | 99.98   |
|                 |       |      |         | 53.75 - 54.25 | 0   | 0.00 | 4081 | 99.98   |
|                 |       |      |         | 54.25 - 54.75 | 1   | 0.02 | 4082 | 100.00  |

## (64) OVERHEAD FINGERTIP REACH, SITTING

The vertical distance between a sitting surface and the dactylion III landmark of a seated participant whose arm is extended overhead is measured with an anthropometer. The participant sits erect on a flat surface 45.8 cm high with the right arm and hand extended vertically overhead as far as possible and the palm of the hand facing forward. The measurement is taken at the maximum point of quiet respiration.

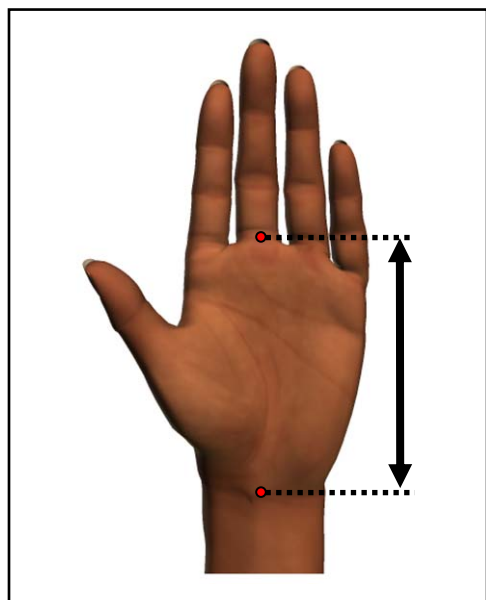
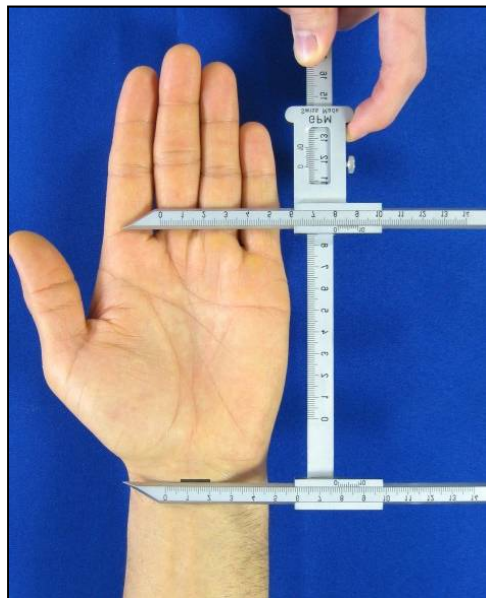


| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 116.50      | 45.87 | 1ST  | 127.60 | 50.24 |
| 118.40      | 46.61 | 2ND  | 129.00 | 50.79 |
| 119.40      | 47.01 | 3RD  | 130.20 | 51.26 |
| 120.70      | 47.52 | 5TH  | 131.60 | 51.81 |
| 123.00      | 48.43 | 10TH | 134.00 | 52.76 |
| 124.60      | 49.06 | 15TH | 135.50 | 53.35 |
| 125.70      | 49.49 | 20TH | 136.90 | 53.90 |
| 126.70      | 49.88 | 25TH | 138.00 | 54.33 |
| 127.60      | 50.24 | 30TH | 139.10 | 54.76 |
| 128.50      | 50.59 | 35TH | 140.10 | 55.16 |
| 129.30      | 50.91 | 40TH | 140.90 | 55.47 |
| 130.10      | 51.22 | 45TH | 141.70 | 55.79 |
| 130.90      | 51.54 | 50TH | 142.60 | 56.14 |
| 131.80      | 51.89 | 55TH | 143.30 | 56.42 |
| 132.40      | 52.13 | 60TH | 144.20 | 56.77 |
| 133.10      | 52.40 | 65TH | 145.20 | 57.17 |
| 134.00      | 52.76 | 70TH | 146.10 | 57.52 |
| 135.00      | 53.15 | 75TH | 147.20 | 57.95 |
| 136.10      | 53.58 | 80TH | 148.30 | 58.39 |
| 137.60      | 54.17 | 85TH | 149.80 | 58.98 |
| 139.50      | 54.92 | 90TH | 151.50 | 59.65 |
| 141.30      | 55.63 | 95TH | 154.00 | 60.63 |
| 142.90      | 56.26 | 97TH | 155.50 | 61.22 |
| 144.00      | 56.69 | 98TH | 157.00 | 61.81 |
| 145.30      | 57.20 | 99TH | 158.80 | 62.52 |



## (65) PALM LENGTH

The distance between the center of the crease at the base of the middle finger (digit III, base) and the ventral stylium landmark is measured with a Poech sliding caliper. The participant holds the right forearm horizontal with the hand straight, palm up. The fingers are together, and the thumb is abducted approximately 45°. The middle finger is parallel to the long axis of the forearm.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 9.60        | 3.78 | 1ST  | 10.30 | 4.06 |
| 9.70        | 3.82 | 2ND  | 10.40 | 4.09 |
| 9.80        | 3.86 | 3RD  | 10.50 | 4.13 |
| 10.00       | 3.94 | 5TH  | 10.70 | 4.21 |
| 10.20       | 4.02 | 10TH | 10.90 | 4.29 |
| 10.30       | 4.06 | 15TH | 11.00 | 4.33 |
| 10.40       | 4.09 | 20TH | 11.10 | 4.37 |
| 10.50       | 4.13 | 25TH | 11.20 | 4.41 |
| 10.50       | 4.13 | 30TH | 11.30 | 4.45 |
| 10.60       | 4.17 | 35TH | 11.40 | 4.49 |
| 10.70       | 4.21 | 40TH | 11.50 | 4.53 |
| 10.70       | 4.21 | 45TH | 11.50 | 4.53 |
| 10.80       | 4.25 | 50TH | 11.60 | 4.57 |
| 10.90       | 4.29 | 55TH | 11.70 | 4.61 |
| 11.00       | 4.33 | 60TH | 11.80 | 4.65 |
| 11.10       | 4.37 | 65TH | 11.80 | 4.65 |
| 11.20       | 4.41 | 70TH | 12.00 | 4.72 |
| 11.30       | 4.45 | 75TH | 12.00 | 4.72 |
| 11.40       | 4.49 | 80TH | 12.20 | 4.80 |
| 11.50       | 4.53 | 85TH | 12.30 | 4.84 |
| 11.60       | 4.57 | 90TH | 12.50 | 4.92 |
| 11.90       | 4.69 | 95TH | 12.70 | 5.00 |
| 12.10       | 4.76 | 97TH | 12.90 | 5.08 |
| 12.30       | 4.84 | 98TH | 13.10 | 5.16 |
| 12.40       | 4.88 | 99TH | 13.30 | 5.24 |

## (65) PALM LENGTH

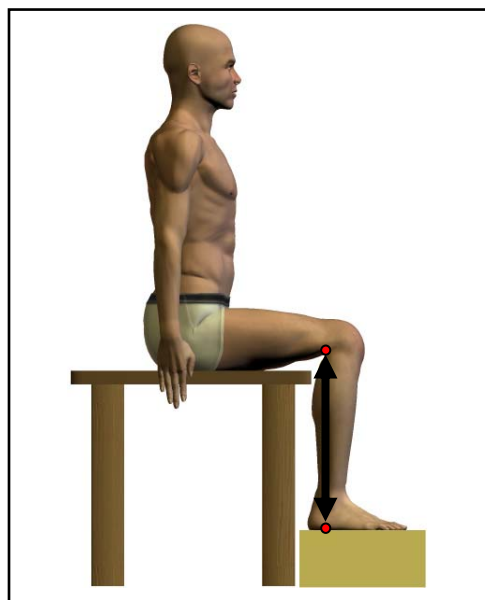
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 10.87                    | MEAN                | 4.28 |
| 0.01                     | STD ERROR (MEAN)    | 0.01 |
| 0.59                     | STANDARD DEVIATION  | 0.23 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 8.80                     | MINIMUM             | 3.46 |
| 13.00                    | MAXIMUM             | 5.12 |
| SKEWNESS                 |                     | 0.33 |
| KURTOSIS                 |                     | 3.11 |
| COEFFICIENT OF VARIATION |                     | 5.5% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       |                     | IN   |
| 11.65                    | MEAN                | 4.59 |
| 0.01                     | STD ERROR (MEAN)    | 0.00 |
| 0.62                     | STANDARD DEVIATION  | 0.25 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 9.50                     | MINIMUM             | 3.74 |
| 14.00                    | MAXIMUM             | 5.51 |
| SKEWNESS                 |                     | 0.27 |
| KURTOSIS                 |                     | 3.22 |
| COEFFICIENT OF VARIATION |                     | 5.4% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |      |      |         |       |   |       |      |      |         |        |  |
|-----------------|------|------|---------|-------|---|-------|------|------|---------|--------|--|
| FEMALES         |      |      |         |       |   | MALES |      |      |         |        |  |
| F               | FPct | CumF | CumFPct | CM    |   | F     | FPct | CumF | CumFPct |        |  |
| 1               | 0.05 | 1    | 0.05    | 8.85  | - | 8.95  |      |      |         |        |  |
| 0               | 0.00 | 1    | 0.05    | 8.95  | - | 9.05  |      |      |         |        |  |
| 0               | 0.00 | 1    | 0.05    | 9.05  | - | 9.15  |      |      |         |        |  |
| 1               | 0.05 | 2    | 0.10    | 9.15  | - | 9.25  |      |      |         |        |  |
| 1               | 0.05 | 3    | 0.15    | 9.25  | - | 9.35  |      |      |         |        |  |
| 2               | 0.10 | 5    | 0.25    | 9.35  | - | 9.45  |      |      |         |        |  |
| 8               | 0.40 | 13   | 0.65    | 9.45  | - | 9.55  |      |      |         |        |  |
| 10              | 0.50 | 23   | 1.16    | 9.55  | - | 9.65  | 1    | 0.02 | 1       | 0.02   |  |
| 18              | 0.91 | 41   | 2.06    | 9.65  | - | 9.75  | 0    | 0.00 | 1       | 0.02   |  |
| 27              | 1.36 | 68   | 3.42    | 9.75  | - | 9.85  | 0    | 0.00 | 1       | 0.02   |  |
| 19              | 0.96 | 87   | 4.38    | 9.85  | - | 9.95  | 3    | 0.07 | 4       | 0.10   |  |
| 58              | 2.92 | 145  | 7.30    | 9.95  | - | 10.05 | 9    | 0.22 | 13      | 0.32   |  |
| 48              | 2.42 | 193  | 9.72    | 10.05 | - | 10.15 | 10   | 0.24 | 23      | 0.56   |  |
| 72              | 3.63 | 265  | 13.34   | 10.15 | - | 10.25 | 9    | 0.22 | 32      | 0.78   |  |
| 100             | 5.04 | 365  | 18.38   | 10.25 | - | 10.35 | 22   | 0.54 | 54      | 1.32   |  |
| 119             | 5.99 | 484  | 24.37   | 10.35 | - | 10.45 | 31   | 0.76 | 85      | 2.08   |  |
| 148             | 7.45 | 632  | 31.82   | 10.45 | - | 10.55 | 43   | 1.05 | 128     | 3.14   |  |
| 123             | 6.19 | 755  | 38.02   | 10.55 | - | 10.65 | 67   | 1.64 | 195     | 4.78   |  |
| 158             | 7.96 | 913  | 45.97   | 10.65 | - | 10.75 | 80   | 1.96 | 275     | 6.74   |  |
| 128             | 6.45 | 1041 | 52.42   | 10.75 | - | 10.85 | 129  | 3.16 | 404     | 9.90   |  |
| 95              | 4.78 | 1136 | 57.20   | 10.85 | - | 10.95 | 102  | 2.50 | 506     | 12.40  |  |
| 137             | 6.90 | 1273 | 64.10   | 10.95 | - | 11.05 | 178  | 4.36 | 684     | 16.76  |  |
| 115             | 5.79 | 1388 | 69.89   | 11.05 | - | 11.15 | 185  | 4.53 | 869     | 21.29  |  |
| 83              | 4.18 | 1471 | 74.07   | 11.15 | - | 11.25 | 169  | 4.14 | 1038    | 25.43  |  |
| 95              | 4.78 | 1566 | 78.85   | 11.25 | - | 11.35 | 225  | 5.51 | 1263    | 30.94  |  |
| 104             | 5.24 | 1670 | 84.09   | 11.35 | - | 11.45 | 327  | 8.01 | 1590    | 38.95  |  |
| 73              | 3.68 | 1743 | 87.76   | 11.45 | - | 11.55 | 279  | 6.83 | 1869    | 45.79  |  |
| 48              | 2.42 | 1791 | 90.18   | 11.55 | - | 11.65 | 271  | 6.64 | 2140    | 52.43  |  |
| 40              | 2.01 | 1831 | 92.20   | 11.65 | - | 11.75 | 299  | 7.32 | 2439    | 59.75  |  |
| 41              | 2.06 | 1872 | 94.26   | 11.75 | - | 11.85 | 259  | 6.34 | 2698    | 66.10  |  |
| 18              | 0.91 | 1890 | 95.17   | 11.85 | - | 11.95 | 155  | 3.80 | 2853    | 69.89  |  |
| 29              | 1.46 | 1919 | 96.63   | 11.95 | - | 12.05 | 244  | 5.98 | 3097    | 75.87  |  |
| 14              | 0.70 | 1933 | 97.33   | 12.05 | - | 12.15 | 130  | 3.18 | 3227    | 79.05  |  |
| 12              | 0.60 | 1945 | 97.94   | 12.15 | - | 12.25 | 179  | 4.39 | 3406    | 83.44  |  |
| 13              | 0.65 | 1958 | 98.59   | 12.25 | - | 12.35 | 133  | 3.26 | 3539    | 86.70  |  |
| 15              | 0.76 | 1973 | 99.35   | 12.35 | - | 12.45 | 133  | 3.26 | 3672    | 89.96  |  |
| 4               | 0.20 | 1977 | 99.55   | 12.45 | - | 12.55 | 103  | 2.52 | 3775    | 92.48  |  |
| 4               | 0.20 | 1981 | 99.75   | 12.55 | - | 12.65 | 63   | 1.54 | 3838    | 94.02  |  |
| 2               | 0.10 | 1983 | 99.85   | 12.65 | - | 12.75 | 78   | 1.91 | 3916    | 95.93  |  |
| 0               | 0.00 | 1983 | 99.85   | 12.75 | - | 12.85 | 42   | 1.03 | 3958    | 96.96  |  |
| 2               | 0.10 | 1985 | 99.95   | 12.85 | - | 12.95 | 23   | 0.56 | 3981    | 97.53  |  |
| 1               | 0.05 | 1986 | 100.00  | 12.95 | - | 13.05 | 17   | 0.42 | 3998    | 97.94  |  |
|                 |      |      |         | 13.05 | - | 13.15 | 16   | 0.39 | 4014    | 98.33  |  |
|                 |      |      |         | 13.15 | - | 13.25 | 17   | 0.42 | 4031    | 98.75  |  |
|                 |      |      |         | 13.25 | - | 13.35 | 16   | 0.39 | 4047    | 99.14  |  |
|                 |      |      |         | 13.35 | - | 13.45 | 15   | 0.37 | 4062    | 99.51  |  |
|                 |      |      |         | 13.45 | - | 13.55 | 5    | 0.12 | 4067    | 99.63  |  |
|                 |      |      |         | 13.55 | - | 13.65 | 6    | 0.15 | 4073    | 99.78  |  |
|                 |      |      |         | 13.65 | - | 13.75 | 6    | 0.15 | 4079    | 99.93  |  |
|                 |      |      |         | 13.75 | - | 13.85 | 1    | 0.02 | 4080    | 99.95  |  |
|                 |      |      |         | 13.85 | - | 13.95 | 1    | 0.02 | 4081    | 99.98  |  |
|                 |      |      |         | 13.95 | - | 14.05 | 1    | 0.02 | 4082    | 100.00 |  |

## (66) POPLITEAL HEIGHT

The vertical distance from a footrest surface to the back of the right knee (the popliteal fossa at the dorsal juncture of the calf and thigh) is measured with an anthropometer. The participant sits with the thighs parallel, the feet in line with the thighs, and the knees flexed 90°.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 33.60       | 13.23 | 1ST  | 37.40 | 14.72 |
| 34.10       | 13.43 | 2ND  | 38.10 | 15.00 |
| 34.60       | 13.62 | 3RD  | 38.50 | 15.16 |
| 35.00       | 13.78 | 5TH  | 39.00 | 15.35 |
| 35.80       | 14.09 | 10TH | 39.80 | 15.67 |
| 36.40       | 14.33 | 15TH | 40.40 | 15.91 |
| 36.90       | 14.53 | 20TH | 40.80 | 16.06 |
| 37.30       | 14.69 | 25TH | 41.30 | 16.26 |
| 37.60       | 14.80 | 30TH | 41.60 | 16.38 |
| 37.90       | 14.92 | 35TH | 42.00 | 16.54 |
| 38.20       | 15.04 | 40TH | 42.30 | 16.65 |
| 38.50       | 15.16 | 45TH | 42.60 | 16.77 |
| 38.70       | 15.24 | 50TH | 43.00 | 16.93 |
| 39.00       | 15.35 | 55TH | 43.30 | 17.05 |
| 39.30       | 15.47 | 60TH | 43.60 | 17.17 |
| 39.70       | 15.63 | 65TH | 43.90 | 17.28 |
| 40.00       | 15.75 | 70TH | 44.20 | 17.40 |
| 40.30       | 15.87 | 75TH | 44.70 | 17.60 |
| 40.80       | 16.06 | 80TH | 45.00 | 17.72 |
| 41.30       | 16.26 | 85TH | 45.50 | 17.91 |
| 41.90       | 16.50 | 90TH | 46.10 | 18.15 |
| 42.80       | 16.85 | 95TH | 47.10 | 18.54 |
| 43.40       | 17.09 | 97TH | 47.70 | 18.78 |
| 43.80       | 17.24 | 98TH | 48.40 | 19.06 |
| 44.50       | 17.52 | 99TH | 49.10 | 19.33 |

## (66) POPLITEAL HEIGHT

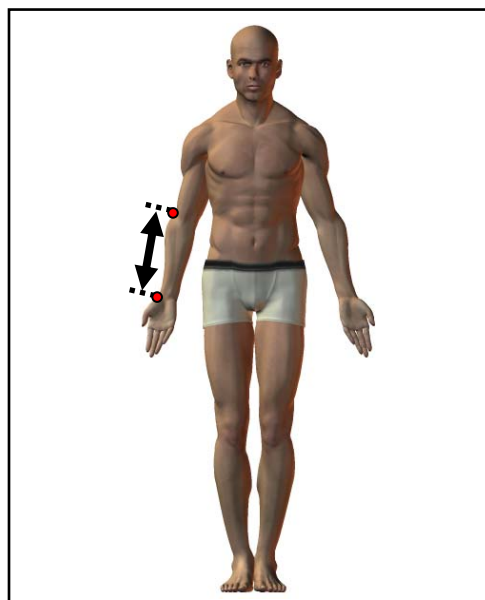
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 38.82                    |                     | 15.28 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 2.36                     | STANDARD DEVIATION  | 0.93  |
| 0.04                     | STD ERROR (STD DEV) | 0.01  |
| 30.50                    | MINIMUM             | 12.01 |
| 47.60                    | MAXIMUM             | 18.74 |
| SKEWNESS                 |                     | 0.10  |
| KURTOSIS                 |                     | 3.23  |
| COEFFICIENT OF VARIATION |                     | 6.1%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 42.98                    |                     | 16.92 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.48                     | STANDARD DEVIATION  | 0.98  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 34.60                    | MINIMUM             | 13.62 |
| 52.50                    | MAXIMUM             | 20.67 |
| SKEWNESS                 |                     | 0.14  |
| KURTOSIS                 |                     | 3.17  |
| COEFFICIENT OF VARIATION |                     | 5.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 30.25           | - | 30.75 |  |       |      |      |         |
| 2       | 0.10  | 3    | 0.15    | 30.75           | - | 31.25 |  |       |      |      |         |
| 3       | 0.15  | 6    | 0.30    | 31.25           | - | 31.75 |  |       |      |      |         |
| 2       | 0.10  | 8    | 0.40    | 31.75           | - | 32.25 |  |       |      |      |         |
| 3       | 0.15  | 11   | 0.55    | 32.25           | - | 32.75 |  |       |      |      |         |
| 3       | 0.15  | 14   | 0.70    | 32.75           | - | 33.25 |  |       |      |      |         |
| 14      | 0.70  | 28   | 1.41    | 33.25           | - | 33.75 |  |       |      |      |         |
| 17      | 0.86  | 45   | 2.27    | 33.75           | - | 34.25 |  |       |      |      |         |
| 31      | 1.56  | 76   | 3.83    | 34.25           | - | 34.75 |  | 1     | 0.02 | 1    | 0.02    |
| 43      | 2.17  | 119  | 5.99    | 34.75           | - | 35.25 |  | 2     | 0.05 | 3    | 0.07    |
| 70      | 3.52  | 189  | 9.52    | 35.25           | - | 35.75 |  | 2     | 0.05 | 5    | 0.12    |
| 80      | 4.03  | 269  | 13.54   | 35.75           | - | 36.25 |  | 5     | 0.12 | 10   | 0.24    |
| 96      | 4.83  | 365  | 18.38   | 36.25           | - | 36.75 |  | 13    | 0.32 | 23   | 0.56    |
| 126     | 6.34  | 491  | 24.72   | 36.75           | - | 37.25 |  | 13    | 0.32 | 36   | 0.88    |
| 152     | 7.65  | 643  | 32.38   | 37.25           | - | 37.75 |  | 22    | 0.54 | 58   | 1.42    |
| 155     | 7.80  | 798  | 40.18   | 37.75           | - | 38.25 |  | 34    | 0.83 | 92   | 2.25    |
| 201     | 10.12 | 999  | 50.30   | 38.25           | - | 38.75 |  | 73    | 1.79 | 165  | 4.04    |
| 178     | 8.96  | 1177 | 59.26   | 38.75           | - | 39.25 |  | 80    | 1.96 | 245  | 6.00    |
| 146     | 7.35  | 1323 | 66.62   | 39.25           | - | 39.75 |  | 140   | 3.43 | 385  | 9.43    |
| 143     | 7.20  | 1466 | 73.82   | 39.75           | - | 40.25 |  | 156   | 3.82 | 541  | 13.25   |
| 117     | 5.89  | 1583 | 79.71   | 40.25           | - | 40.75 |  | 235   | 5.76 | 776  | 19.01   |
| 104     | 5.24  | 1687 | 84.94   | 40.75           | - | 41.25 |  | 233   | 5.71 | 1009 | 24.72   |
| 79      | 3.98  | 1766 | 88.92   | 41.25           | - | 41.75 |  | 292   | 7.15 | 1301 | 31.87   |
| 76      | 3.83  | 1842 | 92.75   | 41.75           | - | 42.25 |  | 275   | 6.74 | 1576 | 38.61   |
| 43      | 2.17  | 1885 | 94.91   | 42.25           | - | 42.75 |  | 342   | 8.38 | 1918 | 46.99   |
| 30      | 1.51  | 1915 | 96.42   | 42.75           | - | 43.25 |  | 306   | 7.50 | 2224 | 54.48   |
| 29      | 1.46  | 1944 | 97.89   | 43.25           | - | 43.75 |  | 328   | 8.04 | 2552 | 62.52   |
| 18      | 0.91  | 1962 | 98.79   | 43.75           | - | 44.25 |  | 308   | 7.55 | 2860 | 70.06   |
| 10      | 0.50  | 1972 | 99.30   | 44.25           | - | 44.75 |  | 249   | 6.10 | 3109 | 76.16   |
| 5       | 0.25  | 1977 | 99.55   | 44.75           | - | 45.25 |  | 244   | 5.98 | 3353 | 82.14   |
| 3       | 0.15  | 1980 | 99.70   | 45.25           | - | 45.75 |  | 208   | 5.10 | 3561 | 87.24   |
| 2       | 0.10  | 1982 | 99.80   | 45.75           | - | 46.25 |  | 160   | 3.92 | 3721 | 91.16   |
| 0       | 0.00  | 1982 | 99.80   | 46.25           | - | 46.75 |  | 107   | 2.62 | 3828 | 93.78   |
| 2       | 0.10  | 1984 | 99.90   | 46.75           | - | 47.25 |  | 72    | 1.76 | 3900 | 95.54   |
| 2       | 0.10  | 1986 | 100.00  | 47.25           | - | 47.75 |  | 61    | 1.49 | 3961 | 97.04   |
|         |       |      |         | 47.75           | - | 48.25 |  | 33    | 0.81 | 3994 | 97.84   |
|         |       |      |         | 48.25           | - | 48.75 |  | 31    | 0.76 | 4025 | 98.60   |
|         |       |      |         | 48.75           | - | 49.25 |  | 20    | 0.49 | 4045 | 99.09   |
|         |       |      |         | 49.25           | - | 49.75 |  | 13    | 0.32 | 4058 | 99.41   |
|         |       |      |         | 49.75           | - | 50.25 |  | 10    | 0.24 | 4068 | 99.66   |
|         |       |      |         | 50.25           | - | 50.75 |  | 5     | 0.12 | 4073 | 99.78   |
|         |       |      |         | 50.75           | - | 51.25 |  | 2     | 0.05 | 4075 | 99.83   |
|         |       |      |         | 51.25           | - | 51.75 |  | 2     | 0.05 | 4077 | 99.88   |
|         |       |      |         | 51.75           | - | 52.25 |  | 2     | 0.05 | 4079 | 99.93   |
|         |       |      |         | 52.25           | - | 52.75 |  | 3     | 0.07 | 4082 | 100.00  |

## (67) RADIALE-STYLION LENGTH

The distance between the radiale landmark and the stylium landmark is measured with a beam caliper held parallel to the long axis of the forearm. The participant stands with the arms relaxed at the sides. The hand and fingers are held straight in line with the long axis of the forearm with the palm facing forward.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 20.90       | 8.23  | 1ST  | 23.50 | 9.25  |
| 21.20       | 8.35  | 2ND  | 23.80 | 9.37  |
| 21.50       | 8.46  | 3RD  | 24.10 | 9.49  |
| 21.80       | 8.58  | 5TH  | 24.40 | 9.61  |
| 22.30       | 8.78  | 10TH | 24.80 | 9.76  |
| 22.60       | 8.90  | 15TH | 25.20 | 9.92  |
| 22.90       | 9.02  | 20TH | 25.50 | 10.04 |
| 23.20       | 9.13  | 25TH | 25.70 | 10.12 |
| 23.30       | 9.17  | 30TH | 26.00 | 10.24 |
| 23.50       | 9.25  | 35TH | 26.20 | 10.31 |
| 23.70       | 9.33  | 40TH | 26.40 | 10.39 |
| 23.90       | 9.41  | 45TH | 26.60 | 10.47 |
| 24.00       | 9.45  | 50TH | 26.70 | 10.51 |
| 24.20       | 9.53  | 55TH | 26.90 | 10.59 |
| 24.40       | 9.61  | 60TH | 27.10 | 10.67 |
| 24.60       | 9.69  | 65TH | 27.30 | 10.75 |
| 24.80       | 9.76  | 70TH | 27.50 | 10.83 |
| 25.10       | 9.88  | 75TH | 27.80 | 10.94 |
| 25.40       | 10.00 | 80TH | 28.00 | 11.02 |
| 25.80       | 10.16 | 85TH | 28.30 | 11.14 |
| 26.20       | 10.31 | 90TH | 28.80 | 11.34 |
| 26.80       | 10.55 | 95TH | 29.50 | 11.61 |
| 27.20       | 10.71 | 97TH | 29.80 | 11.73 |
| 27.50       | 10.83 | 98TH | 30.20 | 11.89 |
| 27.90       | 10.98 | 99TH | 30.80 | 12.13 |

## (67) RADIALE-STYLION LENGTH

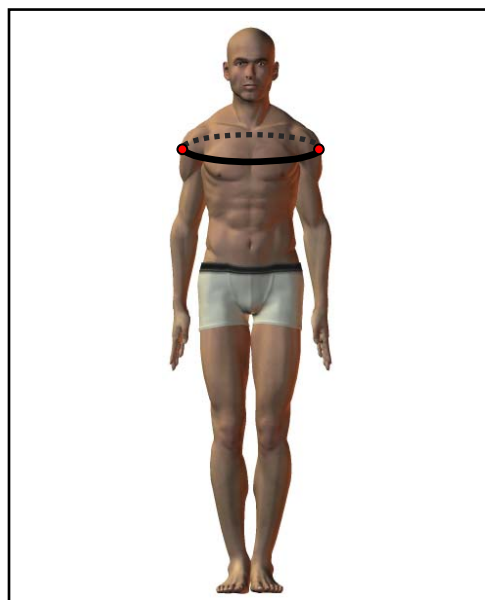
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 24.13                    |                     | 9.50  |
| 0.03                     | STD ERROR (MEAN)    | 0.01  |
| 1.52                     | STANDARD DEVIATION  | 0.60  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 16.90                    | MINIMUM             | 6.65  |
| 29.70                    | MAXIMUM             | 11.69 |
| SKEWNESS                 |                     | 0.24  |
| KURTOSIS                 |                     | 3.40  |
| COEFFICIENT OF VARIATION |                     | 6.3%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 26.79                    |                     | 10.55 |
| 0.02                     | STD ERROR (MEAN)    | 0.01  |
| 1.54                     | STANDARD DEVIATION  | 0.61  |
| 0.02                     | STD ERROR (STD DEV) | 0.01  |
| 21.60                    | MINIMUM             | 8.50  |
| 32.80                    | MAXIMUM             | 12.91 |
| SKEWNESS                 |                     | 0.24  |
| KURTOSIS                 |                     | 3.21  |
| COEFFICIENT OF VARIATION |                     | 5.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |       |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 16.85           | - | 17.20 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 17.20           | - | 17.55 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 17.55           | - | 17.90 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 17.90           | - | 18.25 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 18.25           | - | 18.60 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 18.60           | - | 18.95 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 18.95           | - | 19.30 |  |       |       |      |         |
| 2       | 0.10  | 3    | 0.15    | 19.30           | - | 19.65 |  |       |       |      |         |
| 3       | 0.15  | 6    | 0.30    | 19.65           | - | 20.00 |  |       |       |      |         |
| 5       | 0.25  | 11   | 0.55    | 20.00           | - | 20.35 |  |       |       |      |         |
| 4       | 0.20  | 15   | 0.76    | 20.35           | - | 20.70 |  |       |       |      |         |
| 11      | 0.55  | 26   | 1.31    | 20.70           | - | 21.05 |  |       |       |      |         |
| 27      | 1.36  | 53   | 2.67    | 21.05           | - | 21.40 |  |       |       |      |         |
| 36      | 1.81  | 89   | 4.48    | 21.40           | - | 21.75 |  | 1     | 0.02  | 1    | 0.02    |
| 55      | 2.77  | 144  | 7.25    | 21.75           | - | 22.10 |  | 0     | 0.00  | 1    | 0.02    |
| 109     | 5.49  | 253  | 12.74   | 22.10           | - | 22.45 |  | 6     | 0.15  | 7    | 0.17    |
| 104     | 5.24  | 357  | 17.98   | 22.45           | - | 22.80 |  | 6     | 0.15  | 13   | 0.32    |
| 130     | 6.55  | 487  | 24.52   | 22.80           | - | 23.15 |  | 9     | 0.22  | 22   | 0.54    |
| 172     | 8.66  | 659  | 33.18   | 23.15           | - | 23.50 |  | 18    | 0.44  | 40   | 0.98    |
| 228     | 11.48 | 887  | 44.66   | 23.50           | - | 23.85 |  | 43    | 1.05  | 83   | 2.03    |
| 179     | 9.01  | 1066 | 53.68   | 23.85           | - | 24.20 |  | 62    | 1.52  | 145  | 3.55    |
| 220     | 11.08 | 1286 | 64.75   | 24.20           | - | 24.55 |  | 122   | 2.99  | 267  | 6.54    |
| 128     | 6.45  | 1414 | 71.20   | 24.55           | - | 24.90 |  | 148   | 3.63  | 415  | 10.17   |
| 133     | 6.70  | 1547 | 77.90   | 24.90           | - | 25.25 |  | 245   | 6.00  | 660  | 16.17   |
| 97      | 4.88  | 1644 | 82.78   | 25.25           | - | 25.60 |  | 210   | 5.14  | 870  | 21.31   |
| 93      | 4.68  | 1737 | 87.46   | 25.60           | - | 25.95 |  | 334   | 8.18  | 1204 | 29.50   |
| 68      | 3.42  | 1805 | 90.89   | 25.95           | - | 26.30 |  | 314   | 7.69  | 1518 | 37.19   |
| 62      | 3.12  | 1867 | 94.01   | 26.30           | - | 26.65 |  | 422   | 10.34 | 1940 | 47.53   |
| 31      | 1.56  | 1898 | 95.57   | 26.65           | - | 27.00 |  | 326   | 7.99  | 2266 | 55.51   |
| 35      | 1.76  | 1933 | 97.33   | 27.00           | - | 27.35 |  | 424   | 10.39 | 2690 | 65.90   |
| 20      | 1.01  | 1953 | 98.34   | 27.35           | - | 27.70 |  | 269   | 6.59  | 2959 | 72.49   |
| 17      | 0.86  | 1970 | 99.19   | 27.70           | - | 28.05 |  | 334   | 8.18  | 3293 | 80.67   |
| 5       | 0.25  | 1975 | 99.45   | 28.05           | - | 28.40 |  | 180   | 4.41  | 3473 | 85.08   |
| 5       | 0.25  | 1980 | 99.70   | 28.40           | - | 28.75 |  | 173   | 4.24  | 3646 | 89.32   |
| 4       | 0.20  | 1984 | 99.90   | 28.75           | - | 29.10 |  | 127   | 3.11  | 3773 | 92.43   |
| 1       | 0.05  | 1985 | 99.95   | 29.10           | - | 29.45 |  | 102   | 2.50  | 3875 | 94.93   |
| 1       | 0.05  | 1986 | 100.00  | 29.45           | - | 29.80 |  | 66    | 1.62  | 3941 | 96.55   |
|         |       |      |         | 29.80           | - | 30.15 |  | 54    | 1.32  | 3995 | 97.87   |
|         |       |      |         | 30.15           | - | 30.50 |  | 33    | 0.81  | 4028 | 98.68   |
|         |       |      |         | 30.50           | - | 30.85 |  | 16    | 0.39  | 4044 | 99.07   |
|         |       |      |         | 30.85           | - | 31.20 |  | 13    | 0.32  | 4057 | 99.39   |
|         |       |      |         | 31.20           | - | 31.55 |  | 11    | 0.27  | 4068 | 99.66   |
|         |       |      |         | 31.55           | - | 31.90 |  | 8     | 0.20  | 4076 | 99.85   |
|         |       |      |         | 31.90           | - | 32.25 |  | 2     | 0.05  | 4078 | 99.90   |
|         |       |      |         | 32.25           | - | 32.60 |  | 2     | 0.05  | 4080 | 99.95   |
|         |       |      |         | 32.60           | - | 32.95 |  | 2     | 0.05  | 4082 | 100.00  |

## (68) SHOULDER CIRCUMFERENCE\*

The circumference of the shoulders at the level of the right and left deltoid point landmarks is measured with a tape. The participant stands erect, looking straight ahead. The shoulders and upper extremities are relaxed with the palms facing the thighs. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 91.50       | 36.02 | 1ST  | 103.90 | 40.91 |
| 92.90       | 36.57 | 2ND  | 105.40 | 41.50 |
| 93.50       | 36.81 | 3RD  | 106.50 | 41.93 |
| 94.40       | 37.17 | 5TH  | 108.00 | 42.52 |
| 96.10       | 37.83 | 10TH | 110.00 | 43.31 |
| 97.40       | 38.35 | 15TH | 111.40 | 43.86 |
| 98.30       | 38.70 | 20TH | 112.50 | 44.29 |
| 99.10       | 39.02 | 25TH | 113.50 | 44.69 |
| 99.80       | 39.29 | 30TH | 114.40 | 45.04 |
| 100.60      | 39.61 | 35TH | 115.30 | 45.39 |
| 101.30      | 39.88 | 40TH | 116.00 | 45.67 |
| 102.00      | 40.16 | 45TH | 116.80 | 45.98 |
| 102.70      | 40.43 | 50TH | 117.60 | 46.30 |
| 103.30      | 40.67 | 55TH | 118.40 | 46.61 |
| 104.00      | 40.94 | 60TH | 119.30 | 46.97 |
| 104.70      | 41.22 | 65TH | 120.10 | 47.28 |
| 105.40      | 41.50 | 70TH | 121.00 | 47.64 |
| 106.20      | 41.81 | 75TH | 122.00 | 48.03 |
| 107.20      | 42.20 | 80TH | 123.10 | 48.46 |
| 108.20      | 42.60 | 85TH | 124.40 | 48.98 |
| 109.90      | 43.27 | 90TH | 126.00 | 49.61 |
| 111.90      | 44.06 | 95TH | 128.80 | 50.71 |
| 113.00      | 44.49 | 97TH | 130.80 | 51.50 |
| 114.30      | 45.00 | 98TH | 131.90 | 51.93 |
| 115.90      | 45.63 | 99TH | 134.10 | 52.80 |

\* The definition of the deltoid landmark has changed since the ANSUR survey; (see Section 2.6). As the level of the two shoulders is often slightly different, this measurement may not always be horizontal.

## (68) SHOULDER CIRCUMFERENCE

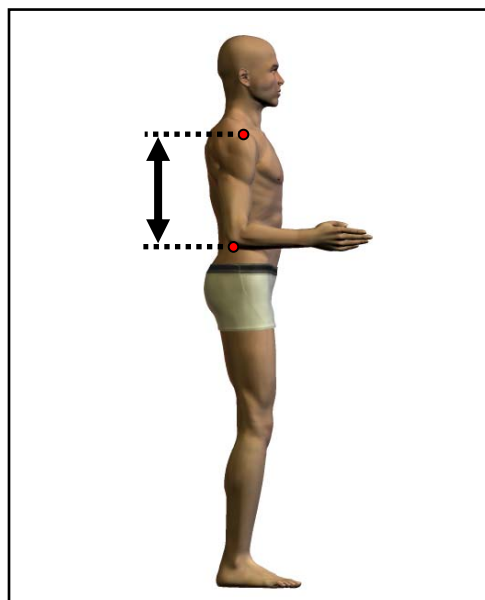
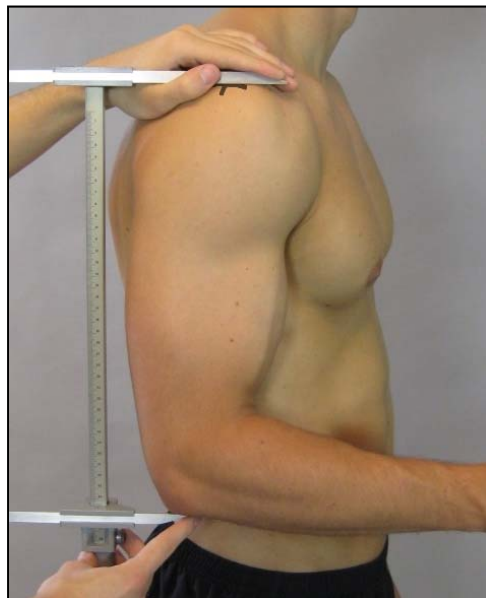
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 102.82                   |                     | 40.48 |
| 0.12                     | STD ERROR (MEAN)    | 0.05  |
| 5.29                     | STANDARD DEVIATION  | 2.08  |
| 0.08                     | STD ERROR (STD DEV) | 0.03  |
| 85.20                    | MINIMUM             | 33.54 |
| 122.50                   | MAXIMUM             | 48.23 |
| SKEWNESS                 |                     | 0.18  |
| KURTOSIS                 |                     | 3.03  |
| COEFFICIENT OF VARIATION |                     | 5.1%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 117.86                   |                     | 46.40 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 6.36                     | STANDARD DEVIATION  | 2.50  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 92.50                    | MINIMUM             | 36.42 |
| 141.30                   | MAXIMUM             | 55.63 |
| SKEWNESS                 |                     | 0.19  |
| KURTOSIS                 |                     | 3.14  |
| COEFFICIENT OF VARIATION |                     | 5.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 84.25           | - | 85.75  |  |       |      |      |         |
| 2       | 0.10  | 3    | 0.15    | 85.75           | - | 87.25  |  |       |      |      |         |
| 2       | 0.10  | 5    | 0.25    | 87.25           | - | 88.75  |  |       |      |      |         |
| 6       | 0.30  | 11   | 0.55    | 88.75           | - | 90.25  |  |       |      |      |         |
| 15      | 0.76  | 26   | 1.31    | 90.25           | - | 91.75  |  |       |      |      |         |
| 25      | 1.26  | 51   | 2.57    | 91.75           | - | 93.25  |  | 1     | 0.02 | 1    | 0.02    |
| 67      | 3.37  | 118  | 5.94    | 93.25           | - | 94.75  |  | 0     | 0.00 | 1    | 0.02    |
| 88      | 4.43  | 206  | 10.37   | 94.75           | - | 96.25  |  | 2     | 0.05 | 3    | 0.07    |
| 132     | 6.65  | 338  | 17.02   | 96.25           | - | 97.75  |  | 1     | 0.02 | 4    | 0.10    |
| 177     | 8.91  | 515  | 25.93   | 97.75           | - | 99.25  |  | 0     | 0.00 | 4    | 0.10    |
| 198     | 9.97  | 713  | 35.90   | 99.25           | - | 100.75 |  | 2     | 0.05 | 6    | 0.15    |
| 212     | 10.67 | 925  | 46.58   | 100.75          | - | 102.25 |  | 10    | 0.24 | 16   | 0.39    |
| 234     | 11.78 | 1159 | 58.36   | 102.25          | - | 103.75 |  | 23    | 0.56 | 39   | 0.96    |
| 211     | 10.62 | 1370 | 68.98   | 103.75          | - | 105.25 |  | 36    | 0.88 | 75   | 1.84    |
| 177     | 8.91  | 1547 | 77.90   | 105.25          | - | 106.75 |  | 72    | 1.76 | 147  | 3.60    |
| 142     | 7.15  | 1689 | 85.05   | 106.75          | - | 108.25 |  | 86    | 2.11 | 233  | 5.71    |
| 91      | 4.58  | 1780 | 89.63   | 108.25          | - | 109.75 |  | 148   | 3.63 | 381  | 9.33    |
| 82      | 4.13  | 1862 | 93.76   | 109.75          | - | 111.25 |  | 212   | 5.19 | 593  | 14.53   |
| 59      | 2.97  | 1921 | 96.73   | 111.25          | - | 112.75 |  | 273   | 6.69 | 866  | 21.22   |
| 25      | 1.26  | 1946 | 97.99   | 112.75          | - | 114.25 |  | 318   | 7.79 | 1184 | 29.01   |
| 20      | 1.01  | 1966 | 98.99   | 114.25          | - | 115.75 |  | 375   | 9.19 | 1559 | 38.19   |
| 10      | 0.50  | 1976 | 99.50   | 115.75          | - | 117.25 |  | 400   | 9.80 | 1959 | 47.99   |
| 6       | 0.30  | 1982 | 99.80   | 117.25          | - | 118.75 |  | 379   | 9.28 | 2338 | 57.28   |
| 1       | 0.05  | 1983 | 99.85   | 118.75          | - | 120.25 |  | 348   | 8.53 | 2686 | 65.80   |
| 2       | 0.10  | 1985 | 99.95   | 120.25          | - | 121.75 |  | 333   | 8.16 | 3019 | 73.96   |
| 1       | 0.05  | 1986 | 100.00  | 121.75          | - | 123.25 |  | 283   | 6.93 | 3302 | 80.89   |
|         |       |      |         | 123.25          | - | 124.75 |  | 212   | 5.19 | 3514 | 86.09   |
|         |       |      |         | 124.75          | - | 126.25 |  | 192   | 4.70 | 3706 | 90.79   |
|         |       |      |         | 126.25          | - | 127.75 |  | 114   | 2.79 | 3820 | 93.58   |
|         |       |      |         | 127.75          | - | 129.25 |  | 78    | 1.91 | 3898 | 95.49   |
|         |       |      |         | 129.25          | - | 130.75 |  | 60    | 1.47 | 3958 | 96.96   |
|         |       |      |         | 130.75          | - | 132.25 |  | 49    | 1.20 | 4007 | 98.16   |
|         |       |      |         | 132.25          | - | 133.75 |  | 27    | 0.66 | 4034 | 98.82   |
|         |       |      |         | 133.75          | - | 135.25 |  | 30    | 0.73 | 4064 | 99.56   |
|         |       |      |         | 135.25          | - | 136.75 |  | 7     | 0.17 | 4071 | 99.73   |
|         |       |      |         | 136.75          | - | 138.25 |  | 6     | 0.15 | 4077 | 99.88   |
|         |       |      |         | 138.25          | - | 139.75 |  | 3     | 0.07 | 4080 | 99.95   |
|         |       |      |         | 139.75          | - | 141.25 |  | 1     | 0.02 | 4081 | 99.98   |
|         |       |      |         | 141.25          | - | 142.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (69) SHOULDER-ELBOW LENGTH

The distance between the right acromion landmark and the olecranon bottom landmark is measured with a beam caliper parallel to the long axis of the upper arm. The participant stands with the right upper arm hanging at the side and the elbow flexed 90°. The hand is straight, and the palm faces inward.

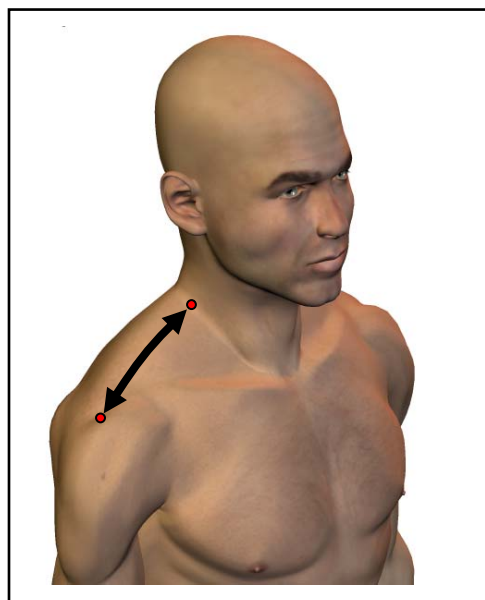


| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 29.20       | 11.50 | 1ST  | 32.20 | 12.68 |
| 29.80       | 11.73 | 2ND  | 32.70 | 12.87 |
| 30.30       | 11.93 | 3RD  | 33.00 | 12.99 |
| 30.70       | 12.09 | 5TH  | 33.40 | 13.15 |
| 31.30       | 12.32 | 10TH | 34.00 | 13.39 |
| 31.70       | 12.48 | 15TH | 34.50 | 13.58 |
| 32.00       | 12.60 | 20TH | 34.80 | 13.70 |
| 32.30       | 12.72 | 25TH | 35.20 | 13.86 |
| 32.50       | 12.80 | 30TH | 35.50 | 13.98 |
| 32.80       | 12.91 | 35TH | 35.70 | 14.06 |
| 33.00       | 12.99 | 40TH | 35.90 | 14.13 |
| 33.20       | 13.07 | 45TH | 36.10 | 14.21 |
| 33.40       | 13.15 | 50TH | 36.30 | 14.29 |
| 33.60       | 13.23 | 55TH | 36.50 | 14.37 |
| 33.80       | 13.31 | 60TH | 36.80 | 14.49 |
| 34.00       | 13.39 | 65TH | 37.00 | 14.57 |
| 34.30       | 13.50 | 70TH | 37.30 | 14.69 |
| 34.60       | 13.62 | 75TH | 37.60 | 14.80 |
| 34.90       | 13.74 | 80TH | 37.90 | 14.92 |
| 35.20       | 13.86 | 85TH | 38.30 | 15.08 |
| 35.70       | 14.06 | 90TH | 38.70 | 15.24 |
| 36.30       | 14.29 | 95TH | 39.40 | 15.51 |
| 36.60       | 14.41 | 97TH | 39.90 | 15.71 |
| 36.90       | 14.53 | 98TH | 40.20 | 15.83 |
| 37.60       | 14.80 | 99TH | 40.80 | 16.06 |



## (70) SHOULDER LENGTH

The surface distance between the right trapezius landmark and the right acromion landmark is measured with a tape. The participant stands erect, looking straight ahead. The shoulders and upper extremities are relaxed.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 11.30       | 4.45 | 1ST  | 12.50 | 4.92 |
| 11.50       | 4.53 | 2ND  | 12.90 | 5.08 |
| 11.70       | 4.61 | 3RD  | 13.00 | 5.12 |
| 12.00       | 4.72 | 5TH  | 13.30 | 5.24 |
| 12.20       | 4.80 | 10TH | 13.70 | 5.39 |
| 12.50       | 4.92 | 15TH | 13.90 | 5.47 |
| 12.70       | 5.00 | 20TH | 14.10 | 5.55 |
| 12.80       | 5.04 | 25TH | 14.20 | 5.59 |
| 13.00       | 5.12 | 30TH | 14.40 | 5.67 |
| 13.10       | 5.16 | 35TH | 14.50 | 5.71 |
| 13.20       | 5.20 | 40TH | 14.70 | 5.79 |
| 13.40       | 5.28 | 45TH | 14.80 | 5.83 |
| 13.50       | 5.31 | 50TH | 15.00 | 5.91 |
| 13.60       | 5.35 | 55TH | 15.10 | 5.94 |
| 13.80       | 5.43 | 60TH | 15.20 | 5.98 |
| 13.90       | 5.47 | 65TH | 15.40 | 6.06 |
| 14.00       | 5.51 | 70TH | 15.50 | 6.10 |
| 14.20       | 5.59 | 75TH | 15.70 | 6.18 |
| 14.40       | 5.67 | 80TH | 15.90 | 6.26 |
| 14.60       | 5.75 | 85TH | 16.00 | 6.30 |
| 14.90       | 5.87 | 90TH | 16.30 | 6.42 |
| 15.30       | 6.02 | 95TH | 16.70 | 6.57 |
| 15.60       | 6.14 | 97TH | 17.00 | 6.69 |
| 15.80       | 6.22 | 98TH | 17.20 | 6.77 |
| 16.10       | 6.34 | 99TH | 17.50 | 6.89 |

## (70) SHOULDER LENGTH

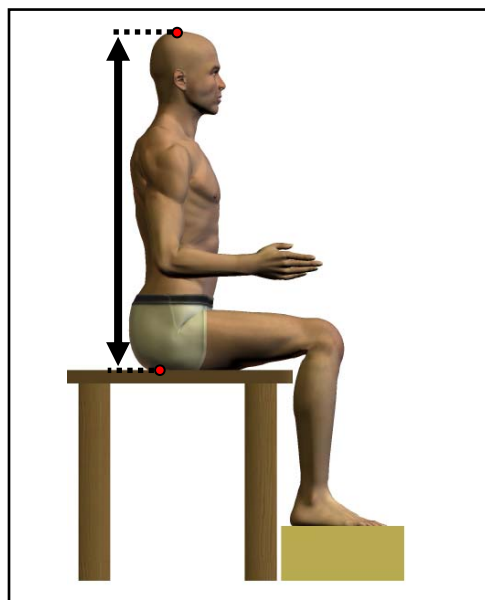
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 13.54                    |                     | 5.33 |
| 0.02                     | STD ERROR (MEAN)    | 0.01 |
| 1.03                     | STANDARD DEVIATION  | 0.40 |
| 0.02                     | STD ERROR (STD DEV) | 0.01 |
| 10.70                    | MINIMUM             | 4.21 |
| 17.50                    | MAXIMUM             | 6.89 |
| SKEWNESS                 |                     | 0.28 |
| KURTOSIS                 |                     | 3.24 |
| COEFFICIENT OF VARIATION |                     | 7.6% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 14.98                    |                     | 5.90 |
| 0.02                     | STD ERROR (MEAN)    | 0.01 |
| 1.05                     | STANDARD DEVIATION  | 0.41 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 11.30                    | MINIMUM             | 4.45 |
| 18.50                    | MAXIMUM             | 7.28 |
| SKEWNESS                 |                     | 0.07 |
| KURTOSIS                 |                     | 3.05 |
| COEFFICIENT OF VARIATION |                     | 7.0% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |      |      |         |               |       |      |      |         |  |
|-----------------|------|------|---------|---------------|-------|------|------|---------|--|
| FEMALES         |      |      |         |               | MALES |      |      |         |  |
| F               | FPct | CumF | CumFPct | CM            | F     | FPct | CumF | CumFPct |  |
| 1               | 0.05 | 1    | 0.05    | 10.55 - 10.75 |       |      |      |         |  |
| 2               | 0.10 | 3    | 0.15    | 10.75 - 10.95 |       |      |      |         |  |
| 9               | 0.45 | 12   | 0.60    | 10.95 - 11.15 |       |      |      |         |  |
| 8               | 0.40 | 20   | 1.01    | 11.15 - 11.35 | 1     | 0.02 | 1    | 0.02    |  |
| 21              | 1.06 | 41   | 2.06    | 11.35 - 11.55 | 2     | 0.05 | 3    | 0.07    |  |
| 27              | 1.36 | 68   | 3.42    | 11.55 - 11.75 | 1     | 0.02 | 4    | 0.10    |  |
| 22              | 1.11 | 90   | 4.53    | 11.75 - 11.95 | 5     | 0.12 | 9    | 0.22    |  |
| 76              | 3.83 | 166  | 8.36    | 11.95 - 12.15 | 6     | 0.15 | 15   | 0.37    |  |
| 68              | 3.42 | 234  | 11.78   | 12.15 - 12.35 | 11    | 0.27 | 26   | 0.64    |  |
| 111             | 5.59 | 345  | 17.37   | 12.35 - 12.55 | 18    | 0.44 | 44   | 1.08    |  |
| 107             | 5.39 | 452  | 22.76   | 12.55 - 12.75 | 21    | 0.51 | 65   | 1.59    |  |
| 109             | 5.49 | 561  | 28.25   | 12.75 - 12.95 | 17    | 0.42 | 82   | 2.01    |  |
| 155             | 7.80 | 716  | 36.05   | 12.95 - 13.15 | 78    | 1.91 | 160  | 3.92    |  |
| 154             | 7.75 | 870  | 43.81   | 13.15 - 13.35 | 73    | 1.79 | 233  | 5.71    |  |
| 169             | 8.51 | 1039 | 52.32   | 13.35 - 13.55 | 115   | 2.82 | 348  | 8.53    |  |
| 144             | 7.25 | 1183 | 59.57   | 13.55 - 13.75 | 110   | 2.69 | 458  | 11.22   |  |
| 119             | 5.99 | 1302 | 65.56   | 13.75 - 13.95 | 172   | 4.21 | 630  | 15.43   |  |
| 162             | 8.16 | 1464 | 73.72   | 13.95 - 14.15 | 287   | 7.03 | 917  | 22.46   |  |
| 109             | 5.49 | 1573 | 79.20   | 14.15 - 14.35 | 248   | 6.08 | 1165 | 28.54   |  |
| 108             | 5.44 | 1681 | 84.64   | 14.35 - 14.55 | 265   | 6.49 | 1430 | 35.03   |  |
| 76              | 3.83 | 1757 | 88.47   | 14.55 - 14.75 | 257   | 6.30 | 1687 | 41.33   |  |
| 56              | 2.82 | 1813 | 91.29   | 14.75 - 14.95 | 278   | 6.81 | 1965 | 48.14   |  |
| 50              | 2.52 | 1863 | 93.81   | 14.95 - 15.15 | 360   | 8.82 | 2325 | 56.96   |  |
| 35              | 1.76 | 1898 | 95.57   | 15.15 - 15.35 | 275   | 6.74 | 2600 | 63.69   |  |
| 25              | 1.26 | 1923 | 96.83   | 15.35 - 15.55 | 320   | 7.84 | 2920 | 71.53   |  |
| 17              | 0.86 | 1940 | 97.68   | 15.55 - 15.75 | 237   | 5.81 | 3157 | 77.34   |  |
| 20              | 1.01 | 1960 | 98.69   | 15.75 - 15.95 | 188   | 4.61 | 3345 | 81.95   |  |
| 9               | 0.45 | 1969 | 99.14   | 15.95 - 16.15 | 219   | 5.37 | 3564 | 87.31   |  |
| 3               | 0.15 | 1972 | 99.30   | 16.15 - 16.35 | 124   | 3.04 | 3688 | 90.35   |  |
| 5               | 0.25 | 1977 | 99.55   | 16.35 - 16.55 | 120   | 2.94 | 3808 | 93.29   |  |
| 1               | 0.05 | 1978 | 99.60   | 16.55 - 16.75 | 80    | 1.96 | 3888 | 95.25   |  |
| 0               | 0.00 | 1978 | 99.60   | 16.75 - 16.95 | 55    | 1.35 | 3943 | 96.59   |  |
| 2               | 0.10 | 1980 | 99.70   | 16.95 - 17.15 | 53    | 1.30 | 3996 | 97.89   |  |
| 5               | 0.25 | 1985 | 99.95   | 17.15 - 17.35 | 29    | 0.71 | 4025 | 98.60   |  |
| 1               | 0.05 | 1986 | 100.00  | 17.35 - 17.55 | 18    | 0.44 | 4043 | 99.04   |  |
|                 |      |      |         | 17.55 - 17.75 | 12    | 0.29 | 4055 | 99.34   |  |
|                 |      |      |         | 17.75 - 17.95 | 11    | 0.27 | 4066 | 99.61   |  |
|                 |      |      |         | 17.95 - 18.15 | 9     | 0.22 | 4075 | 99.83   |  |
|                 |      |      |         | 18.15 - 18.35 | 4     | 0.10 | 4079 | 99.93   |  |
|                 |      |      |         | 18.35 - 18.55 | 3     | 0.07 | 4082 | 100.00  |  |

## (71) SITTING HEIGHT

The vertical distance between a sitting surface and the top of the head is measured with an anthropometer. The participant sits erect with the head in the Frankfurt plane. The shoulders and upper arms are relaxed, and the forearms and hands are extended forward horizontally with the palms facing each other. The thighs are parallel, and the knees are flexed 90° with the feet in line with the thighs. The measurement is taken at the maximum point of quiet respiration.

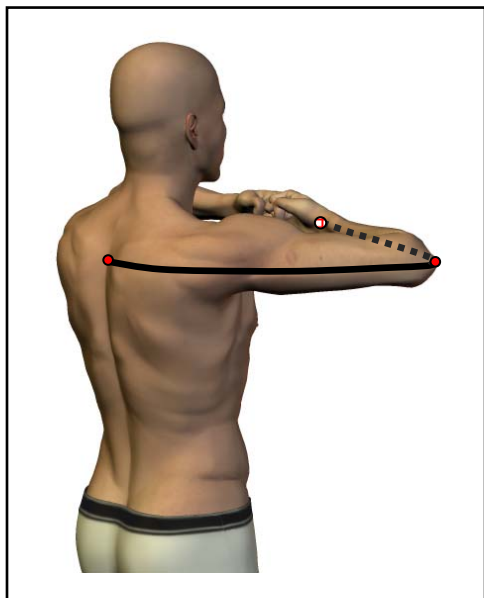
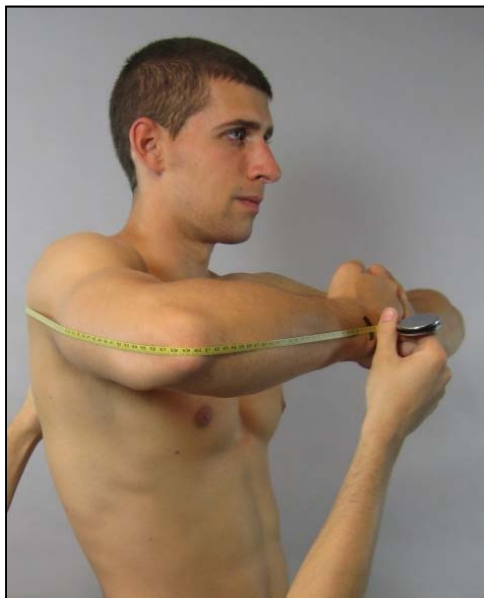


| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 78.40       | 30.87 | 1ST  | 83.50  | 32.87 |
| 79.10       | 31.14 | 2ND  | 84.50  | 33.27 |
| 79.60       | 31.34 | 3RD  | 85.10  | 33.50 |
| 80.30       | 31.61 | 5TH  | 86.00  | 33.86 |
| 81.30       | 32.01 | 10TH | 87.30  | 34.37 |
| 82.20       | 32.36 | 15TH | 88.20  | 34.72 |
| 82.80       | 32.60 | 20TH | 88.90  | 35.00 |
| 83.40       | 32.83 | 25TH | 89.40  | 35.20 |
| 83.90       | 33.03 | 30TH | 89.90  | 35.39 |
| 84.30       | 33.19 | 35TH | 90.40  | 35.59 |
| 84.80       | 33.39 | 40TH | 90.80  | 35.75 |
| 85.30       | 33.58 | 45TH | 91.30  | 35.94 |
| 85.70       | 33.74 | 50TH | 91.80  | 36.14 |
| 86.10       | 33.90 | 55TH | 92.20  | 36.30 |
| 86.50       | 34.06 | 60TH | 92.70  | 36.50 |
| 86.90       | 34.21 | 65TH | 93.20  | 36.69 |
| 87.40       | 34.41 | 70TH | 93.70  | 36.89 |
| 87.90       | 34.61 | 75TH | 94.30  | 37.13 |
| 88.50       | 34.84 | 80TH | 94.80  | 37.32 |
| 89.10       | 35.08 | 85TH | 95.50  | 37.60 |
| 90.00       | 35.43 | 90TH | 96.40  | 37.95 |
| 91.20       | 35.91 | 95TH | 97.70  | 38.46 |
| 91.90       | 36.18 | 97TH | 98.70  | 38.86 |
| 92.30       | 36.34 | 98TH | 99.20  | 39.06 |
| 93.30       | 36.73 | 99TH | 100.20 | 39.45 |



## (72) SLEEVE LENGTH: SPINE-WRIST

The horizontal surface distance from the midspine landmark, across the olecranon, center landmark at the tip of the raised right elbow, to the dorsal stylium landmark is measured with a tape. The measurement is taken while the participant holds his/her arms up in a horizontal position parallel to the standing surface and joins them by bringing the fists together at the metacarpophalangeal and proximal interphalangeal knuckles. The forearms and fists are in a straight line.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 71.60       | 28.19 | 1ST  | 80.50 | 31.69 |
| 73.20       | 28.82 | 2ND  | 81.60 | 32.13 |
| 73.80       | 29.06 | 3RD  | 82.20 | 32.36 |
| 74.60       | 29.37 | 5TH  | 83.10 | 32.72 |
| 75.90       | 29.88 | 10TH | 84.50 | 33.27 |
| 76.90       | 30.28 | 15TH | 85.30 | 33.58 |
| 77.50       | 30.51 | 20TH | 86.20 | 33.94 |
| 78.20       | 30.79 | 25TH | 86.80 | 34.17 |
| 78.70       | 30.98 | 30TH | 87.50 | 34.45 |
| 79.20       | 31.18 | 35TH | 88.00 | 34.65 |
| 79.70       | 31.38 | 40TH | 88.50 | 34.84 |
| 80.10       | 31.54 | 45TH | 89.00 | 35.04 |
| 80.50       | 31.69 | 50TH | 89.50 | 35.24 |
| 81.00       | 31.89 | 55TH | 90.00 | 35.43 |
| 81.50       | 32.09 | 60TH | 90.60 | 35.67 |
| 82.00       | 32.28 | 65TH | 91.10 | 35.87 |
| 82.50       | 32.48 | 70TH | 91.70 | 36.10 |
| 83.00       | 32.68 | 75TH | 92.20 | 36.30 |
| 83.90       | 33.03 | 80TH | 92.90 | 36.57 |
| 84.70       | 33.35 | 85TH | 93.70 | 36.89 |
| 85.70       | 33.74 | 90TH | 94.80 | 37.32 |
| 87.00       | 34.25 | 95TH | 96.30 | 37.91 |
| 88.00       | 34.65 | 97TH | 97.50 | 38.39 |
| 88.50       | 34.84 | 98TH | 98.10 | 38.62 |
| 89.80       | 35.35 | 99TH | 99.00 | 38.98 |

## (72) SLEEVE LENGTH: SPINE-WRIST

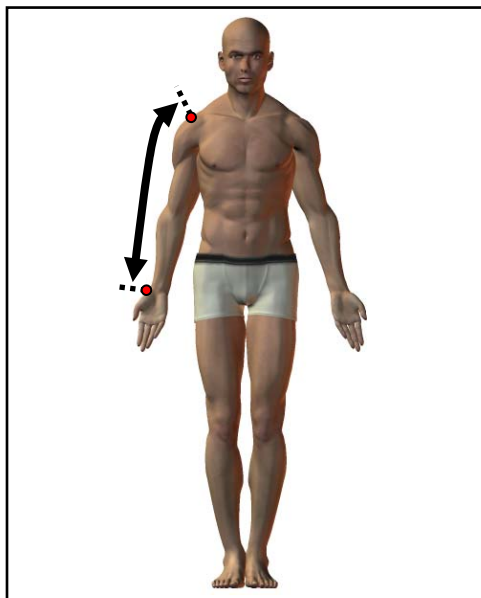
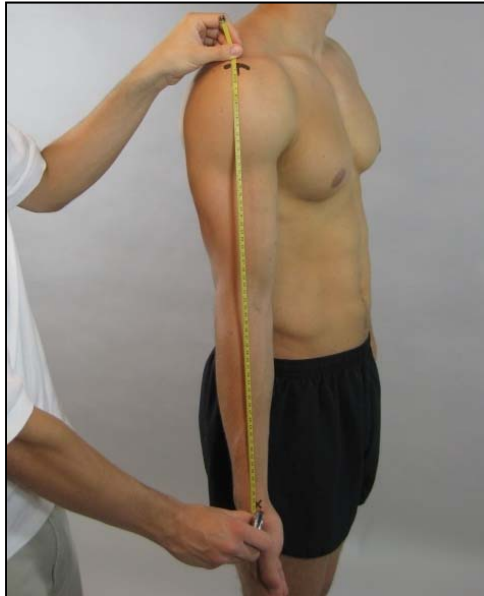
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 80.67                    |                     | 31.76 |
| 0.09                     | STD ERROR (MEAN)    | 0.03  |
| 3.79                     | STANDARD DEVIATION  | 1.49  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 63.60                    | MINIMUM             | 25.04 |
| 93.00                    | MAXIMUM             | 36.61 |
| SKEWNESS                 |                     | 0.01  |
| KURTOSIS                 |                     | 3.28  |
| COEFFICIENT OF VARIATION |                     | 4.7%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 89.58                    |                     | 35.27 |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 4.02                     | STANDARD DEVIATION  | 1.58  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 73.20                    | MINIMUM             | 28.82 |
| 105.80                   | MAXIMUM             | 41.65 |
| SKEWNESS                 |                     | 0.06  |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 4.5%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|-------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 63.55           | - | 64.55  |  |       |      |      |         |
| 0       | 0.00  | 1    | 0.05    | 64.55           | - | 65.55  |  |       |      |      |         |
| 0       | 0.00  | 1    | 0.05    | 65.55           | - | 66.55  |  |       |      |      |         |
| 1       | 0.05  | 2    | 0.10    | 66.55           | - | 67.55  |  |       |      |      |         |
| 3       | 0.15  | 5    | 0.25    | 67.55           | - | 68.55  |  |       |      |      |         |
| 3       | 0.15  | 8    | 0.40    | 68.55           | - | 69.55  |  |       |      |      |         |
| 4       | 0.20  | 12   | 0.60    | 69.55           | - | 70.55  |  |       |      |      |         |
| 7       | 0.35  | 19   | 0.96    | 70.55           | - | 71.55  |  |       |      |      |         |
| 7       | 0.35  | 26   | 1.31    | 71.55           | - | 72.55  |  |       |      |      |         |
| 25      | 1.26  | 51   | 2.57    | 72.55           | - | 73.55  |  | 1     | 0.02 | 1    | 0.02    |
| 46      | 2.32  | 97   | 4.88    | 73.55           | - | 74.55  |  | 2     | 0.05 | 3    | 0.07    |
| 72      | 3.63  | 169  | 8.51    | 74.55           | - | 75.55  |  | 0     | 0.00 | 3    | 0.07    |
| 99      | 4.98  | 268  | 13.49   | 75.55           | - | 76.55  |  | 1     | 0.02 | 4    | 0.10    |
| 132     | 6.65  | 400  | 20.14   | 76.55           | - | 77.55  |  | 4     | 0.10 | 8    | 0.20    |
| 171     | 8.61  | 571  | 28.75   | 77.55           | - | 78.55  |  | 7     | 0.17 | 15   | 0.37    |
| 198     | 9.97  | 769  | 38.72   | 78.55           | - | 79.55  |  | 9     | 0.22 | 24   | 0.59    |
| 231     | 11.63 | 1000 | 50.35   | 79.55           | - | 80.55  |  | 21    | 0.51 | 45   | 1.10    |
| 220     | 11.08 | 1220 | 61.43   | 80.55           | - | 81.55  |  | 33    | 0.81 | 78   | 1.91    |
| 201     | 10.12 | 1421 | 71.55   | 81.55           | - | 82.55  |  | 72    | 1.76 | 150  | 3.67    |
| 135     | 6.80  | 1556 | 78.35   | 82.55           | - | 83.55  |  | 106   | 2.60 | 256  | 6.27    |
| 119     | 5.99  | 1675 | 84.34   | 83.55           | - | 84.55  |  | 157   | 3.85 | 413  | 10.12   |
| 100     | 5.04  | 1775 | 89.38   | 84.55           | - | 85.55  |  | 246   | 6.03 | 659  | 16.14   |
| 90      | 4.53  | 1865 | 93.91   | 85.55           | - | 86.55  |  | 272   | 6.66 | 931  | 22.81   |
| 49      | 2.47  | 1914 | 96.37   | 86.55           | - | 87.55  |  | 334   | 8.18 | 1265 | 30.99   |
| 35      | 1.76  | 1949 | 98.14   | 87.55           | - | 88.55  |  | 391   | 9.58 | 1656 | 40.57   |
| 15      | 0.76  | 1964 | 98.89   | 88.55           | - | 89.55  |  | 403   | 9.87 | 2059 | 50.44   |
| 11      | 0.55  | 1975 | 99.45   | 89.55           | - | 90.55  |  | 387   | 9.48 | 2446 | 59.92   |
| 7       | 0.35  | 1982 | 99.80   | 90.55           | - | 91.55  |  | 371   | 9.09 | 2817 | 69.01   |
| 3       | 0.15  | 1985 | 99.95   | 91.55           | - | 92.55  |  | 378   | 9.26 | 3195 | 78.27   |
| 1       | 0.05  | 1986 | 100.00  | 92.55           | - | 93.55  |  | 256   | 6.27 | 3451 | 84.54   |
|         |       |      |         | 93.55           | - | 94.55  |  | 197   | 4.83 | 3648 | 89.37   |
|         |       |      |         | 94.55           | - | 95.55  |  | 142   | 3.48 | 3790 | 92.85   |
|         |       |      |         | 95.55           | - | 96.55  |  | 110   | 2.69 | 3900 | 95.54   |
|         |       |      |         | 96.55           | - | 97.55  |  | 65    | 1.59 | 3965 | 97.13   |
|         |       |      |         | 97.55           | - | 98.55  |  | 59    | 1.45 | 4024 | 98.58   |
|         |       |      |         | 98.55           | - | 99.55  |  | 28    | 0.69 | 4052 | 99.27   |
|         |       |      |         | 99.55           | - | 100.55 |  | 13    | 0.32 | 4065 | 99.58   |
|         |       |      |         | 100.55          | - | 101.55 |  | 12    | 0.29 | 4077 | 99.88   |
|         |       |      |         | 101.55          | - | 102.55 |  | 1     | 0.02 | 4078 | 99.90   |
|         |       |      |         | 102.55          | - | 103.55 |  | 2     | 0.05 | 4080 | 99.95   |
|         |       |      |         | 103.55          | - | 104.55 |  | 1     | 0.02 | 4081 | 99.98   |
|         |       |      |         | 104.55          | - | 105.55 |  | 0     | 0.00 | 4081 | 99.98   |
|         |       |      |         | 105.55          | - | 106.55 |  | 1     | 0.02 | 4082 | 100.00  |

### (73) SLEEVE OUTSEAM

The straight-line distance between the right acromion landmark and the stylium landmark is measured with a tape. The participant stands erect with both arms straight at the sides with the hands straight and the palms facing forward.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 47.60       | 18.74 | 1ST  | 52.20 | 20.55 |
| 48.70       | 19.17 | 2ND  | 53.10 | 20.91 |
| 49.00       | 19.29 | 3RD  | 53.60 | 21.10 |
| 49.70       | 19.57 | 5TH  | 54.50 | 21.46 |
| 50.60       | 19.92 | 10TH | 55.40 | 21.81 |
| 51.40       | 20.24 | 15TH | 56.10 | 22.09 |
| 52.00       | 20.47 | 20TH | 56.80 | 22.36 |
| 52.50       | 20.67 | 25TH | 57.20 | 22.52 |
| 52.80       | 20.79 | 30TH | 57.60 | 22.68 |
| 53.20       | 20.94 | 35TH | 58.10 | 22.87 |
| 53.50       | 21.06 | 40TH | 58.50 | 23.03 |
| 54.00       | 21.26 | 45TH | 58.90 | 23.19 |
| 54.20       | 21.34 | 50TH | 59.20 | 23.31 |
| 54.50       | 21.46 | 55TH | 59.60 | 23.46 |
| 55.00       | 21.65 | 60TH | 60.00 | 23.62 |
| 55.50       | 21.85 | 65TH | 60.50 | 23.82 |
| 55.80       | 21.97 | 70TH | 60.80 | 23.94 |
| 56.30       | 22.17 | 75TH | 61.20 | 24.09 |
| 56.80       | 22.36 | 80TH | 61.80 | 24.33 |
| 57.40       | 22.60 | 85TH | 62.50 | 24.61 |
| 58.10       | 22.87 | 90TH | 63.40 | 24.96 |
| 59.40       | 23.39 | 95TH | 64.50 | 25.39 |
| 60.20       | 23.70 | 97TH | 65.30 | 25.71 |
| 60.50       | 23.82 | 98TH | 66.00 | 25.98 |
| 61.10       | 24.06 | 99TH | 67.00 | 26.38 |

## (73) SLEEVE OUTSEAM

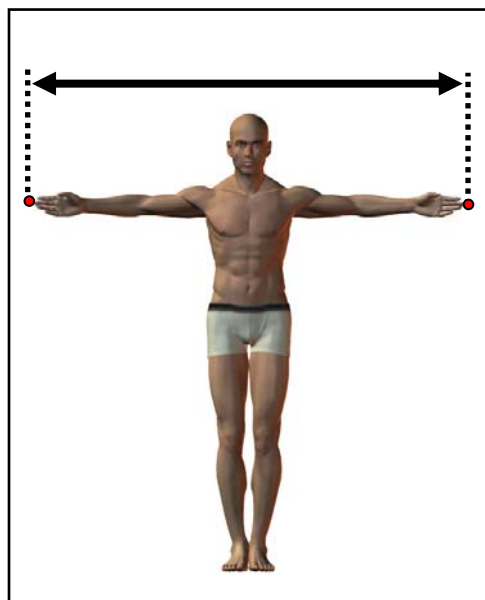
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 54.36                    |                     | 21.40 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 2.94                     | STANDARD DEVIATION  | 1.16  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 41.00                    | MINIMUM             | 16.14 |
| 66.20                    | MAXIMUM             | 26.06 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.30  |
| COEFFICIENT OF VARIATION |                     | 5.4%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 59.31                    |                     | 23.35 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 3.08                     | STANDARD DEVIATION  | 1.21  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 48.80                    | MINIMUM             | 19.21 |
| 70.90                    | MAXIMUM             | 27.91 |
| SKEWNESS                 |                     | 0.13  |
| KURTOSIS                 |                     | 3.13  |
| COEFFICIENT OF VARIATION |                     | 5.2%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |       |  | MALES |       |      |         |
|---------|-------|------|---------|-----------------|---|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |       |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 40.75           | - | 41.50 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 41.50           | - | 42.25 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 42.25           | - | 43.00 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 43.00           | - | 43.75 |  |       |       |      |         |
| 1       | 0.05  | 2    | 0.10    | 43.75           | - | 44.50 |  |       |       |      |         |
| 1       | 0.05  | 3    | 0.15    | 44.50           | - | 45.25 |  |       |       |      |         |
| 3       | 0.15  | 6    | 0.30    | 45.25           | - | 46.00 |  |       |       |      |         |
| 6       | 0.30  | 12   | 0.60    | 46.00           | - | 46.75 |  |       |       |      |         |
| 2       | 0.10  | 14   | 0.70    | 46.75           | - | 47.50 |  |       |       |      |         |
| 12      | 0.60  | 26   | 1.31    | 47.50           | - | 48.25 |  |       |       |      |         |
| 26      | 1.31  | 52   | 2.62    | 48.25           | - | 49.00 |  |       |       |      |         |
| 52      | 2.62  | 104  | 5.24    | 49.00           | - | 49.75 |  | 1     | 0.02  | 1    | 0.02    |
| 64      | 3.22  | 168  | 8.46    | 49.75           | - | 50.50 |  | 2     | 0.05  | 3    | 0.07    |
| 118     | 5.94  | 286  | 14.40   | 50.50           | - | 51.25 |  | 1     | 0.02  | 4    | 0.10    |
| 101     | 5.09  | 387  | 19.49   | 51.25           | - | 52.00 |  | 12    | 0.29  | 16   | 0.39    |
| 188     | 9.47  | 575  | 28.95   | 52.00           | - | 52.75 |  | 14    | 0.34  | 30   | 0.73    |
| 171     | 8.61  | 746  | 37.56   | 52.75           | - | 53.50 |  | 32    | 0.78  | 62   | 1.52    |
| 266     | 13.39 | 1012 | 50.96   | 53.50           | - | 54.25 |  | 39    | 0.96  | 101  | 2.47    |
| 170     | 8.56  | 1182 | 59.52   | 54.25           | - | 55.00 |  | 74    | 1.81  | 175  | 4.29    |
| 199     | 10.02 | 1381 | 69.54   | 55.00           | - | 55.75 |  | 121   | 2.96  | 296  | 7.25    |
| 125     | 6.29  | 1506 | 75.83   | 55.75           | - | 56.50 |  | 199   | 4.88  | 495  | 12.13   |
| 168     | 8.46  | 1674 | 84.29   | 56.50           | - | 57.25 |  | 197   | 4.83  | 692  | 16.95   |
| 90      | 4.53  | 1764 | 88.82   | 57.25           | - | 58.00 |  | 343   | 8.40  | 1035 | 25.36   |
| 73      | 3.68  | 1837 | 92.50   | 58.00           | - | 58.75 |  | 296   | 7.25  | 1331 | 32.61   |
| 51      | 2.57  | 1888 | 95.07   | 58.75           | - | 59.50 |  | 447   | 10.95 | 1778 | 43.56   |
| 42      | 2.11  | 1930 | 97.18   | 59.50           | - | 60.25 |  | 346   | 8.48  | 2124 | 52.03   |
| 27      | 1.36  | 1957 | 98.54   | 60.25           | - | 61.00 |  | 460   | 11.27 | 2584 | 63.30   |
| 17      | 0.86  | 1974 | 99.40   | 61.00           | - | 61.75 |  | 297   | 7.28  | 2881 | 70.58   |
| 4       | 0.20  | 1978 | 99.60   | 61.75           | - | 62.50 |  | 371   | 9.09  | 3252 | 79.67   |
| 4       | 0.20  | 1982 | 99.80   | 62.50           | - | 63.25 |  | 196   | 4.80  | 3448 | 84.47   |
| 2       | 0.10  | 1984 | 99.90   | 63.25           | - | 64.00 |  | 209   | 5.12  | 3657 | 89.59   |
| 1       | 0.05  | 1985 | 99.95   | 64.00           | - | 64.75 |  | 126   | 3.09  | 3783 | 92.68   |
| 0       | 0.00  | 1985 | 99.95   | 64.75           | - | 65.50 |  | 120   | 2.94  | 3903 | 95.61   |
| 1       | 0.05  | 1986 | 100.00  | 65.50           | - | 66.25 |  | 67    | 1.64  | 3970 | 97.26   |
|         |       |      |         | 66.25           | - | 67.00 |  | 45    | 1.10  | 4015 | 98.36   |
|         |       |      |         | 67.00           | - | 67.75 |  | 25    | 0.61  | 4040 | 98.97   |
|         |       |      |         | 67.75           | - | 68.50 |  | 21    | 0.51  | 4061 | 99.49   |
|         |       |      |         | 68.50           | - | 69.25 |  | 7     | 0.17  | 4068 | 99.66   |
|         |       |      |         | 69.25           | - | 70.00 |  | 8     | 0.20  | 4076 | 99.85   |
|         |       |      |         | 70.00           | - | 70.75 |  | 4     | 0.10  | 4080 | 99.95   |
|         |       |      |         | 70.75           | - | 71.50 |  | 1     | 0.02  | 4081 | 99.98   |
|         |       |      |         |                 |   |       |  | 1     | 0.02  | 4082 | 100.00  |

## (74) SPAN

The distance between the tips of the middle fingers (dactylion III) of the horizontally outstretched arms is measured on a wall chart. The participant stands erect with the back against a wall-mounted scale and the heels together. Both arms and hands are stretched horizontally along the wall with the tip of the middle finger of one hand just touching a side wall. A block is placed at the tip of the middle finger of the other hand to establish the measurement on the scale. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 148.00      | 58.27 | 1ST  | 162.70 | 64.06 |
| 150.20      | 59.13 | 2ND  | 165.10 | 65.00 |
| 151.30      | 59.57 | 3RD  | 166.30 | 65.47 |
| 152.90      | 60.20 | 5TH  | 168.00 | 66.14 |
| 155.50      | 61.22 | 10TH | 170.70 | 67.20 |
| 157.70      | 62.09 | 15TH | 172.50 | 67.91 |
| 159.10      | 62.64 | 20TH | 174.30 | 68.62 |
| 160.50      | 63.19 | 25TH | 175.70 | 69.17 |
| 161.70      | 63.66 | 30TH | 177.00 | 69.69 |
| 162.60      | 64.02 | 35TH | 178.00 | 70.08 |
| 163.60      | 64.41 | 40TH | 179.20 | 70.55 |
| 164.60      | 64.80 | 45TH | 180.20 | 70.94 |
| 165.70      | 65.24 | 50TH | 181.20 | 71.34 |
| 166.70      | 65.63 | 55TH | 182.20 | 71.73 |
| 167.80      | 66.06 | 60TH | 183.20 | 72.13 |
| 168.80      | 66.46 | 65TH | 184.40 | 72.60 |
| 170.00      | 66.93 | 70TH | 185.60 | 73.07 |
| 171.30      | 67.44 | 75TH | 186.90 | 73.58 |
| 172.80      | 68.03 | 80TH | 188.30 | 74.13 |
| 174.50      | 68.70 | 85TH | 189.90 | 74.76 |
| 177.10      | 69.72 | 90TH | 192.30 | 75.71 |
| 180.30      | 70.98 | 95TH | 195.70 | 77.05 |
| 182.40      | 71.81 | 97TH | 198.20 | 78.03 |
| 183.80      | 72.36 | 98TH | 199.70 | 78.62 |
| 186.20      | 73.31 | 99TH | 203.20 | 80.00 |

(74) SPAN

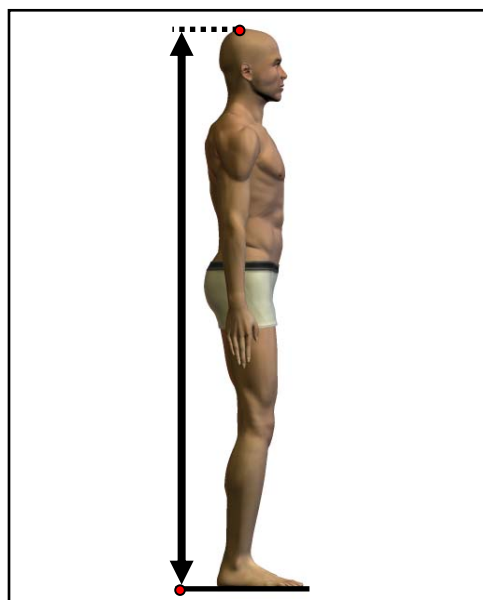
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 166.03                   | MEAN                | 65.37 |
| 0.19                     | STD ERROR (MEAN)    | 0.07  |
| 8.30                     | STANDARD DEVIATION  | 3.27  |
| 0.13                     | STD ERROR (STD DEV) | 0.05  |
| 132.30                   | MINIMUM             | 52.09 |
| 193.80                   | MAXIMUM             | 76.30 |
| SKEWNESS                 |                     | 0.17  |
| KURTOSIS                 |                     | 3.15  |
| COEFFICIENT OF VARIATION |                     | 5.0%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 181.42                   | MEAN                | 71.42 |
| 0.13                     | STD ERROR (MEAN)    | 0.05  |
| 8.46                     | STANDARD DEVIATION  | 3.33  |
| 0.09                     | STD ERROR (STD DEV) | 0.04  |
| 150.10                   | MINIMUM             | 59.09 |
| 212.10                   | MAXIMUM             | 83.50 |
| SKEWNESS                 |                     | 0.17  |
| KURTOSIS                 |                     | 3.13  |
| COEFFICIENT OF VARIATION |                     | 4.7%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |       |      |         | FREQUENCY TABLE |   |        |  | MALES |       |      |         |
|---------|-------|------|---------|-----------------|---|--------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM              |   |        |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 131.55          | - | 133.55 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 133.55          | - | 135.55 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 135.55          | - | 137.55 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 137.55          | - | 139.55 |  |       |       |      |         |
| 2       | 0.10  | 3    | 0.15    | 139.55          | - | 141.55 |  |       |       |      |         |
| 5       | 0.25  | 8    | 0.40    | 141.55          | - | 143.55 |  |       |       |      |         |
| 5       | 0.25  | 13   | 0.65    | 143.55          | - | 145.55 |  |       |       |      |         |
| 4       | 0.20  | 17   | 0.86    | 145.55          | - | 147.55 |  |       |       |      |         |
| 12      | 0.60  | 29   | 1.46    | 147.55          | - | 149.55 |  |       |       |      |         |
| 38      | 1.91  | 67   | 3.37    | 149.55          | - | 151.55 |  | 1     | 0.02  | 1    | 0.02    |
| 65      | 3.27  | 132  | 6.65    | 151.55          | - | 153.55 |  | 0     | 0.00  | 1    | 0.02    |
| 67      | 3.37  | 199  | 10.02   | 153.55          | - | 155.55 |  | 3     | 0.07  | 4    | 0.10    |
| 86      | 4.33  | 285  | 14.35   | 155.55          | - | 157.55 |  | 2     | 0.05  | 6    | 0.15    |
| 142     | 7.15  | 427  | 21.50   | 157.55          | - | 159.55 |  | 8     | 0.20  | 14   | 0.34    |
| 158     | 7.96  | 585  | 29.46   | 159.55          | - | 161.55 |  | 14    | 0.34  | 28   | 0.69    |
| 207     | 10.42 | 792  | 39.88   | 161.55          | - | 163.55 |  | 23    | 0.56  | 51   | 1.25    |
| 192     | 9.67  | 984  | 49.55   | 163.55          | - | 165.55 |  | 43    | 1.05  | 94   | 2.30    |
| 183     | 9.21  | 1167 | 58.76   | 165.55          | - | 167.55 |  | 81    | 1.98  | 175  | 4.29    |
| 185     | 9.32  | 1352 | 68.08   | 167.55          | - | 169.55 |  | 138   | 3.38  | 313  | 7.67    |
| 162     | 8.16  | 1514 | 76.23   | 169.55          | - | 171.55 |  | 193   | 4.73  | 506  | 12.40   |
| 114     | 5.74  | 1628 | 81.97   | 171.55          | - | 173.55 |  | 220   | 5.39  | 726  | 17.79   |
| 104     | 5.24  | 1732 | 87.21   | 173.55          | - | 175.55 |  | 270   | 6.61  | 996  | 24.40   |
| 71      | 3.58  | 1803 | 90.79   | 175.55          | - | 177.55 |  | 328   | 8.04  | 1324 | 32.44   |
| 56      | 2.82  | 1859 | 93.61   | 177.55          | - | 179.55 |  | 363   | 8.89  | 1687 | 41.33   |
| 51      | 2.57  | 1910 | 96.17   | 179.55          | - | 181.55 |  | 421   | 10.31 | 2108 | 51.64   |
| 28      | 1.41  | 1938 | 97.58   | 181.55          | - | 183.55 |  | 383   | 9.38  | 2491 | 61.02   |
| 24      | 1.21  | 1962 | 98.79   | 183.55          | - | 185.55 |  | 351   | 8.60  | 2842 | 69.62   |
| 12      | 0.60  | 1974 | 99.40   | 185.55          | - | 187.55 |  | 309   | 7.57  | 3151 | 77.19   |
| 5       | 0.25  | 1979 | 99.65   | 187.55          | - | 189.55 |  | 267   | 6.54  | 3418 | 83.73   |
| 1       | 0.05  | 1980 | 99.70   | 189.55          | - | 191.55 |  | 195   | 4.78  | 3613 | 88.51   |
| 5       | 0.25  | 1985 | 99.95   | 191.55          | - | 193.55 |  | 151   | 3.70  | 3764 | 92.21   |
| 1       | 0.05  | 1986 | 100.00  | 193.55          | - | 195.55 |  | 105   | 2.57  | 3869 | 94.78   |
|         |       |      |         | 195.55          | - | 197.55 |  | 70    | 1.71  | 3939 | 96.50   |
|         |       |      |         | 197.55          | - | 199.55 |  | 53    | 1.30  | 3992 | 97.80   |
|         |       |      |         | 199.55          | - | 201.55 |  | 41    | 1.00  | 4033 | 98.80   |
|         |       |      |         | 201.55          | - | 203.55 |  | 19    | 0.47  | 4052 | 99.27   |
|         |       |      |         | 203.55          | - | 205.55 |  | 12    | 0.29  | 4064 | 99.56   |
|         |       |      |         | 205.55          | - | 207.55 |  | 7     | 0.17  | 4071 | 99.73   |
|         |       |      |         | 207.55          | - | 209.55 |  | 6     | 0.15  | 4077 | 99.88   |
|         |       |      |         | 209.55          | - | 211.55 |  | 4     | 0.10  | 4081 | 99.98   |
|         |       |      |         | 211.55          | - | 213.55 |  | 1     | 0.02  | 4082 | 100.00  |

## (75) STATURE

The vertical distance from a standing surface to the top of the head is measured with an anthropometer. The participant stands erect with the head in the Frankfurt plane. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 148.00      | 58.27 | 1ST  | 160.00 | 62.99 |
| 149.80      | 58.98 | 2ND  | 162.10 | 63.82 |
| 150.90      | 59.41 | 3RD  | 163.40 | 64.33 |
| 152.50      | 60.04 | 5TH  | 164.80 | 64.88 |
| 154.70      | 60.91 | 10TH | 166.90 | 65.71 |
| 156.30      | 61.54 | 15TH | 168.50 | 66.34 |
| 157.50      | 62.01 | 20TH | 169.90 | 66.89 |
| 158.60      | 62.44 | 25TH | 171.00 | 67.32 |
| 159.50      | 62.80 | 30TH | 172.00 | 67.72 |
| 160.30      | 63.11 | 35TH | 172.90 | 68.07 |
| 161.10      | 63.43 | 40TH | 173.80 | 68.43 |
| 161.70      | 63.66 | 45TH | 174.50 | 68.70 |
| 162.60      | 64.02 | 50TH | 175.50 | 69.09 |
| 163.40      | 64.33 | 55TH | 176.40 | 69.45 |
| 164.30      | 64.69 | 60TH | 177.30 | 69.80 |
| 165.30      | 65.08 | 65TH | 178.20 | 70.16 |
| 166.10      | 65.39 | 70TH | 179.10 | 70.51 |
| 167.20      | 65.83 | 75TH | 180.20 | 70.94 |
| 168.10      | 66.18 | 80TH | 181.30 | 71.38 |
| 169.60      | 66.77 | 85TH | 182.70 | 71.93 |
| 171.30      | 67.44 | 90TH | 184.40 | 72.60 |
| 174.00      | 68.50 | 95TH | 187.00 | 73.62 |
| 175.20      | 68.98 | 97TH | 189.00 | 74.41 |
| 176.60      | 69.53 | 98TH | 190.50 | 75.00 |
| 178.10      | 70.12 | 99TH | 192.70 | 75.87 |

## (75) STATURE

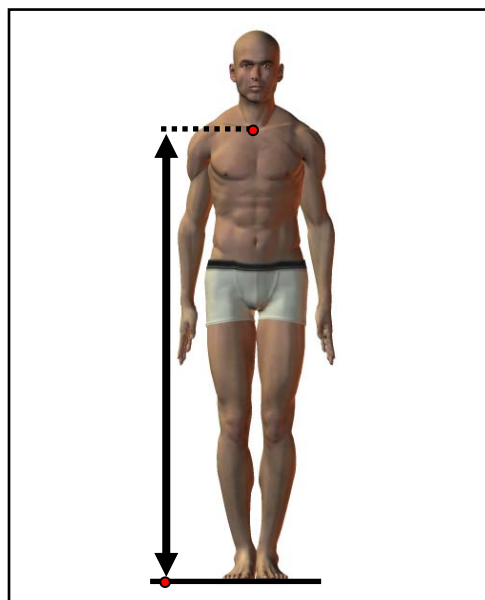
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 162.85                   |                     | 64.11 |
| 0.14                     | STD ERROR (MEAN)    | 0.06  |
| 6.42                     | STANDARD DEVIATION  | 2.53  |
| 0.10                     | STD ERROR (STD DEV) | 0.04  |
| 140.90                   | MINIMUM             | 55.47 |
| 182.90                   | MAXIMUM             | 72.01 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.01  |
| COEFFICIENT OF VARIATION |                     | 3.9%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 175.62                   |                     | 69.14 |
| 0.11                     | STD ERROR (MEAN)    | 0.04  |
| 6.86                     | STANDARD DEVIATION  | 2.70  |
| 0.08                     | STD ERROR (STD DEV) | 0.03  |
| 149.10                   | MINIMUM             | 58.70 |
| 199.30                   | MAXIMUM             | 78.46 |
| SKEWNESS                 |                     | 0.11  |
| KURTOSIS                 |                     | 3.07  |
| COEFFICIENT OF VARIATION |                     | 3.9%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 139.75          | - | 141.25 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 141.25          | - | 142.75 |  |       |      |      |         |
| 3       | 0.15 | 4    | 0.20    | 142.75          | - | 144.25 |  |       |      |      |         |
| 3       | 0.15 | 7    | 0.35    | 144.25          | - | 145.75 |  |       |      |      |         |
| 7       | 0.35 | 14   | 0.70    | 145.75          | - | 147.25 |  |       |      |      |         |
| 8       | 0.40 | 22   | 1.11    | 147.25          | - | 148.75 |  |       |      |      |         |
| 26      | 1.31 | 48   | 2.42    | 148.75          | - | 150.25 |  | 1     | 0.02 | 1    | 0.02    |
| 27      | 1.36 | 75   | 3.78    | 150.25          | - | 151.75 |  | 0     | 0.00 | 1    | 0.02    |
| 54      | 2.72 | 129  | 6.50    | 151.75          | - | 153.25 |  | 1     | 0.02 | 2    | 0.05    |
| 71      | 3.58 | 200  | 10.07   | 153.25          | - | 154.75 |  | 1     | 0.02 | 3    | 0.07    |
| 92      | 4.63 | 292  | 14.70   | 154.75          | - | 156.25 |  | 1     | 0.02 | 4    | 0.10    |
| 123     | 6.19 | 415  | 20.90   | 156.25          | - | 157.75 |  | 14    | 0.34 | 18   | 0.44    |
| 155     | 7.80 | 570  | 28.70   | 157.75          | - | 159.25 |  | 13    | 0.32 | 31   | 0.76    |
| 182     | 9.16 | 752  | 37.87   | 159.25          | - | 160.75 |  | 22    | 0.54 | 53   | 1.30    |
| 196     | 9.87 | 948  | 47.73   | 160.75          | - | 162.25 |  | 34    | 0.83 | 87   | 2.13    |
| 189     | 9.52 | 1137 | 57.25   | 162.25          | - | 163.75 |  | 56    | 1.37 | 143  | 3.50    |
| 152     | 7.65 | 1289 | 64.90   | 163.75          | - | 165.25 |  | 100   | 2.45 | 243  | 5.95    |
| 161     | 8.11 | 1450 | 73.01   | 165.25          | - | 166.75 |  | 144   | 3.53 | 387  | 9.48    |
| 149     | 7.50 | 1599 | 80.51   | 166.75          | - | 168.25 |  | 201   | 4.92 | 588  | 14.40   |
| 99      | 4.98 | 1698 | 85.50   | 168.25          | - | 169.75 |  | 212   | 5.19 | 800  | 19.60   |
| 88      | 4.43 | 1786 | 89.93   | 169.75          | - | 171.25 |  | 269   | 6.59 | 1069 | 26.19   |
| 59      | 2.97 | 1845 | 92.90   | 171.25          | - | 172.75 |  | 333   | 8.16 | 1402 | 34.35   |
| 48      | 2.42 | 1893 | 95.32   | 172.75          | - | 174.25 |  | 352   | 8.62 | 1754 | 42.97   |
| 42      | 2.11 | 1935 | 97.43   | 174.25          | - | 175.75 |  | 337   | 8.26 | 2091 | 51.22   |
| 25      | 1.26 | 1960 | 98.69   | 175.75          | - | 177.25 |  | 341   | 8.35 | 2432 | 59.58   |
| 11      | 0.55 | 1971 | 99.24   | 177.25          | - | 178.75 |  | 344   | 8.43 | 2776 | 68.01   |
| 7       | 0.35 | 1978 | 99.60   | 178.75          | - | 180.25 |  | 299   | 7.32 | 3075 | 75.33   |
| 2       | 0.10 | 1980 | 99.70   | 180.25          | - | 181.75 |  | 261   | 6.39 | 3336 | 81.72   |
| 6       | 0.30 | 1986 | 100.00  | 181.75          | - | 183.25 |  | 208   | 5.10 | 3544 | 86.82   |
|         |      |      |         | 183.25          | - | 184.75 |  | 166   | 4.07 | 3710 | 90.89   |
|         |      |      |         | 184.75          | - | 186.25 |  | 125   | 3.06 | 3835 | 93.95   |
|         |      |      |         | 186.25          | - | 187.75 |  | 81    | 1.98 | 3916 | 95.93   |
|         |      |      |         | 187.75          | - | 189.25 |  | 52    | 1.27 | 3968 | 97.21   |
|         |      |      |         | 189.25          | - | 190.75 |  | 40    | 0.98 | 4008 | 98.19   |
|         |      |      |         | 190.75          | - | 192.25 |  | 20    | 0.49 | 4028 | 98.68   |
|         |      |      |         | 192.25          | - | 193.75 |  | 26    | 0.64 | 4054 | 99.31   |
|         |      |      |         | 193.75          | - | 195.25 |  | 14    | 0.34 | 4068 | 99.66   |
|         |      |      |         | 195.25          | - | 196.75 |  | 8     | 0.20 | 4076 | 99.85   |
|         |      |      |         | 196.75          | - | 198.25 |  | 5     | 0.12 | 4081 | 99.98   |
|         |      |      |         | 198.25          | - | 199.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (76) SUPRASTERNALE HEIGHT

The vertical distance between a standing surface and the suprasternale landmark is measured with an anthropometer. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 119.80      | 47.17 | 1ST  | 130.00 | 51.18 |
| 121.50      | 47.83 | 2ND  | 131.70 | 51.85 |
| 122.40      | 48.19 | 3RD  | 132.70 | 52.24 |
| 123.60      | 48.66 | 5TH  | 134.10 | 52.80 |
| 125.90      | 49.57 | 10TH | 136.00 | 53.54 |
| 127.20      | 50.08 | 15TH | 137.40 | 54.09 |
| 128.40      | 50.55 | 20TH | 138.80 | 54.65 |
| 129.30      | 50.91 | 25TH | 139.80 | 55.04 |
| 130.00      | 51.18 | 30TH | 140.70 | 55.39 |
| 130.80      | 51.50 | 35TH | 141.50 | 55.71 |
| 131.30      | 51.69 | 40TH | 142.20 | 55.98 |
| 132.00      | 51.97 | 45TH | 143.00 | 56.30 |
| 132.60      | 52.20 | 50TH | 143.70 | 56.57 |
| 133.30      | 52.48 | 55TH | 144.50 | 56.89 |
| 134.30      | 52.87 | 60TH | 145.30 | 57.20 |
| 135.00      | 53.15 | 65TH | 146.10 | 57.52 |
| 135.90      | 53.50 | 70TH | 146.80 | 57.80 |
| 136.70      | 53.82 | 75TH | 147.80 | 58.19 |
| 137.70      | 54.21 | 80TH | 148.90 | 58.62 |
| 138.90      | 54.69 | 85TH | 150.20 | 59.13 |
| 140.50      | 55.31 | 90TH | 151.70 | 59.72 |
| 142.80      | 56.22 | 95TH | 154.00 | 60.63 |
| 144.10      | 56.73 | 97TH | 155.70 | 61.30 |
| 145.30      | 57.20 | 98TH | 157.60 | 62.05 |
| 146.80      | 57.80 | 99TH | 159.20 | 62.68 |

## (76) SUPRASTERNALE HEIGHT

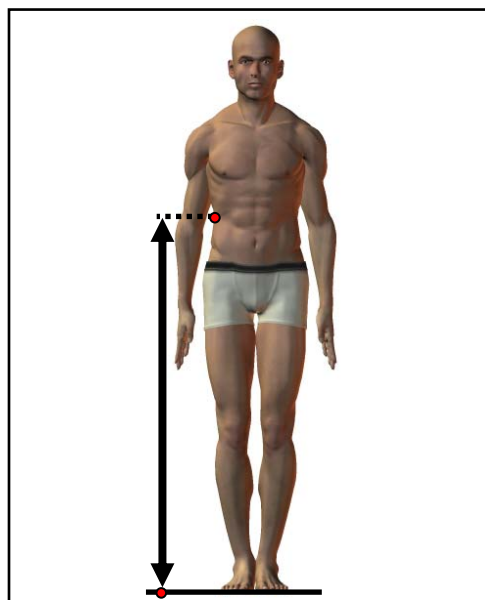
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 132.97                   | MEAN                | 52.35 |
| 0.13                     | STD ERROR (MEAN)    | 0.05  |
| 5.72                     | STANDARD DEVIATION  | 2.25  |
| 0.09                     | STD ERROR (STD DEV) | 0.04  |
| 113.10                   | MINIMUM             | 44.53 |
| 151.60                   | MAXIMUM             | 59.69 |
| SKEWNESS                 |                     | 0.09  |
| KURTOSIS                 |                     | 3.08  |
| COEFFICIENT OF VARIATION |                     | 4.3%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 143.86                   | MEAN                | 56.64 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 6.12                     | STANDARD DEVIATION  | 2.41  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 119.20                   | MINIMUM             | 46.93 |
| 165.00                   | MAXIMUM             | 64.96 |
| SKEWNESS                 |                     | 0.12  |
| KURTOSIS                 |                     | 3.10  |
| COEFFICIENT OF VARIATION |                     | 4.3%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |        |   |        |  |       |      |      |         |
|-----------------|------|------|---------|--------|---|--------|--|-------|------|------|---------|
| FEMALES         |      |      |         |        |   |        |  | MALES |      |      |         |
| F               | FPct | CumF | CumFPct | CM     |   |        |  | F     | FPct | CumF | CumFPct |
| 1               | 0.05 | 1    | 0.05    | 112.55 | - | 113.55 |  |       |      |      |         |
| 1               | 0.05 | 2    | 0.10    | 113.55 | - | 114.55 |  |       |      |      |         |
| 1               | 0.05 | 3    | 0.15    | 114.55 | - | 115.55 |  |       |      |      |         |
| 1               | 0.05 | 4    | 0.20    | 115.55 | - | 116.55 |  |       |      |      |         |
| 4               | 0.20 | 8    | 0.40    | 116.55 | - | 117.55 |  |       |      |      |         |
| 5               | 0.25 | 13   | 0.65    | 117.55 | - | 118.55 |  |       |      |      |         |
| 3               | 0.15 | 16   | 0.81    | 118.55 | - | 119.55 |  | 1     | 0.02 | 1    | 0.02    |
| 11              | 0.55 | 27   | 1.36    | 119.55 | - | 120.55 |  | 0     | 0.00 | 1    | 0.02    |
| 14              | 0.70 | 41   | 2.06    | 120.55 | - | 121.55 |  | 0     | 0.00 | 1    | 0.02    |
| 26              | 1.31 | 67   | 3.37    | 121.55 | - | 122.55 |  | 0     | 0.00 | 1    | 0.02    |
| 28              | 1.41 | 95   | 4.78    | 122.55 | - | 123.55 |  | 0     | 0.00 | 1    | 0.02    |
| 35              | 1.76 | 130  | 6.55    | 123.55 | - | 124.55 |  | 1     | 0.02 | 2    | 0.05    |
| 47              | 2.37 | 177  | 8.91    | 124.55 | - | 125.55 |  | 0     | 0.00 | 2    | 0.05    |
| 71              | 3.58 | 248  | 12.49   | 125.55 | - | 126.55 |  | 3     | 0.07 | 5    | 0.12    |
| 89              | 4.48 | 337  | 16.97   | 126.55 | - | 127.55 |  | 10    | 0.24 | 15   | 0.37    |
| 74              | 3.73 | 411  | 20.69   | 127.55 | - | 128.55 |  | 10    | 0.24 | 25   | 0.61    |
| 130             | 6.55 | 541  | 27.24   | 128.55 | - | 129.55 |  | 9     | 0.22 | 34   | 0.83    |
| 123             | 6.19 | 664  | 33.43   | 129.55 | - | 130.55 |  | 16    | 0.39 | 50   | 1.22    |
| 167             | 8.41 | 831  | 41.84   | 130.55 | - | 131.55 |  | 30    | 0.73 | 80   | 1.96    |
| 147             | 7.40 | 978  | 49.24   | 131.55 | - | 132.55 |  | 37    | 0.91 | 117  | 2.87    |
| 140             | 7.05 | 1118 | 56.29   | 132.55 | - | 133.55 |  | 48    | 1.18 | 165  | 4.04    |
| 118             | 5.94 | 1236 | 62.24   | 133.55 | - | 134.55 |  | 66    | 1.62 | 231  | 5.66    |
| 120             | 6.04 | 1356 | 68.28   | 134.55 | - | 135.55 |  | 105   | 2.57 | 336  | 8.23    |
| 119             | 5.99 | 1475 | 74.27   | 135.55 | - | 136.55 |  | 134   | 3.28 | 470  | 11.51   |
| 100             | 5.04 | 1575 | 79.31   | 136.55 | - | 137.55 |  | 158   | 3.87 | 628  | 15.38   |
| 88              | 4.43 | 1663 | 83.74   | 137.55 | - | 138.55 |  | 169   | 4.14 | 797  | 19.52   |
| 70              | 3.52 | 1733 | 87.26   | 138.55 | - | 139.55 |  | 170   | 4.16 | 967  | 23.69   |
| 57              | 2.87 | 1790 | 90.13   | 139.55 | - | 140.55 |  | 220   | 5.39 | 1187 | 29.08   |
| 51              | 2.57 | 1841 | 92.70   | 140.55 | - | 141.55 |  | 266   | 6.52 | 1453 | 35.60   |
| 38              | 1.91 | 1879 | 94.61   | 141.55 | - | 142.55 |  | 268   | 6.57 | 1721 | 42.16   |
| 38              | 1.91 | 1917 | 96.53   | 142.55 | - | 143.55 |  | 302   | 7.40 | 2023 | 49.56   |
| 19              | 0.96 | 1936 | 97.48   | 143.55 | - | 144.55 |  | 231   | 5.66 | 2254 | 55.22   |
| 16              | 0.81 | 1952 | 98.29   | 144.55 | - | 145.55 |  | 245   | 6.00 | 2499 | 61.22   |
| 12              | 0.60 | 1964 | 98.89   | 145.55 | - | 146.55 |  | 276   | 6.76 | 2775 | 67.98   |
| 11              | 0.55 | 1975 | 99.45   | 146.55 | - | 147.55 |  | 227   | 5.56 | 3002 | 73.54   |
| 3               | 0.15 | 1978 | 99.60   | 147.55 | - | 148.55 |  | 207   | 5.07 | 3209 | 78.61   |
| 3               | 0.15 | 1981 | 99.75   | 148.55 | - | 149.55 |  | 163   | 3.99 | 3372 | 82.61   |
| 2               | 0.10 | 1983 | 99.85   | 149.55 | - | 150.55 |  | 164   | 4.02 | 3536 | 86.62   |
| 2               | 0.10 | 1985 | 99.95   | 150.55 | - | 151.55 |  | 121   | 2.96 | 3657 | 89.59   |
| 1               | 0.05 | 1986 | 100.00  | 151.55 | - | 152.55 |  | 108   | 2.65 | 3765 | 92.23   |
|                 |      |      |         | 152.55 | - | 153.55 |  | 77    | 1.89 | 3842 | 94.12   |
|                 |      |      |         | 153.55 | - | 154.55 |  | 63    | 1.54 | 3905 | 95.66   |
|                 |      |      |         | 154.55 | - | 155.55 |  | 47    | 1.15 | 3952 | 96.82   |
|                 |      |      |         | 155.55 | - | 156.55 |  | 23    | 0.56 | 3975 | 97.38   |
|                 |      |      |         | 156.55 | - | 157.55 |  | 24    | 0.59 | 3999 | 97.97   |
|                 |      |      |         | 157.55 | - | 158.55 |  | 34    | 0.83 | 4033 | 98.80   |
|                 |      |      |         | 158.55 | - | 159.55 |  | 14    | 0.34 | 4047 | 99.14   |
|                 |      |      |         | 159.55 | - | 160.55 |  | 11    | 0.27 | 4058 | 99.41   |
|                 |      |      |         | 160.55 | - | 161.55 |  | 12    | 0.29 | 4070 | 99.71   |
|                 |      |      |         | 161.55 | - | 162.55 |  | 5     | 0.12 | 4075 | 99.83   |
|                 |      |      |         | 162.55 | - | 163.55 |  | 5     | 0.12 | 4080 | 99.95   |
|                 |      |      |         | 163.55 | - | 164.55 |  | 1     | 0.02 | 4081 | 99.98   |
|                 |      |      |         | 164.55 | - | 165.55 |  | 1     | 0.02 | 4082 | 100.00  |

## (77) TENTH RIB HEIGHT

The vertical distance between a standing surface and the tenth rib landmark is measured with an anthropometer. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 94.20       | 37.09 | 1ST  | 100.30 | 39.49 |
| 96.00       | 37.80 | 2ND  | 101.50 | 39.96 |
| 96.60       | 38.03 | 3RD  | 102.40 | 40.31 |
| 97.60       | 38.43 | 5TH  | 103.40 | 40.71 |
| 99.50       | 39.17 | 10TH | 105.30 | 41.46 |
| 100.60      | 39.61 | 15TH | 106.40 | 41.89 |
| 101.60      | 40.00 | 20TH | 107.50 | 42.32 |
| 102.40      | 40.31 | 25TH | 108.40 | 42.68 |
| 103.00      | 40.55 | 30TH | 109.20 | 42.99 |
| 103.60      | 40.79 | 35TH | 109.90 | 43.27 |
| 104.10      | 40.98 | 40TH | 110.60 | 43.54 |
| 104.80      | 41.26 | 45TH | 111.30 | 43.82 |
| 105.40      | 41.50 | 50TH | 111.90 | 44.06 |
| 106.00      | 41.73 | 55TH | 112.60 | 44.33 |
| 106.70      | 42.01 | 60TH | 113.40 | 44.65 |
| 107.50      | 42.32 | 65TH | 114.10 | 44.92 |
| 108.10      | 42.56 | 70TH | 114.90 | 45.24 |
| 109.00      | 42.91 | 75TH | 115.60 | 45.51 |
| 109.80      | 43.23 | 80TH | 116.50 | 45.87 |
| 110.90      | 43.66 | 85TH | 117.50 | 46.26 |
| 112.20      | 44.17 | 90TH | 118.90 | 46.81 |
| 114.00      | 44.88 | 95TH | 121.10 | 47.68 |
| 115.30      | 45.39 | 97TH | 122.60 | 48.27 |
| 116.00      | 45.67 | 98TH | 123.80 | 48.74 |
| 117.50      | 46.26 | 99TH | 125.60 | 49.45 |

## (77) TENTH RIB HEIGHT

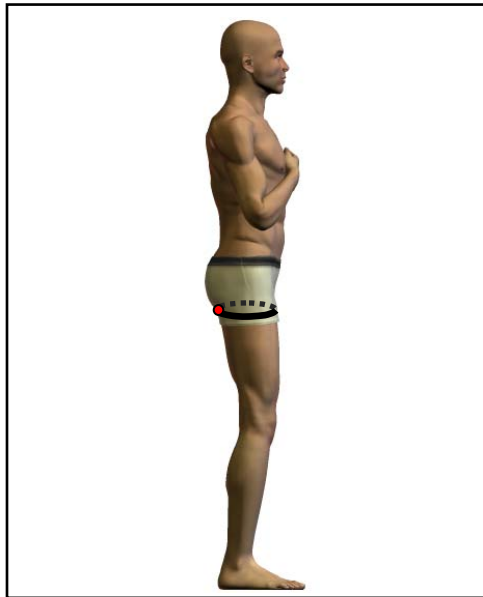
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 105.63                   | MEAN                | 41.58 |
| 0.11                     | STD ERROR (MEAN)    | 0.04  |
| 5.00                     | STANDARD DEVIATION  | 1.97  |
| 0.08                     | STD ERROR (STD DEV) | 0.03  |
| 86.80                    | MINIMUM             | 34.17 |
| 121.90                   | MAXIMUM             | 47.99 |
| SKEWNESS                 |                     | 0.10  |
| KURTOSIS                 |                     | 3.10  |
| COEFFICIENT OF VARIATION |                     | 4.7%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 112.07                   | MEAN                | 44.12 |
| 0.08                     | STD ERROR (MEAN)    | 0.03  |
| 5.36                     | STANDARD DEVIATION  | 2.11  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 91.70                    | MINIMUM             | 36.10 |
| 130.50                   | MAXIMUM             | 51.38 |
| SKEWNESS                 |                     | 0.15  |
| KURTOSIS                 |                     | 3.04  |
| COEFFICIENT OF VARIATION |                     | 4.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10 | 2    | 0.10    | 86.55           | - | 87.55  |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 87.55           | - | 88.55  |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 88.55           | - | 89.55  |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 89.55           | - | 90.55  |  |       |      |      |         |
| 2       | 0.10 | 5    | 0.25    | 90.55           | - | 91.55  |  |       |      |      |         |
| 4       | 0.20 | 9    | 0.45    | 91.55           | - | 92.55  |  | 1     | 0.02 | 1    | 0.02    |
| 3       | 0.15 | 12   | 0.60    | 92.55           | - | 93.55  |  | 0     | 0.00 | 1    | 0.02    |
| 11      | 0.55 | 23   | 1.16    | 93.55           | - | 94.55  |  | 0     | 0.00 | 1    | 0.02    |
| 13      | 0.65 | 36   | 1.81    | 94.55           | - | 95.55  |  | 1     | 0.02 | 2    | 0.05    |
| 22      | 1.11 | 58   | 2.92    | 95.55           | - | 96.55  |  | 3     | 0.07 | 5    | 0.12    |
| 37      | 1.86 | 95   | 4.78    | 96.55           | - | 97.55  |  | 4     | 0.10 | 9    | 0.22    |
| 50      | 2.52 | 145  | 7.30    | 97.55           | - | 98.55  |  | 3     | 0.07 | 12   | 0.29    |
| 61      | 3.07 | 206  | 10.37   | 98.55           | - | 99.55  |  | 15    | 0.37 | 27   | 0.66    |
| 86      | 4.33 | 292  | 14.70   | 99.55           | - | 100.55 |  | 20    | 0.49 | 47   | 1.15    |
| 99      | 4.98 | 391  | 19.69   | 100.55          | - | 101.55 |  | 36    | 0.88 | 83   | 2.03    |
| 131     | 6.60 | 522  | 26.28   | 101.55          | - | 102.55 |  | 51    | 1.25 | 134  | 3.28    |
| 172     | 8.66 | 694  | 34.94   | 102.55          | - | 103.55 |  | 82    | 2.01 | 216  | 5.29    |
| 170     | 8.56 | 864  | 43.50   | 103.55          | - | 104.55 |  | 101   | 2.47 | 317  | 7.77    |
| 157     | 7.91 | 1021 | 51.41   | 104.55          | - | 105.55 |  | 134   | 3.28 | 451  | 11.05   |
| 155     | 7.80 | 1176 | 59.21   | 105.55          | - | 106.55 |  | 178   | 4.36 | 629  | 15.41   |
| 132     | 6.65 | 1308 | 65.86   | 106.55          | - | 107.55 |  | 202   | 4.95 | 831  | 20.36   |
| 140     | 7.05 | 1448 | 72.91   | 107.55          | - | 108.55 |  | 214   | 5.24 | 1045 | 25.60   |
| 103     | 5.19 | 1551 | 78.10   | 108.55          | - | 109.55 |  | 276   | 6.76 | 1321 | 32.36   |
| 101     | 5.09 | 1652 | 83.18   | 109.55          | - | 110.55 |  | 304   | 7.45 | 1625 | 39.81   |
| 89      | 4.48 | 1741 | 87.66   | 110.55          | - | 111.55 |  | 310   | 7.59 | 1935 | 47.40   |
| 64      | 3.22 | 1805 | 90.89   | 111.55          | - | 112.55 |  | 283   | 6.93 | 2218 | 54.34   |
| 63      | 3.17 | 1868 | 94.06   | 112.55          | - | 113.55 |  | 289   | 7.08 | 2507 | 61.42   |
| 33      | 1.66 | 1901 | 95.72   | 113.55          | - | 114.55 |  | 275   | 6.74 | 2782 | 68.15   |
| 35      | 1.76 | 1936 | 97.48   | 114.55          | - | 115.55 |  | 271   | 6.64 | 3053 | 74.79   |
| 20      | 1.01 | 1956 | 98.49   | 115.55          | - | 116.55 |  | 232   | 5.68 | 3285 | 80.48   |
| 11      | 0.55 | 1967 | 99.04   | 116.55          | - | 117.55 |  | 195   | 4.78 | 3480 | 85.25   |
| 5       | 0.25 | 1972 | 99.30   | 117.55          | - | 118.55 |  | 159   | 3.90 | 3639 | 89.15   |
| 6       | 0.30 | 1978 | 99.60   | 118.55          | - | 119.55 |  | 116   | 2.84 | 3755 | 91.99   |
| 4       | 0.20 | 1982 | 99.80   | 119.55          | - | 120.55 |  | 81    | 1.98 | 3836 | 93.97   |
| 1       | 0.05 | 1983 | 99.85   | 120.55          | - | 121.55 |  | 71    | 1.74 | 3907 | 95.71   |
| 3       | 0.15 | 1986 | 100.00  | 121.55          | - | 122.55 |  | 50    | 1.22 | 3957 | 96.94   |
|         |      |      |         | 122.55          | - | 123.55 |  | 32    | 0.78 | 3989 | 97.72   |
|         |      |      |         | 123.55          | - | 124.55 |  | 32    | 0.78 | 4021 | 98.51   |
|         |      |      |         | 124.55          | - | 125.55 |  | 18    | 0.44 | 4039 | 98.95   |
|         |      |      |         | 125.55          | - | 126.55 |  | 21    | 0.51 | 4060 | 99.46   |
|         |      |      |         | 126.55          | - | 127.55 |  | 8     | 0.20 | 4068 | 99.66   |
|         |      |      |         | 127.55          | - | 128.55 |  | 8     | 0.20 | 4076 | 99.85   |
|         |      |      |         | 128.55          | - | 129.55 |  | 3     | 0.07 | 4079 | 99.93   |
|         |      |      |         | 129.55          | - | 130.55 |  | 3     | 0.07 | 4082 | 100.00  |

## (78) THIGH CIRCUMFERENCE

The circumference of the right thigh at the gluteal furrow landmark is measured with a tape. The measurement is taken perpendicular to the long axis of the thigh. The participant stands erect with the weight distributed equally on both feet. The legs are spread apart just enough so that the thighs do not touch.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 49.50       | 19.49 | 1ST  | 49.70 | 19.57 |
| 50.90       | 20.04 | 2ND  | 50.70 | 19.96 |
| 51.60       | 20.31 | 3RD  | 51.70 | 20.35 |
| 52.70       | 20.75 | 5TH  | 53.20 | 20.94 |
| 54.40       | 21.42 | 10TH | 55.10 | 21.69 |
| 55.70       | 21.93 | 15TH | 56.50 | 22.24 |
| 57.20       | 22.52 | 20TH | 57.60 | 22.68 |
| 57.90       | 22.80 | 25TH | 58.60 | 23.07 |
| 58.60       | 23.07 | 30TH | 59.50 | 23.43 |
| 59.40       | 23.39 | 35TH | 60.20 | 23.70 |
| 60.00       | 23.62 | 40TH | 61.00 | 24.02 |
| 60.60       | 23.86 | 45TH | 61.70 | 24.29 |
| 61.30       | 24.13 | 50TH | 62.40 | 24.57 |
| 62.00       | 24.41 | 55TH | 63.10 | 24.84 |
| 62.90       | 24.76 | 60TH | 63.80 | 25.12 |
| 63.60       | 25.04 | 65TH | 64.60 | 25.43 |
| 64.30       | 25.31 | 70TH | 65.40 | 25.75 |
| 65.10       | 25.63 | 75TH | 66.20 | 26.06 |
| 66.40       | 26.14 | 80TH | 67.20 | 26.46 |
| 67.40       | 26.54 | 85TH | 68.30 | 26.89 |
| 68.80       | 27.09 | 90TH | 69.80 | 27.48 |
| 71.10       | 27.99 | 95TH | 72.30 | 28.46 |
| 72.50       | 28.54 | 97TH | 74.20 | 29.21 |
| 73.10       | 28.78 | 98TH | 75.60 | 29.76 |
| 75.70       | 29.80 | 99TH | 77.40 | 30.47 |

## (78) THIGH CIRCUMFERENCE

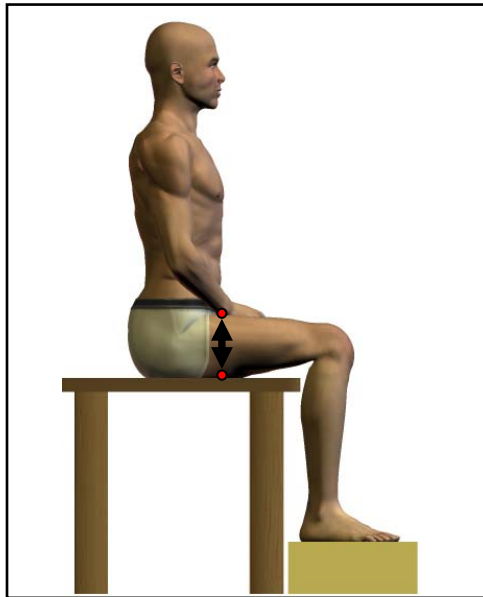
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 61.61                    | MEAN                | 24.26 |
| 0.13                     | STD ERROR (MEAN)    | 0.05  |
| 5.58                     | STANDARD DEVIATION  | 2.20  |
| 0.09                     | STD ERROR (STD DEV) | 0.03  |
| 44.80                    | MINIMUM             | 17.64 |
| 87.00                    | MAXIMUM             | 34.25 |
| SKEWNESS                 |                     | 0.29  |
| KURTOSIS                 |                     | 3.40  |
| COEFFICIENT OF VARIATION |                     | 9.1%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 62.51                    | MEAN                | 24.61 |
| 0.09                     | STD ERROR (MEAN)    | 0.04  |
| 5.85                     | STANDARD DEVIATION  | 2.30  |
| 0.06                     | STD ERROR (STD DEV) | 0.03  |
| 41.20                    | MINIMUM             | 16.22 |
| 84.30                    | MAXIMUM             | 33.19 |
| SKEWNESS                 |                     | 0.22  |
| KURTOSIS                 |                     | 3.27  |
| COEFFICIENT OF VARIATION |                     | 9.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |    |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|----|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct |                 | CM |       |  | F     | FPct | CumF | CumFPct |
|         |      |      |         | 40.55           | -  | 41.55 |  | 1     | 0.02 | 1    | 0.02    |
|         |      |      |         | 41.55           | -  | 42.55 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 42.55           | -  | 43.55 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 43.55           | -  | 44.55 |  | 0     | 0.00 | 1    | 0.02    |
| 1       | 0.05 | 1    | 0.05    | 44.55           | -  | 45.55 |  | 1     | 0.02 | 2    | 0.05    |
| 1       | 0.05 | 2    | 0.10    | 45.55           | -  | 46.55 |  | 2     | 0.05 | 4    | 0.10    |
| 1       | 0.05 | 3    | 0.15    | 46.55           | -  | 47.55 |  | 6     | 0.15 | 10   | 0.24    |
| 5       | 0.25 | 8    | 0.40    | 47.55           | -  | 48.55 |  | 13    | 0.32 | 23   | 0.56    |
| 13      | 0.65 | 21   | 1.06    | 48.55           | -  | 49.55 |  | 15    | 0.37 | 38   | 0.93    |
| 12      | 0.60 | 33   | 1.66    | 49.55           | -  | 50.55 |  | 35    | 0.86 | 73   | 1.79    |
| 23      | 1.16 | 56   | 2.82    | 50.55           | -  | 51.55 |  | 41    | 1.00 | 114  | 2.79    |
| 38      | 1.91 | 94   | 4.73    | 51.55           | -  | 52.55 |  | 50    | 1.22 | 164  | 4.02    |
| 40      | 2.01 | 134  | 6.75    | 52.55           | -  | 53.55 |  | 74    | 1.81 | 238  | 5.83    |
| 76      | 3.83 | 210  | 10.57   | 53.55           | -  | 54.55 |  | 95    | 2.33 | 333  | 8.16    |
| 73      | 3.68 | 283  | 14.25   | 54.55           | -  | 55.55 |  | 136   | 3.33 | 469  | 11.49   |
| 64      | 3.22 | 347  | 17.47   | 55.55           | -  | 56.55 |  | 146   | 3.58 | 615  | 15.07   |
| 100     | 5.04 | 447  | 22.51   | 56.55           | -  | 57.55 |  | 189   | 4.63 | 804  | 19.70   |
| 140     | 7.05 | 587  | 29.56   | 57.55           | -  | 58.55 |  | 205   | 5.02 | 1009 | 24.72   |
| 136     | 6.85 | 723  | 36.40   | 58.55           | -  | 59.55 |  | 223   | 5.46 | 1232 | 30.18   |
| 156     | 7.85 | 879  | 44.26   | 59.55           | -  | 60.55 |  | 287   | 7.03 | 1519 | 37.21   |
| 150     | 7.55 | 1029 | 51.81   | 60.55           | -  | 61.55 |  | 271   | 6.64 | 1790 | 43.85   |
| 127     | 6.39 | 1156 | 58.21   | 61.55           | -  | 62.55 |  | 277   | 6.79 | 2067 | 50.64   |
| 126     | 6.34 | 1282 | 64.55   | 62.55           | -  | 63.55 |  | 311   | 7.62 | 2378 | 58.26   |
| 139     | 7.00 | 1421 | 71.55   | 63.55           | -  | 64.55 |  | 272   | 6.66 | 2650 | 64.92   |
| 104     | 5.24 | 1525 | 76.79   | 64.55           | -  | 65.55 |  | 254   | 6.22 | 2904 | 71.14   |
| 90      | 4.53 | 1615 | 81.32   | 65.55           | -  | 66.55 |  | 237   | 5.81 | 3141 | 76.95   |
| 91      | 4.58 | 1706 | 85.90   | 66.55           | -  | 67.55 |  | 201   | 4.92 | 3342 | 81.87   |
| 70      | 3.52 | 1776 | 89.43   | 67.55           | -  | 68.55 |  | 159   | 3.90 | 3501 | 85.77   |
| 51      | 2.57 | 1827 | 91.99   | 68.55           | -  | 69.55 |  | 141   | 3.45 | 3642 | 89.22   |
| 47      | 2.37 | 1874 | 94.36   | 69.55           | -  | 70.55 |  | 101   | 2.47 | 3743 | 91.70   |
| 30      | 1.51 | 1904 | 95.87   | 70.55           | -  | 71.55 |  | 78    | 1.91 | 3821 | 93.61   |
| 26      | 1.31 | 1930 | 97.18   | 71.55           | -  | 72.55 |  | 67    | 1.64 | 3888 | 95.25   |
| 23      | 1.16 | 1953 | 98.34   | 72.55           | -  | 73.55 |  | 48    | 1.18 | 3936 | 96.42   |
| 7       | 0.35 | 1960 | 98.69   | 73.55           | -  | 74.55 |  | 33    | 0.81 | 3969 | 97.23   |
| 5       | 0.25 | 1965 | 98.94   | 74.55           | -  | 75.55 |  | 29    | 0.71 | 3998 | 97.94   |
| 4       | 0.20 | 1969 | 99.14   | 75.55           | -  | 76.55 |  | 24    | 0.59 | 4022 | 98.53   |
| 3       | 0.15 | 1972 | 99.30   | 76.55           | -  | 77.55 |  | 22    | 0.54 | 4044 | 99.07   |
| 5       | 0.25 | 1977 | 99.55   | 77.55           | -  | 78.55 |  | 10    | 0.24 | 4054 | 99.31   |
| 3       | 0.15 | 1980 | 99.70   | 78.55           | -  | 79.55 |  | 7     | 0.17 | 4061 | 99.49   |
| 1       | 0.05 | 1981 | 99.75   | 79.55           | -  | 80.55 |  | 3     | 0.07 | 4064 | 99.56   |
| 2       | 0.10 | 1983 | 99.85   | 80.55           | -  | 81.55 |  | 8     | 0.20 | 4072 | 99.76   |
| 0       | 0.00 | 1983 | 99.85   | 81.55           | -  | 82.55 |  | 4     | 0.10 | 4076 | 99.85   |
| 1       | 0.05 | 1984 | 99.90   | 82.55           | -  | 83.55 |  | 4     | 0.10 | 4080 | 99.95   |
| 0       | 0.00 | 1984 | 99.90   | 83.55           | -  | 84.55 |  | 2     | 0.05 | 4082 | 100.00  |
| 0       | 0.00 | 1984 | 99.90   | 84.55           | -  | 85.55 |  |       |      |      |         |
| 0       | 0.00 | 1984 | 99.90   | 85.55           | -  | 86.55 |  |       |      |      |         |
| 2       | 0.10 | 1986 | 100.00  | 86.55           | -  | 87.55 |  |       |      |      |         |

## (79) THIGH CLEARANCE

The vertical distance between a sitting surface and the thigh point, top landmark is measured with an anthropometer. The participant sits with the thighs parallel, knees flexed 90°, and the feet in line with the thighs.

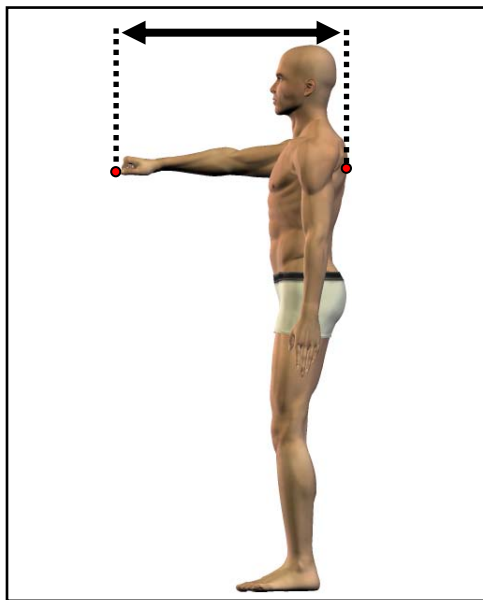


| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 13.80       | 5.43 | 1ST  | 14.80 | 5.83 |
| 14.10       | 5.55 | 2ND  | 15.10 | 5.94 |
| 14.20       | 5.59 | 3RD  | 15.30 | 6.02 |
| 14.50       | 5.71 | 5TH  | 15.70 | 6.18 |
| 15.00       | 5.91 | 10TH | 16.20 | 6.38 |
| 15.30       | 6.02 | 15TH | 16.50 | 6.50 |
| 15.60       | 6.14 | 20TH | 16.70 | 6.57 |
| 15.80       | 6.22 | 25TH | 17.00 | 6.69 |
| 16.00       | 6.30 | 30TH | 17.20 | 6.77 |
| 16.30       | 6.42 | 35TH | 17.40 | 6.85 |
| 16.40       | 6.46 | 40TH | 17.60 | 6.93 |
| 16.60       | 6.54 | 45TH | 17.80 | 7.01 |
| 16.70       | 6.57 | 50TH | 18.00 | 7.09 |
| 16.90       | 6.65 | 55TH | 18.20 | 7.17 |
| 17.10       | 6.73 | 60TH | 18.30 | 7.20 |
| 17.30       | 6.81 | 65TH | 18.50 | 7.28 |
| 17.40       | 6.85 | 70TH | 18.80 | 7.40 |
| 17.70       | 6.97 | 75TH | 19.00 | 7.48 |
| 17.90       | 7.05 | 80TH | 19.30 | 7.60 |
| 18.30       | 7.20 | 85TH | 19.60 | 7.72 |
| 18.60       | 7.32 | 90TH | 20.10 | 7.91 |
| 19.10       | 7.52 | 95TH | 20.70 | 8.15 |
| 19.60       | 7.72 | 97TH | 21.30 | 8.39 |
| 19.80       | 7.80 | 98TH | 21.70 | 8.54 |
| 20.30       | 7.99 | 99TH | 22.30 | 8.78 |



## (80) THUMB TIP REACH

The horizontal distance from a back wall to the tip of the right thumb is measured on a wall scale. The participant stands erect in a corner, looking straight ahead with the feet together and the heels 20 cm from the back wall. The buttocks and shoulders are against the wall. The right arm and hand, palm down, are stretched forward horizontally along a scale on the side wall. The thumb continues the horizontal line of the arm, and the remaining fingers curve around to form a fist. The participant's right shoulder is held against the rear wall (not shown in the photo in order to show participant position).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 65.10       | 25.63 | 1ST  | 71.60 | 28.19 |
| 66.10       | 26.02 | 2ND  | 72.60 | 28.58 |
| 66.70       | 26.26 | 3RD  | 73.20 | 28.82 |
| 67.40       | 26.54 | 5TH  | 74.20 | 29.21 |
| 69.10       | 27.20 | 10TH | 75.70 | 29.80 |
| 70.20       | 27.64 | 15TH | 76.70 | 30.20 |
| 70.90       | 27.91 | 20TH | 77.60 | 30.55 |
| 71.50       | 28.15 | 25TH | 78.20 | 30.79 |
| 72.10       | 28.39 | 30TH | 78.90 | 31.06 |
| 72.60       | 28.58 | 35TH | 79.50 | 31.30 |
| 73.10       | 28.78 | 40TH | 80.00 | 31.50 |
| 73.60       | 28.98 | 45TH | 80.60 | 31.73 |
| 74.20       | 29.21 | 50TH | 81.10 | 31.93 |
| 74.80       | 29.45 | 55TH | 81.70 | 32.17 |
| 75.30       | 29.65 | 60TH | 82.20 | 32.36 |
| 75.90       | 29.88 | 65TH | 82.70 | 32.56 |
| 76.60       | 30.16 | 70TH | 83.30 | 32.80 |
| 77.20       | 30.39 | 75TH | 83.80 | 32.99 |
| 78.00       | 30.71 | 80TH | 84.60 | 33.31 |
| 79.00       | 31.10 | 85TH | 85.60 | 33.70 |
| 80.10       | 31.54 | 90TH | 86.80 | 34.17 |
| 81.60       | 32.13 | 95TH | 88.60 | 34.88 |
| 82.70       | 32.56 | 97TH | 89.70 | 35.31 |
| 83.60       | 32.91 | 98TH | 91.00 | 35.83 |
| 85.20       | 33.54 | 99TH | 92.30 | 36.34 |

## (80) THUMB TIP REACH

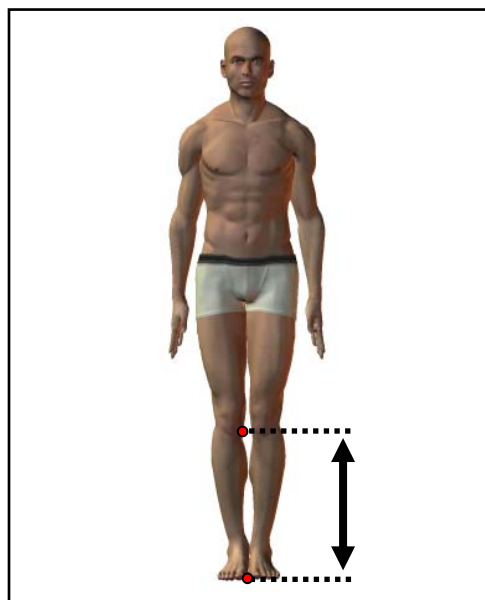
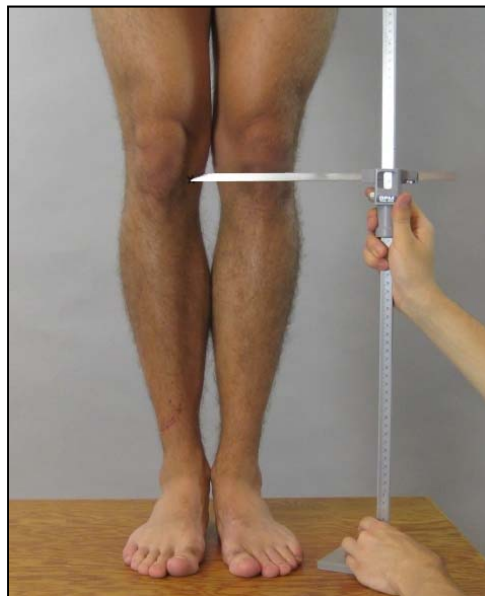
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 74.40                    | MEAN                | 29.29 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 4.28                     | STANDARD DEVIATION  | 1.68  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 60.20                    | MINIMUM             | 23.70 |
| 89.40                    | MAXIMUM             | 35.20 |
| SKEWNESS                 |                     | 0.17  |
| KURTOSIS                 |                     | 3.00  |
| COEFFICIENT OF VARIATION |                     | 5.7%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 81.19                    | MEAN                | 31.97 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 4.37                     | STANDARD DEVIATION  | 1.72  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 65.00                    | MINIMUM             | 25.59 |
| 99.80                    | MAXIMUM             | 39.29 |
| SKEWNESS                 |                     | 0.21  |
| KURTOSIS                 |                     | 3.26  |
| COEFFICIENT OF VARIATION |                     | 5.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 59.55           | - | 60.55  |  |       |      |      |         |
| 2       | 0.10 | 3    | 0.15    | 60.55           | - | 61.55  |  |       |      |      |         |
| 1       | 0.05 | 4    | 0.20    | 61.55           | - | 62.55  |  |       |      |      |         |
| 1       | 0.05 | 5    | 0.25    | 62.55           | - | 63.55  |  |       |      |      |         |
| 8       | 0.40 | 13   | 0.65    | 63.55           | - | 64.55  |  |       |      |      |         |
| 16      | 0.81 | 29   | 1.46    | 64.55           | - | 65.55  |  | 1     | 0.02 | 1    | 0.02    |
| 28      | 1.41 | 57   | 2.87    | 65.55           | - | 66.55  |  | 0     | 0.00 | 1    | 0.02    |
| 46      | 2.32 | 103  | 5.19    | 66.55           | - | 67.55  |  | 1     | 0.02 | 2    | 0.05    |
| 59      | 2.97 | 162  | 8.16    | 67.55           | - | 68.55  |  | 3     | 0.07 | 5    | 0.12    |
| 82      | 4.13 | 244  | 12.29   | 68.55           | - | 69.55  |  | 2     | 0.05 | 7    | 0.17    |
| 94      | 4.73 | 338  | 17.02   | 69.55           | - | 70.55  |  | 11    | 0.27 | 18   | 0.44    |
| 166     | 8.36 | 504  | 25.38   | 70.55           | - | 71.55  |  | 19    | 0.47 | 37   | 0.91    |
| 178     | 8.96 | 682  | 34.34   | 71.55           | - | 72.55  |  | 38    | 0.93 | 75   | 1.84    |
| 197     | 9.92 | 879  | 44.26   | 72.55           | - | 73.55  |  | 70    | 1.71 | 145  | 3.55    |
| 179     | 9.01 | 1058 | 53.27   | 73.55           | - | 74.55  |  | 104   | 2.55 | 249  | 6.10    |
| 180     | 9.06 | 1238 | 62.34   | 74.55           | - | 75.55  |  | 129   | 3.16 | 378  | 9.26    |
| 152     | 7.65 | 1390 | 69.99   | 75.55           | - | 76.55  |  | 196   | 4.80 | 574  | 14.06   |
| 143     | 7.20 | 1533 | 77.19   | 76.55           | - | 77.55  |  | 239   | 5.85 | 813  | 19.92   |
| 112     | 5.64 | 1645 | 82.83   | 77.55           | - | 78.55  |  | 299   | 7.32 | 1112 | 27.24   |
| 92      | 4.63 | 1737 | 87.46   | 78.55           | - | 79.55  |  | 335   | 8.21 | 1447 | 35.45   |
| 93      | 4.68 | 1830 | 92.15   | 79.55           | - | 80.55  |  | 388   | 9.51 | 1835 | 44.95   |
| 51      | 2.57 | 1881 | 94.71   | 80.55           | - | 81.55  |  | 358   | 8.77 | 2193 | 53.72   |
| 42      | 2.11 | 1923 | 96.83   | 81.55           | - | 82.55  |  | 396   | 9.70 | 2589 | 63.42   |
| 23      | 1.16 | 1946 | 97.99   | 82.55           | - | 83.55  |  | 354   | 8.67 | 2943 | 72.10   |
| 13      | 0.65 | 1959 | 98.64   | 83.55           | - | 84.55  |  | 304   | 7.45 | 3247 | 79.54   |
| 15      | 0.76 | 1974 | 99.40   | 84.55           | - | 85.55  |  | 211   | 5.17 | 3458 | 84.71   |
| 6       | 0.30 | 1980 | 99.70   | 85.55           | - | 86.55  |  | 173   | 4.24 | 3631 | 88.95   |
| 5       | 0.25 | 1985 | 99.95   | 86.55           | - | 87.55  |  | 137   | 3.36 | 3768 | 92.31   |
| 0       | 0.00 | 1985 | 99.95   | 87.55           | - | 88.55  |  | 97    | 2.38 | 3865 | 94.68   |
| 1       | 0.05 | 1986 | 100.00  | 88.55           | - | 89.55  |  | 81    | 1.98 | 3946 | 96.67   |
|         |      |      |         | 89.55           | - | 90.55  |  | 42    | 1.03 | 3988 | 97.70   |
|         |      |      |         | 90.55           | - | 91.55  |  | 39    | 0.96 | 4027 | 98.65   |
|         |      |      |         | 91.55           | - | 92.55  |  | 18    | 0.44 | 4045 | 99.09   |
|         |      |      |         | 92.55           | - | 93.55  |  | 16    | 0.39 | 4061 | 99.49   |
|         |      |      |         | 93.55           | - | 94.55  |  | 8     | 0.20 | 4069 | 99.68   |
|         |      |      |         | 94.55           | - | 95.55  |  | 5     | 0.12 | 4074 | 99.80   |
|         |      |      |         | 95.55           | - | 96.55  |  | 4     | 0.10 | 4078 | 99.90   |
|         |      |      |         | 96.55           | - | 97.55  |  | 1     | 0.02 | 4079 | 99.93   |
|         |      |      |         | 97.55           | - | 98.55  |  | 2     | 0.05 | 4081 | 99.98   |
|         |      |      |         | 98.55           | - | 99.55  |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 99.55           | - | 100.55 |  | 1     | 0.02 | 4082 | 100.00  |

## (81) TIBIAL HEIGHT

The vertical distance between a standing surface and the tibiale landmark is measured with an anthropometer. The participant stands erect on a table with the feet together and the weight distributed equally on both feet.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 38.10       | 15.00 | 1ST  | 40.80 | 16.06 |
| 38.80       | 15.28 | 2ND  | 41.70 | 16.42 |
| 39.20       | 15.43 | 3RD  | 42.00 | 16.54 |
| 39.90       | 15.71 | 5TH  | 42.60 | 16.77 |
| 40.70       | 16.02 | 10TH | 43.50 | 17.13 |
| 41.30       | 16.26 | 15TH | 44.10 | 17.36 |
| 41.70       | 16.42 | 20TH | 44.60 | 17.56 |
| 42.10       | 16.57 | 25TH | 45.00 | 17.72 |
| 42.50       | 16.73 | 30TH | 45.40 | 17.87 |
| 42.80       | 16.85 | 35TH | 45.70 | 17.99 |
| 43.10       | 16.97 | 40TH | 46.10 | 18.15 |
| 43.40       | 17.09 | 45TH | 46.50 | 18.31 |
| 43.70       | 17.20 | 50TH | 46.70 | 18.39 |
| 44.00       | 17.32 | 55TH | 47.10 | 18.54 |
| 44.20       | 17.40 | 60TH | 47.40 | 18.66 |
| 44.60       | 17.56 | 65TH | 47.80 | 18.82 |
| 45.00       | 17.72 | 70TH | 48.10 | 18.94 |
| 45.40       | 17.87 | 75TH | 48.60 | 19.13 |
| 45.90       | 18.07 | 80TH | 49.00 | 19.29 |
| 46.50       | 18.31 | 85TH | 49.60 | 19.53 |
| 47.10       | 18.54 | 90TH | 50.20 | 19.76 |
| 47.90       | 18.86 | 95TH | 51.30 | 20.20 |
| 48.70       | 19.17 | 97TH | 52.00 | 20.47 |
| 49.30       | 19.41 | 98TH | 52.60 | 20.71 |
| 49.80       | 19.61 | 99TH | 53.50 | 21.06 |

## (81) TIBIAL HEIGHT

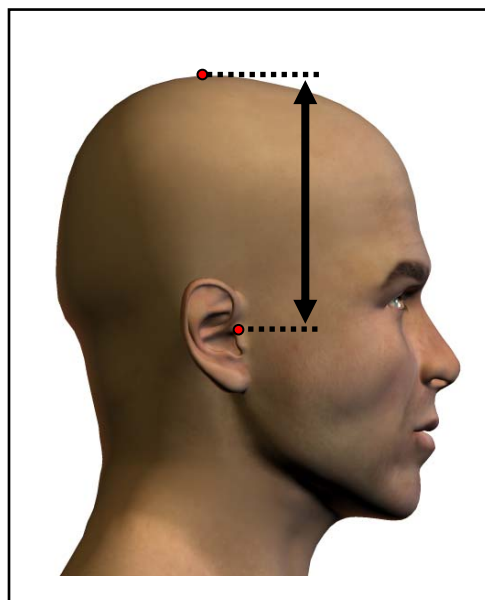
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 43.78                    | MEAN                | 17.23 |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 2.50                     | STANDARD DEVIATION  | 0.99  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 34.40                    | MINIMUM             | 13.54 |
| 52.70                    | MAXIMUM             | 20.75 |
| SKEWNESS                 |                     |       |
|                          |                     | 0.11  |
| KURTOSIS                 |                     |       |
|                          |                     | 3.25  |
| COEFFICIENT OF VARIATION |                     |       |
|                          |                     | 5.7%  |
| NUMBER OF PARTICIPANTS   |                     |       |
|                          |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 46.82                    | MEAN                | 18.43 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.66                     | STANDARD DEVIATION  | 1.05  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 37.60                    | MINIMUM             | 14.80 |
| 58.40                    | MAXIMUM             | 22.99 |
| SKEWNESS                 |                     |       |
|                          |                     | 0.16  |
| KURTOSIS                 |                     |       |
|                          |                     | 3.19  |
| COEFFICIENT OF VARIATION |                     |       |
|                          |                     | 5.7%  |
| NUMBER OF PARTICIPANTS   |                     |       |
|                          |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 3       | 0.15 | 3    | 0.15    | 34.25           | - | 34.75 |  |       |      |      |         |
| 2       | 0.10 | 5    | 0.25    | 34.75           | - | 35.25 |  |       |      |      |         |
| 0       | 0.00 | 5    | 0.25    | 35.25           | - | 35.75 |  |       |      |      |         |
| 0       | 0.00 | 5    | 0.25    | 35.75           | - | 36.25 |  |       |      |      |         |
| 2       | 0.10 | 7    | 0.35    | 36.25           | - | 36.75 |  |       |      |      |         |
| 0       | 0.00 | 7    | 0.35    | 36.75           | - | 37.25 |  |       |      |      |         |
| 4       | 0.20 | 11   | 0.55    | 37.25           | - | 37.75 |  | 1     | 0.02 | 1    | 0.02    |
| 11      | 0.55 | 22   | 1.11    | 37.75           | - | 38.25 |  | 1     | 0.02 | 2    | 0.05    |
| 16      | 0.81 | 38   | 1.91    | 38.25           | - | 38.75 |  | 1     | 0.02 | 3    | 0.07    |
| 22      | 1.11 | 60   | 3.02    | 38.75           | - | 39.25 |  | 8     | 0.20 | 4    | 0.27    |
| 26      | 1.31 | 86   | 4.33    | 39.25           | - | 39.75 |  | 6     | 0.15 | 12   | 0.42    |
| 61      | 3.07 | 147  | 7.40    | 39.75           | - | 40.25 |  | 9     | 0.22 | 18   | 0.64    |
| 60      | 3.02 | 207  | 10.42   | 40.25           | - | 40.75 |  | 12    | 0.29 | 27   | 0.93    |
| 81      | 4.08 | 288  | 14.50   | 40.75           | - | 41.25 |  | 17    | 0.42 | 39   | 1.35    |
| 115     | 5.79 | 403  | 20.29   | 41.25           | - | 41.75 |  | 35    | 0.86 | 56   | 2.20    |
| 131     | 6.60 | 534  | 26.89   | 41.75           | - | 42.25 |  | 55    | 1.35 | 91   | 3.55    |
| 154     | 7.75 | 688  | 34.64   | 42.25           | - | 42.75 |  | 86    | 2.11 | 146  | 5.66    |
| 165     | 8.31 | 853  | 42.95   | 42.75           | - | 43.25 |  | 123   | 3.01 | 232  | 8.67    |
| 186     | 9.37 | 1039 | 52.32   | 43.25           | - | 43.75 |  | 143   | 3.50 | 355  | 12.18   |
| 154     | 7.75 | 1193 | 60.07   | 43.75           | - | 44.25 |  | 190   | 4.65 | 498  | 16.83   |
| 129     | 6.50 | 1322 | 66.57   | 44.25           | - | 44.75 |  | 222   | 5.44 | 688  | 22.27   |
| 121     | 6.09 | 1443 | 72.66   | 44.75           | - | 45.25 |  | 239   | 5.85 | 910  | 28.12   |
| 114     | 5.74 | 1557 | 78.40   | 45.25           | - | 45.75 |  | 291   | 7.13 | 1149 | 35.25   |
| 92      | 4.63 | 1649 | 83.03   | 45.75           | - | 46.25 |  | 272   | 6.66 | 1440 | 41.92   |
| 88      | 4.43 | 1737 | 87.46   | 46.25           | - | 46.75 |  | 330   | 8.08 | 1712 | 50.00   |
| 75      | 3.78 | 1812 | 91.24   | 46.75           | - | 47.25 |  | 315   | 7.72 | 2042 | 57.72   |
| 61      | 3.07 | 1873 | 94.31   | 47.25           | - | 47.75 |  | 274   | 6.71 | 2357 | 64.43   |
| 32      | 1.61 | 1905 | 95.92   | 47.75           | - | 48.25 |  | 277   | 6.79 | 2631 | 71.22   |
| 26      | 1.31 | 1931 | 97.23   | 48.25           | - | 48.75 |  | 255   | 6.25 | 2908 | 77.46   |
| 15      | 0.76 | 1946 | 97.99   | 48.75           | - | 49.25 |  | 205   | 5.02 | 3163 | 82.48   |
| 20      | 1.01 | 1966 | 98.99   | 49.25           | - | 49.75 |  | 165   | 4.04 | 3368 | 86.53   |
| 6       | 0.30 | 1972 | 99.30   | 49.75           | - | 50.25 |  | 142   | 3.48 | 3533 | 90.00   |
| 6       | 0.30 | 1978 | 99.60   | 50.25           | - | 50.75 |  | 117   | 2.87 | 3675 | 92.87   |
| 4       | 0.20 | 1982 | 99.80   | 50.75           | - | 51.25 |  | 79    | 1.94 | 3792 | 94.81   |
| 0       | 0.00 | 1982 | 99.80   | 51.25           | - | 51.75 |  | 65    | 1.59 | 3871 | 96.40   |
| 3       | 0.15 | 1985 | 99.95   | 51.75           | - | 52.25 |  | 47    | 1.15 | 3936 | 97.55   |
| 1       | 0.05 | 1986 | 100.00  | 52.25           | - | 52.75 |  | 28    | 0.69 | 3983 | 98.24   |
|         |      |      |         | 52.75           | - | 53.25 |  | 27    | 0.66 | 4011 | 98.90   |
|         |      |      |         | 53.25           | - | 53.75 |  | 14    | 0.34 | 4038 | 99.24   |
|         |      |      |         | 53.75           | - | 54.25 |  | 13    | 0.32 | 4052 | 99.56   |
|         |      |      |         | 54.25           | - | 54.75 |  | 7     | 0.17 | 4065 | 99.73   |
|         |      |      |         | 54.75           | - | 55.25 |  | 5     | 0.12 | 4072 | 99.85   |
|         |      |      |         | 55.25           | - | 55.75 |  | 2     | 0.05 | 4077 | 99.90   |
|         |      |      |         | 55.75           | - | 56.25 |  | 1     | 0.02 | 4079 | 99.93   |
|         |      |      |         | 56.25           | - | 56.75 |  | 1     | 0.02 | 4080 | 99.95   |
|         |      |      |         | 56.75           | - | 57.25 |  | 0     | 0.00 | 4080 | 99.95   |
|         |      |      |         | 57.25           | - | 57.75 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 57.75           | - | 58.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 58.25           | - | 58.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (82) TRAGION - TOP OF HEAD\*

The vertical distance between the right tragion landmark and the horizontal plane tangent to the top of the head is measured with a beam caliper with a paddle blade. The participant sits with the head in the Frankfurt plane. For female participants with braids or cornrows, the measurement includes the styled hair.



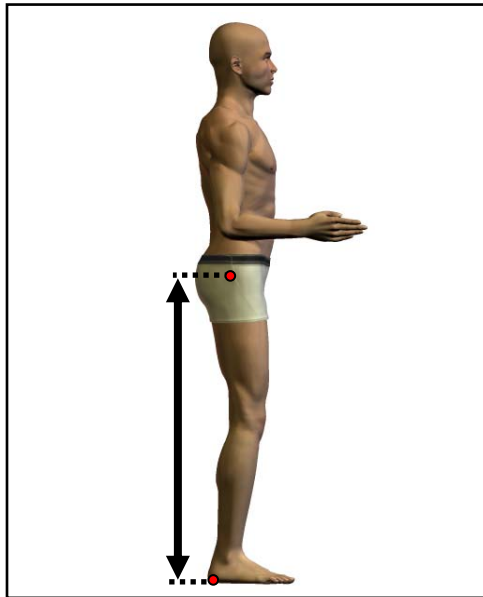
| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 11.00       | 4.33 | 1ST  | 11.60 | 4.57 |
| 11.30       | 4.45 | 2ND  | 11.80 | 4.65 |
| 11.40       | 4.49 | 3RD  | 12.00 | 4.72 |
| 11.60       | 4.57 | 5TH  | 12.10 | 4.76 |
| 11.80       | 4.65 | 10TH | 12.30 | 4.84 |
| 12.00       | 4.72 | 15TH | 12.50 | 4.92 |
| 12.10       | 4.76 | 20TH | 12.60 | 4.96 |
| 12.20       | 4.80 | 25TH | 12.70 | 5.00 |
| 12.30       | 4.84 | 30TH | 12.80 | 5.04 |
| 12.40       | 4.88 | 35TH | 12.90 | 5.08 |
| 12.50       | 4.92 | 40TH | 13.00 | 5.12 |
| 12.60       | 4.96 | 45TH | 13.00 | 5.12 |
| 12.70       | 5.00 | 50TH | 13.10 | 5.16 |
| 12.70       | 5.00 | 55TH | 13.20 | 5.20 |
| 12.80       | 5.04 | 60TH | 13.30 | 5.24 |
| 12.90       | 5.08 | 65TH | 13.40 | 5.28 |
| 13.00       | 5.12 | 70TH | 13.40 | 5.28 |
| 13.10       | 5.16 | 75TH | 13.50 | 5.31 |
| 13.20       | 5.20 | 80TH | 13.60 | 5.35 |
| 13.30       | 5.24 | 85TH | 13.80 | 5.43 |
| 13.40       | 5.28 | 90TH | 13.90 | 5.47 |
| 13.70       | 5.39 | 95TH | 14.10 | 5.55 |
| 13.90       | 5.47 | 97TH | 14.20 | 5.59 |
| 14.00       | 5.51 | 98TH | 14.40 | 5.67 |
| 14.20       | 5.59 | 99TH | 14.50 | 5.71 |

\* This measurement is not equivalent to ANSUR for females. See text on page 44 for details.



### (83) TROCHANTERION HEIGHT

The vertical distance between a standing surface and the trochanterion landmark is measured with an anthropometer. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 74.50       | 29.33 | 1ST  | 79.50  | 31.30 |
| 75.70       | 29.80 | 2ND  | 80.50  | 31.69 |
| 76.40       | 30.08 | 3RD  | 81.40  | 32.05 |
| 77.40       | 30.47 | 5TH  | 82.40  | 32.44 |
| 79.00       | 31.10 | 10TH | 84.00  | 33.07 |
| 79.90       | 31.46 | 15TH | 85.00  | 33.46 |
| 80.80       | 31.81 | 20TH | 85.90  | 33.82 |
| 81.60       | 32.13 | 25TH | 86.70  | 34.13 |
| 82.20       | 32.36 | 30TH | 87.40  | 34.41 |
| 82.80       | 32.60 | 35TH | 88.10  | 34.69 |
| 83.30       | 32.80 | 40TH | 88.70  | 34.92 |
| 83.80       | 32.99 | 45TH | 89.30  | 35.16 |
| 84.40       | 33.23 | 50TH | 89.90  | 35.39 |
| 84.90       | 33.43 | 55TH | 90.50  | 35.63 |
| 85.50       | 33.66 | 60TH | 91.10  | 35.87 |
| 86.20       | 33.94 | 65TH | 91.80  | 36.14 |
| 86.80       | 34.17 | 70TH | 92.50  | 36.42 |
| 87.40       | 34.41 | 75TH | 93.20  | 36.69 |
| 88.30       | 34.76 | 80TH | 94.10  | 37.05 |
| 89.20       | 35.12 | 85TH | 95.20  | 37.48 |
| 90.40       | 35.59 | 90TH | 96.40  | 37.95 |
| 91.90       | 36.18 | 95TH | 98.50  | 38.78 |
| 92.80       | 36.54 | 97TH | 100.10 | 39.41 |
| 94.00       | 37.01 | 98TH | 101.10 | 39.80 |
| 95.20       | 37.48 | 99TH | 102.20 | 40.24 |

### (83) TROCHANTERION HEIGHT

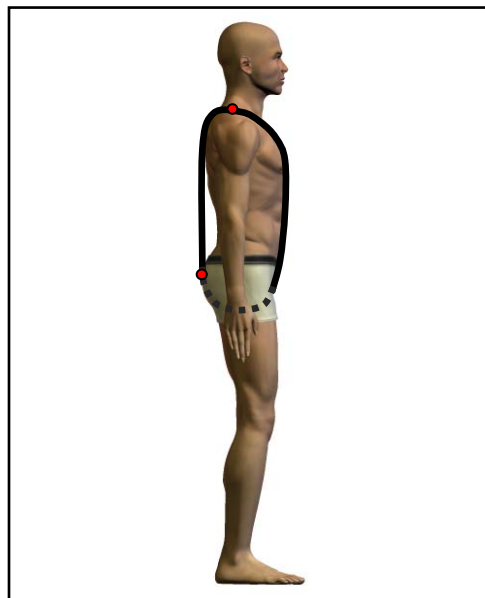
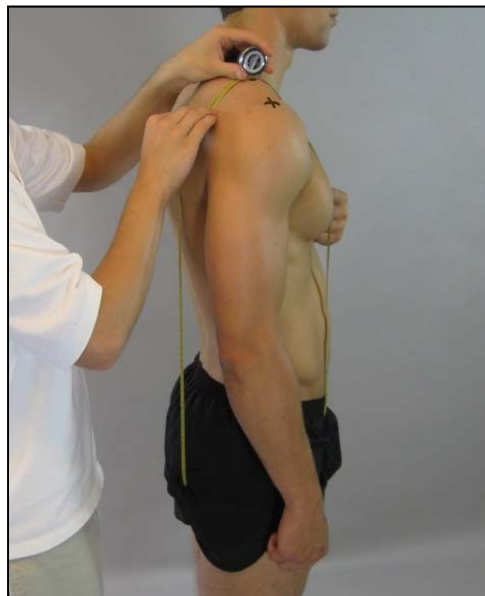
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 84.54                    | MEAN                | 33.28 |
| 0.10                     | STD ERROR (MEAN)    | 0.04  |
| 4.47                     | STANDARD DEVIATION  | 1.76  |
| 0.07                     | STD ERROR (STD DEV) | 0.03  |
| 66.00                    | MINIMUM             | 25.98 |
| 101.80                   | MAXIMUM             | 40.08 |
| SKEWNESS                 |                     | 0.08  |
| KURTOSIS                 |                     | 3.27  |
| COEFFICIENT OF VARIATION |                     | 5.3%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 90.09                    | MEAN                | 35.47 |
| 0.08                     | STD ERROR (MEAN)    | 0.03  |
| 4.92                     | STANDARD DEVIATION  | 1.94  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 73.10                    | MINIMUM             | 28.78 |
| 109.50                   | MAXIMUM             | 43.11 |
| SKEWNESS                 |                     | 0.24  |
| KURTOSIS                 |                     | 3.17  |
| COEFFICIENT OF VARIATION |                     | 5.5%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 65.55           | - | 66.55  |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 66.55           | - | 67.55  |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 67.55           | - | 68.55  |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 68.55           | - | 69.55  |  |       |      |      |         |
| 2       | 0.10 | 4    | 0.20    | 69.55           | - | 70.55  |  |       |      |      |         |
| 2       | 0.10 | 6    | 0.30    | 70.55           | - | 71.55  |  |       |      |      |         |
| 2       | 0.10 | 8    | 0.40    | 71.55           | - | 72.55  |  |       |      |      |         |
| 6       | 0.30 | 14   | 0.70    | 72.55           | - | 73.55  |  | 1     | 0.02 | 1    | 0.02    |
| 6       | 0.30 | 20   | 1.01    | 73.55           | - | 74.55  |  | 2     | 0.05 | 3    | 0.07    |
| 15      | 0.76 | 35   | 1.76    | 74.55           | - | 75.55  |  | 3     | 0.07 | 6    | 0.15    |
| 26      | 1.31 | 61   | 3.07    | 75.55           | - | 76.55  |  | 0     | 0.00 | 6    | 0.15    |
| 46      | 2.32 | 107  | 5.39    | 76.55           | - | 77.55  |  | 4     | 0.10 | 10   | 0.24    |
| 54      | 2.72 | 161  | 8.11    | 77.55           | - | 78.55  |  | 13    | 0.32 | 23   | 0.56    |
| 96      | 4.83 | 257  | 12.94   | 78.55           | - | 79.55  |  | 21    | 0.51 | 44   | 1.08    |
| 113     | 5.69 | 370  | 18.63   | 79.55           | - | 80.55  |  | 38    | 0.93 | 82   | 2.01    |
| 122     | 6.14 | 492  | 24.77   | 80.55           | - | 81.55  |  | 52    | 1.27 | 134  | 3.28    |
| 169     | 8.51 | 661  | 33.28   | 81.55           | - | 82.55  |  | 89    | 2.18 | 223  | 5.46    |
| 181     | 9.11 | 842  | 42.40   | 82.55           | - | 83.55  |  | 111   | 2.72 | 334  | 8.18    |
| 188     | 9.47 | 1030 | 51.86   | 83.55           | - | 84.55  |  | 166   | 4.07 | 500  | 12.25   |
| 172     | 8.66 | 1202 | 60.52   | 84.55           | - | 85.55  |  | 233   | 5.71 | 733  | 17.96   |
| 150     | 7.55 | 1352 | 68.08   | 85.55           | - | 86.55  |  | 240   | 5.88 | 973  | 23.84   |
| 148     | 7.45 | 1500 | 75.53   | 86.55           | - | 87.55  |  | 297   | 7.28 | 1270 | 31.11   |
| 112     | 5.64 | 1612 | 81.17   | 87.55           | - | 88.55  |  | 296   | 7.25 | 1566 | 38.36   |
| 103     | 5.19 | 1715 | 86.35   | 88.55           | - | 89.55  |  | 351   | 8.60 | 1917 | 46.96   |
| 78      | 3.93 | 1793 | 90.28   | 89.55           | - | 90.55  |  | 336   | 8.23 | 2253 | 55.19   |
| 76      | 3.83 | 1869 | 94.11   | 90.55           | - | 91.55  |  | 329   | 8.06 | 2582 | 63.25   |
| 50      | 2.52 | 1919 | 96.63   | 91.55           | - | 92.55  |  | 292   | 7.15 | 2874 | 70.41   |
| 19      | 0.96 | 1938 | 97.58   | 92.55           | - | 93.55  |  | 260   | 6.37 | 3134 | 76.78   |
| 21      | 1.06 | 1959 | 98.64   | 93.55           | - | 94.55  |  | 222   | 5.44 | 3356 | 82.21   |
| 11      | 0.55 | 1970 | 99.19   | 94.55           | - | 95.55  |  | 198   | 4.85 | 3554 | 87.07   |
| 8       | 0.40 | 1978 | 99.60   | 95.55           | - | 96.55  |  | 136   | 3.33 | 3690 | 90.40   |
| 1       | 0.05 | 1979 | 99.65   | 96.55           | - | 97.55  |  | 106   | 2.60 | 3796 | 92.99   |
| 2       | 0.10 | 1981 | 99.75   | 97.55           | - | 98.55  |  | 82    | 2.01 | 3878 | 95.00   |
| 3       | 0.15 | 1984 | 99.90   | 98.55           | - | 99.55  |  | 56    | 1.37 | 3934 | 96.37   |
| 1       | 0.05 | 1985 | 99.95   | 99.55           | - | 100.55 |  | 47    | 1.15 | 3981 | 97.53   |
| 0       | 0.00 | 1985 | 99.95   | 100.55          | - | 101.55 |  | 36    | 0.88 | 4017 | 98.41   |
| 1       | 0.05 | 1986 | 100.00  | 101.55          | - | 102.55 |  | 30    | 0.73 | 4047 | 99.14   |
|         |      |      |         | 102.55          | - | 103.55 |  | 13    | 0.32 | 4060 | 99.46   |
|         |      |      |         | 103.55          | - | 104.55 |  | 6     | 0.15 | 4066 | 99.61   |
|         |      |      |         | 104.55          | - | 105.55 |  | 7     | 0.17 | 4073 | 99.78   |
|         |      |      |         | 105.55          | - | 106.55 |  | 4     | 0.10 | 4077 | 99.88   |
|         |      |      |         | 106.55          | - | 107.55 |  | 0     | 0.00 | 4077 | 99.88   |
|         |      |      |         | 107.55          | - | 108.55 |  | 3     | 0.07 | 4080 | 99.95   |
|         |      |      |         | 108.55          | - | 109.55 |  | 2     | 0.05 | 4082 | 100.00  |

## (84) VERTICAL TRUNK CIRCUMFERENCE (USA)

The vertical circumference of the torso is measured with a tape passing over the buttock point posterior landmark, to the right of the genitalia, midway between the sternum and the anterior axillary fold, and across the midshoulder landmark. The participant stands erect, looking straight ahead with the right arm hanging relaxed at the side. The heels are together with the weight distributed equally on both feet. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 139.10      | 54.76 | 1ST  | 146.80 | 57.80 |
| 141.40      | 55.67 | 2ND  | 148.80 | 58.58 |
| 142.10      | 55.94 | 3RD  | 150.20 | 59.13 |
| 144.00      | 56.69 | 5TH  | 151.90 | 59.80 |
| 146.30      | 57.60 | 10TH | 154.90 | 60.98 |
| 148.20      | 58.35 | 15TH | 157.20 | 61.89 |
| 149.60      | 58.90 | 20TH | 158.90 | 62.56 |
| 150.80      | 59.37 | 25TH | 160.50 | 63.19 |
| 151.80      | 59.76 | 30TH | 161.70 | 63.66 |
| 152.70      | 60.12 | 35TH | 162.80 | 64.09 |
| 153.70      | 60.51 | 40TH | 164.10 | 64.61 |
| 154.50      | 60.83 | 45TH | 165.30 | 65.08 |
| 155.50      | 61.22 | 50TH | 166.40 | 65.51 |
| 156.50      | 61.61 | 55TH | 167.40 | 65.91 |
| 157.60      | 62.05 | 60TH | 168.50 | 66.34 |
| 158.70      | 62.48 | 65TH | 169.60 | 66.77 |
| 159.80      | 62.91 | 70TH | 170.80 | 67.24 |
| 161.00      | 63.39 | 75TH | 172.30 | 67.83 |
| 162.50      | 63.98 | 80TH | 174.00 | 68.50 |
| 164.20      | 64.65 | 85TH | 175.90 | 69.25 |
| 166.00      | 65.35 | 90TH | 178.00 | 70.08 |
| 168.50      | 66.34 | 95TH | 181.40 | 71.42 |
| 170.20      | 67.01 | 97TH | 183.80 | 72.36 |
| 172.40      | 67.87 | 98TH | 185.40 | 72.99 |
| 174.50      | 68.70 | 99TH | 188.10 | 74.06 |

## (84) VERTICAL TRUNK CIRCUMFERENCE (USA)

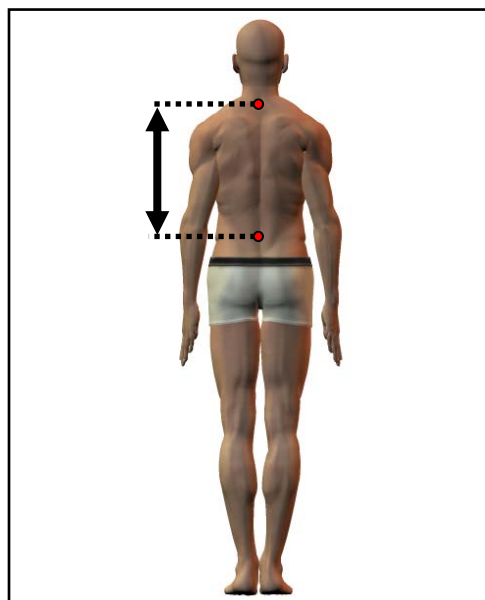
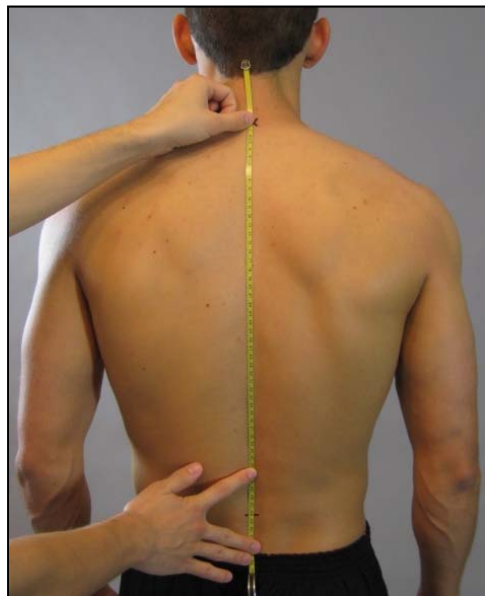
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 155.94                   | MEAN                | 61.39 |
| 0.17                     | STD ERROR (MEAN)    | 0.07  |
| 7.60                     | STANDARD DEVIATION  | 2.99  |
| 0.12                     | STD ERROR (STD DEV) | 0.05  |
| 134.20                   | MINIMUM             | 52.83 |
| 182.80                   | MAXIMUM             | 71.97 |
| SKEWNESS                 |                     | 0.17  |
| KURTOSIS                 |                     | 2.91  |
| COEFFICIENT OF VARIATION |                     | 4.9%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 166.48                   | MEAN                | 65.54 |
| 0.14                     | STD ERROR (MEAN)    | 0.06  |
| 8.95                     | STANDARD DEVIATION  | 3.52  |
| 0.10                     | STD ERROR (STD DEV) | 0.04  |
| 136.10                   | MINIMUM             | 53.58 |
| 199.10                   | MAXIMUM             | 78.39 |
| SKEWNESS                 |                     | 0.12  |
| KURTOSIS                 |                     | 3.02  |
| COEFFICIENT OF VARIATION |                     | 5.4%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 3       | 0.15 | 3    | 0.15    | 133.75          | - | 135.25 |  | 2     | 0.05 | 2    | 0.05    |
| 3       | 0.15 | 6    | 0.30    | 135.25          | - | 136.75 |  | 0     | 0.00 | 2    | 0.05    |
| 6       | 0.30 | 12   | 0.60    | 136.75          | - | 138.25 |  | 1     | 0.02 | 3    | 0.07    |
| 10      | 0.50 | 22   | 1.11    | 138.25          | - | 139.75 |  | 3     | 0.07 | 6    | 0.15    |
| 14      | 0.70 | 36   | 1.81    | 139.75          | - | 141.25 |  | 8     | 0.20 | 14   | 0.34    |
| 43      | 2.17 | 79   | 3.98    | 141.25          | - | 142.75 |  | 8     | 0.20 | 22   | 0.54    |
| 29      | 1.46 | 108  | 5.44    | 142.75          | - | 144.25 |  | 7     | 0.17 | 29   | 0.71    |
| 65      | 3.27 | 173  | 8.71    | 144.25          | - | 145.75 |  | 19    | 0.47 | 48   | 1.18    |
| 72      | 3.63 | 245  | 12.34   | 145.75          | - | 147.25 |  | 31    | 0.76 | 79   | 1.94    |
| 93      | 4.68 | 338  | 17.02   | 147.25          | - | 148.75 |  | 50    | 1.22 | 129  | 3.16    |
| 114     | 5.74 | 452  | 22.76   | 148.75          | - | 150.25 |  | 63    | 1.54 | 192  | 4.70    |
| 138     | 6.95 | 590  | 29.71   | 150.25          | - | 151.75 |  | 67    | 1.64 | 259  | 6.34    |
| 158     | 7.96 | 748  | 37.66   | 151.75          | - | 153.25 |  | 128   | 3.14 | 387  | 9.48    |
| 174     | 8.76 | 922  | 46.42   | 153.25          | - | 154.75 |  | 143   | 3.50 | 530  | 12.98   |
| 145     | 7.30 | 1067 | 53.73   | 154.75          | - | 156.25 |  | 149   | 3.65 | 679  | 16.63   |
| 137     | 6.90 | 1204 | 60.62   | 156.25          | - | 157.75 |  | 179   | 4.39 | 858  | 21.02   |
| 129     | 6.50 | 1333 | 67.12   | 157.75          | - | 159.25 |  | 199   | 4.88 | 1057 | 25.89   |
| 132     | 6.65 | 1465 | 73.77   | 159.25          | - | 160.75 |  | 270   | 6.61 | 1327 | 32.51   |
| 107     | 5.39 | 1572 | 79.15   | 160.75          | - | 162.25 |  | 254   | 6.22 | 1581 | 38.73   |
| 88      | 4.43 | 1660 | 83.59   | 162.25          | - | 163.75 |  | 243   | 5.95 | 1824 | 44.68   |
| 86      | 4.33 | 1746 | 87.92   | 163.75          | - | 165.25 |  | 265   | 6.49 | 2089 | 51.18   |
| 78      | 3.93 | 1824 | 91.84   | 165.25          | - | 166.75 |  | 304   | 7.45 | 2393 | 58.62   |
| 50      | 2.52 | 1874 | 94.36   | 166.75          | - | 168.25 |  | 289   | 7.08 | 2682 | 65.70   |
| 40      | 2.01 | 1914 | 96.37   | 168.25          | - | 169.75 |  | 249   | 6.10 | 2931 | 71.80   |
| 22      | 1.11 | 1936 | 97.48   | 169.75          | - | 171.25 |  | 177   | 4.34 | 3108 | 76.14   |
| 18      | 0.91 | 1954 | 98.39   | 171.25          | - | 172.75 |  | 186   | 4.56 | 3294 | 80.70   |
| 10      | 0.50 | 1964 | 98.89   | 172.75          | - | 174.25 |  | 156   | 3.82 | 3450 | 84.52   |
| 13      | 0.65 | 1977 | 99.55   | 174.25          | - | 175.75 |  | 152   | 3.72 | 3602 | 88.24   |
| 3       | 0.15 | 1980 | 99.70   | 175.75          | - | 177.25 |  | 117   | 2.87 | 3719 | 91.11   |
| 1       | 0.05 | 1981 | 99.75   | 177.25          | - | 178.75 |  | 90    | 2.20 | 3809 | 93.31   |
| 2       | 0.10 | 1983 | 99.85   | 178.75          | - | 180.25 |  | 74    | 1.81 | 3883 | 95.12   |
| 2       | 0.10 | 1985 | 99.95   | 180.25          | - | 181.75 |  | 56    | 1.37 | 3939 | 96.50   |
| 1       | 0.05 | 1986 | 100.00  | 181.75          | - | 183.25 |  | 45    | 1.10 | 3984 | 97.60   |
|         |      |      |         | 183.25          | - | 184.75 |  | 31    | 0.76 | 4015 | 98.36   |
|         |      |      |         | 184.75          | - | 186.25 |  | 21    | 0.51 | 4036 | 98.87   |
|         |      |      |         | 186.25          | - | 187.75 |  | 18    | 0.44 | 4054 | 99.31   |
|         |      |      |         | 187.75          | - | 189.25 |  | 9     | 0.22 | 4063 | 99.53   |
|         |      |      |         | 189.25          | - | 190.75 |  | 5     | 0.12 | 4068 | 99.66   |
|         |      |      |         | 190.75          | - | 192.25 |  | 4     | 0.10 | 4072 | 99.76   |
|         |      |      |         | 192.25          | - | 193.75 |  | 4     | 0.10 | 4076 | 99.85   |
|         |      |      |         | 193.75          | - | 195.25 |  | 5     | 0.12 | 4081 | 99.98   |
|         |      |      |         | 195.25          | - | 196.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 196.75          | - | 198.25 |  | 1     | 0.02 | 4082 | 100.00  |
|         |      |      |         | 198.25          | - | 199.75 |  |       |      |      |         |

## (85) WAIST BACK LENGTH (OMPHALION)\*

The surface distance between the cervicale landmark and the posterior omphalion landmark is measured with a tape. The participant stands erect with the head in the Frankfurt plane. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 36.40       | 14.33 | 1ST  | 41.50 | 16.34 |
| 37.30       | 14.69 | 2ND  | 42.30 | 16.65 |
| 37.70       | 14.84 | 3RD  | 42.70 | 16.81 |
| 38.40       | 15.12 | 5TH  | 43.30 | 17.05 |
| 39.40       | 15.51 | 10TH | 44.30 | 17.44 |
| 39.90       | 15.71 | 15TH | 45.00 | 17.72 |
| 40.40       | 15.91 | 20TH | 45.50 | 17.91 |
| 40.70       | 16.02 | 25TH | 45.90 | 18.07 |
| 41.10       | 16.18 | 30TH | 46.30 | 18.23 |
| 41.50       | 16.34 | 35TH | 46.60 | 18.35 |
| 41.80       | 16.46 | 40TH | 47.00 | 18.50 |
| 42.00       | 16.54 | 45TH | 47.40 | 18.66 |
| 42.40       | 16.69 | 50TH | 47.70 | 18.78 |
| 42.80       | 16.85 | 55TH | 48.00 | 18.90 |
| 43.10       | 16.97 | 60TH | 48.30 | 19.02 |
| 43.50       | 17.13 | 65TH | 48.70 | 19.17 |
| 43.90       | 17.28 | 70TH | 49.10 | 19.33 |
| 44.20       | 17.40 | 75TH | 49.50 | 19.49 |
| 44.70       | 17.60 | 80TH | 50.00 | 19.69 |
| 45.20       | 17.80 | 85TH | 50.60 | 19.92 |
| 46.00       | 18.11 | 90TH | 51.30 | 20.20 |
| 47.00       | 18.50 | 95TH | 52.40 | 20.63 |
| 47.80       | 18.82 | 97TH | 53.00 | 20.87 |
| 48.20       | 18.98 | 98TH | 53.80 | 21.18 |
| 49.50       | 19.49 | 99TH | 54.90 | 21.61 |

\* In ANSUR cervicale was defined as the highest point on the seventh cervical vertebra. For consistency with international standards, it is now the most prominent point on the seventh cervical vertebra.

## (85) WAIST BACK LENGTH (OMPHALION)

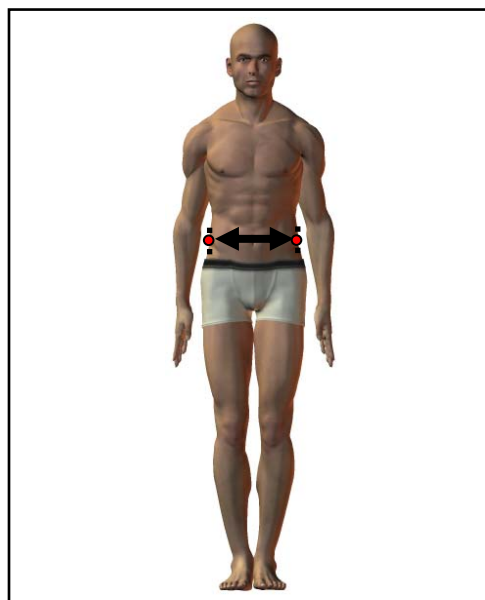
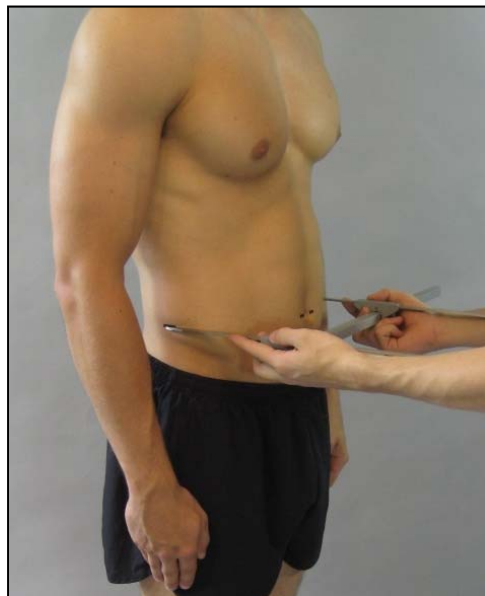
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 42.54                    | MEAN                | 16.75 |
| 0.06                     | STD ERROR (MEAN)    | 0.02  |
| 2.64                     | STANDARD DEVIATION  | 1.04  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 34.50                    | MINIMUM             | 13.58 |
| 53.20                    | MAXIMUM             | 20.94 |
| SKEWNESS                 |                     | 0.25  |
| KURTOSIS                 |                     | 3.33  |
| COEFFICIENT OF VARIATION |                     | 6.2%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 47.76                    | MEAN                | 18.80 |
| 0.04                     | STD ERROR (MEAN)    | 0.02  |
| 2.77                     | STANDARD DEVIATION  | 1.09  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 38.30                    | MINIMUM             | 15.08 |
| 59.80                    | MAXIMUM             | 23.54 |
| SKEWNESS                 |                     | 0.18  |
| KURTOSIS                 |                     | 3.28  |
| COEFFICIENT OF VARIATION |                     | 5.8%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 34.25           | - | 34.75 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 34.75           | - | 35.25 |  |       |      |      |         |
| 6       | 0.30 | 7    | 0.35    | 35.25           | - | 35.75 |  |       |      |      |         |
| 11      | 0.55 | 18   | 0.91    | 35.75           | - | 36.25 |  |       |      |      |         |
| 9       | 0.45 | 27   | 1.36    | 36.25           | - | 36.75 |  |       |      |      |         |
| 10      | 0.50 | 37   | 1.86    | 36.75           | - | 37.25 |  |       |      |      |         |
| 23      | 1.16 | 60   | 3.02    | 37.25           | - | 37.75 |  |       |      |      |         |
| 27      | 1.36 | 87   | 4.38    | 37.75           | - | 38.25 |  |       |      |      |         |
| 40      | 2.01 | 127  | 6.39    | 38.25           | - | 38.75 |  | 3     | 0.07 | 3    | 0.07    |
| 54      | 2.72 | 181  | 9.11    | 38.75           | - | 39.25 |  | 2     | 0.05 | 5    | 0.12    |
| 89      | 4.48 | 270  | 13.60   | 39.25           | - | 39.75 |  | 2     | 0.05 | 7    | 0.17    |
| 106     | 5.34 | 376  | 18.93   | 39.75           | - | 40.25 |  | 6     | 0.15 | 13   | 0.32    |
| 127     | 6.39 | 503  | 25.33   | 40.25           | - | 40.75 |  | 5     | 0.12 | 18   | 0.44    |
| 140     | 7.05 | 643  | 32.38   | 40.75           | - | 41.25 |  | 14    | 0.34 | 32   | 0.78    |
| 146     | 7.35 | 789  | 39.73   | 41.25           | - | 41.75 |  | 17    | 0.42 | 49   | 1.20    |
| 162     | 8.16 | 951  | 47.89   | 41.75           | - | 42.25 |  | 29    | 0.71 | 78   | 1.91    |
| 135     | 6.80 | 1086 | 54.68   | 42.25           | - | 42.75 |  | 45    | 1.10 | 123  | 3.01    |
| 147     | 7.40 | 1233 | 62.08   | 42.75           | - | 43.25 |  | 68    | 1.67 | 191  | 4.68    |
| 139     | 7.00 | 1372 | 69.08   | 43.25           | - | 43.75 |  | 83    | 2.03 | 274  | 6.71    |
| 123     | 6.19 | 1495 | 75.28   | 43.75           | - | 44.25 |  | 117   | 2.87 | 391  | 9.58    |
| 108     | 5.44 | 1603 | 80.72   | 44.25           | - | 44.75 |  | 154   | 3.77 | 545  | 13.35   |
| 86      | 4.33 | 1689 | 85.05   | 44.75           | - | 45.25 |  | 176   | 4.31 | 721  | 17.66   |
| 87      | 4.38 | 1776 | 89.43   | 45.25           | - | 45.75 |  | 227   | 5.56 | 948  | 23.22   |
| 53      | 2.67 | 1829 | 92.09   | 45.75           | - | 46.25 |  | 249   | 6.10 | 1197 | 29.32   |
| 35      | 1.76 | 1864 | 93.86   | 46.25           | - | 46.75 |  | 282   | 6.91 | 1479 | 36.23   |
| 38      | 1.91 | 1902 | 95.77   | 46.75           | - | 47.25 |  | 309   | 7.57 | 1788 | 43.80   |
| 20      | 1.01 | 1922 | 96.78   | 47.25           | - | 47.75 |  | 286   | 7.01 | 2074 | 50.81   |
| 25      | 1.26 | 1947 | 98.04   | 47.75           | - | 48.25 |  | 339   | 8.30 | 2413 | 59.11   |
| 9       | 0.45 | 1956 | 98.49   | 48.25           | - | 48.75 |  | 268   | 6.57 | 2681 | 65.68   |
| 9       | 0.45 | 1965 | 98.94   | 48.75           | - | 49.25 |  | 255   | 6.25 | 2936 | 71.93   |
| 6       | 0.30 | 1971 | 99.24   | 49.25           | - | 49.75 |  | 218   | 5.34 | 3154 | 77.27   |
| 7       | 0.35 | 1978 | 99.60   | 49.75           | - | 50.25 |  | 197   | 4.83 | 3351 | 82.09   |
| 1       | 0.05 | 1979 | 99.65   | 50.25           | - | 50.75 |  | 157   | 3.85 | 3508 | 85.94   |
| 1       | 0.05 | 1980 | 99.70   | 50.75           | - | 51.25 |  | 148   | 3.63 | 3656 | 89.56   |
| 3       | 0.15 | 1983 | 99.85   | 51.25           | - | 51.75 |  | 105   | 2.57 | 3761 | 92.14   |
| 1       | 0.05 | 1984 | 99.90   | 51.75           | - | 52.25 |  | 88    | 2.16 | 3849 | 94.29   |
| 1       | 0.05 | 1985 | 99.95   | 52.25           | - | 52.75 |  | 78    | 1.91 | 3927 | 96.20   |
| 1       | 0.05 | 1986 | 100.00  | 52.75           | - | 53.25 |  | 48    | 1.18 | 3975 | 97.38   |
|         |      |      |         | 53.25           | - | 53.75 |  | 24    | 0.59 | 3999 | 97.97   |
|         |      |      |         | 53.75           | - | 54.25 |  | 17    | 0.42 | 4016 | 98.38   |
|         |      |      |         | 54.25           | - | 54.75 |  | 24    | 0.59 | 4040 | 98.97   |
|         |      |      |         | 54.75           | - | 55.25 |  | 13    | 0.32 | 4053 | 99.29   |
|         |      |      |         | 55.25           | - | 55.75 |  | 10    | 0.24 | 4063 | 99.53   |
|         |      |      |         | 55.75           | - | 56.25 |  | 9     | 0.22 | 4072 | 99.76   |
|         |      |      |         | 56.25           | - | 56.75 |  | 3     | 0.07 | 4075 | 99.83   |
|         |      |      |         | 56.75           | - | 57.25 |  | 3     | 0.07 | 4078 | 99.90   |
|         |      |      |         | 57.25           | - | 57.75 |  | 1     | 0.02 | 4079 | 99.93   |
|         |      |      |         | 57.75           | - | 58.25 |  | 1     | 0.02 | 4080 | 99.95   |
|         |      |      |         | 58.25           | - | 58.75 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 58.75           | - | 59.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 59.25           | - | 59.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 59.75           | - | 60.25 |  | 1     | 0.02 | 4082 | 100.00  |

## (86) WAIST BREADTH

The horizontal breadth of the waist at the level of omphalion is measured with a beam caliper. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 23.20       | 9.13  | 1ST  | 25.70 | 10.12 |
| 23.90       | 9.41  | 2ND  | 26.20 | 10.31 |
| 24.30       | 9.57  | 3RD  | 26.60 | 10.47 |
| 25.00       | 9.84  | 5TH  | 27.20 | 10.71 |
| 26.00       | 10.24 | 10TH | 28.20 | 11.10 |
| 26.60       | 10.47 | 15TH | 28.90 | 11.38 |
| 27.20       | 10.71 | 20TH | 29.50 | 11.61 |
| 27.60       | 10.87 | 25TH | 30.10 | 11.85 |
| 28.10       | 11.06 | 30TH | 30.70 | 12.09 |
| 28.50       | 11.22 | 35TH | 31.20 | 12.28 |
| 28.90       | 11.38 | 40TH | 31.60 | 12.44 |
| 29.40       | 11.57 | 45TH | 32.10 | 12.64 |
| 29.80       | 11.73 | 50TH | 32.50 | 12.80 |
| 30.20       | 11.89 | 55TH | 33.00 | 12.99 |
| 30.60       | 12.05 | 60TH | 33.50 | 13.19 |
| 31.10       | 12.24 | 65TH | 34.00 | 13.39 |
| 31.50       | 12.40 | 70TH | 34.50 | 13.58 |
| 32.10       | 12.64 | 75TH | 35.00 | 13.78 |
| 32.70       | 12.87 | 80TH | 35.60 | 14.02 |
| 33.40       | 13.15 | 85TH | 36.20 | 14.25 |
| 34.40       | 13.54 | 90TH | 37.10 | 14.61 |
| 35.60       | 14.02 | 95TH | 38.50 | 15.16 |
| 36.70       | 14.45 | 97TH | 39.50 | 15.55 |
| 37.50       | 14.76 | 98TH | 40.20 | 15.83 |
| 38.50       | 15.16 | 99TH | 41.30 | 16.26 |

## (86) WAIST BREADTH

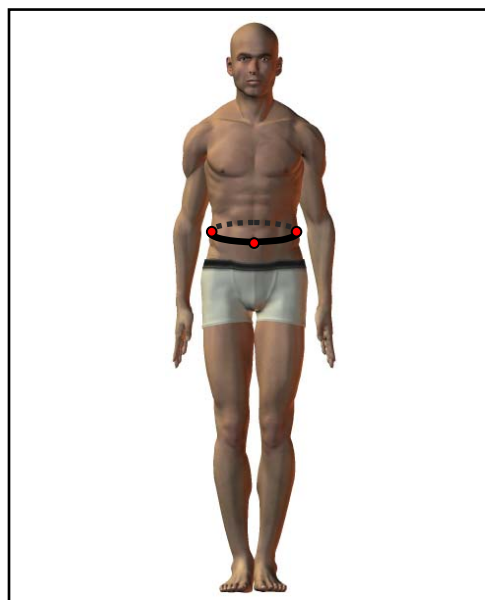
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 29.99                    | MEAN                | 11.81 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 3.30                     | STANDARD DEVIATION  | 1.30  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 21.10                    | MINIMUM             | 8.31  |
| 46.10                    | MAXIMUM             | 18.15 |
| SKEWNESS                 |                     | 0.41  |
| KURTOSIS                 |                     | 3.34  |
| COEFFICIENT OF VARIATION |                     | 11.0% |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 32.64                    | MEAN                | 12.85 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 3.47                     | STANDARD DEVIATION  | 1.37  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 23.20                    | MINIMUM             | 9.13  |
| 45.90                    | MAXIMUM             | 18.07 |
| SKEWNESS                 |                     | 0.25  |
| KURTOSIS                 |                     | 2.87  |
| COEFFICIENT OF VARIATION |                     | 10.6% |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |       |   |       |      |      |         |        |  |
|-----------------|------|------|---------|-------|---|-------|------|------|---------|--------|--|
| FEMALES         |      |      |         |       |   | MALES |      |      |         |        |  |
| F               | FPct | CumF | CumFPct | CM    |   | F     | FPct | CumF | CumFPct |        |  |
| 2               | 0.10 | 2    | 0.10    | 20.75 | - | 21.25 |      |      |         |        |  |
| 1               | 0.05 | 3    | 0.15    | 21.25 | - | 21.75 |      |      |         |        |  |
| 4               | 0.20 | 7    | 0.35    | 21.75 | - | 22.25 |      |      |         |        |  |
| 4               | 0.20 | 11   | 0.55    | 22.25 | - | 22.75 |      |      |         |        |  |
| 10              | 0.50 | 21   | 1.06    | 22.75 | - | 23.25 | 1    | 0.02 | 1       | 0.02   |  |
| 10              | 0.50 | 31   | 1.56    | 23.25 | - | 23.75 | 1    | 0.02 | 2       | 0.05   |  |
| 25              | 1.26 | 56   | 2.82    | 23.75 | - | 24.25 | 5    | 0.12 | 7       | 0.17   |  |
| 19              | 0.96 | 75   | 3.78    | 24.25 | - | 24.75 | 4    | 0.10 | 11      | 0.27   |  |
| 42              | 2.11 | 117  | 5.89    | 24.75 | - | 25.25 | 17   | 0.42 | 28      | 0.69   |  |
| 58              | 2.92 | 175  | 8.81    | 25.25 | - | 25.75 | 14   | 0.34 | 42      | 1.03   |  |
| 65              | 3.27 | 240  | 12.08   | 25.75 | - | 26.25 | 45   | 1.10 | 87      | 2.13   |  |
| 73              | 3.68 | 313  | 15.76   | 26.25 | - | 26.75 | 57   | 1.40 | 144     | 3.53   |  |
| 91              | 4.58 | 404  | 20.34   | 26.75 | - | 27.25 | 73   | 1.79 | 217     | 5.32   |  |
| 121             | 6.09 | 525  | 26.44   | 27.25 | - | 27.75 | 98   | 2.40 | 315     | 7.72   |  |
| 97              | 4.88 | 622  | 31.32   | 27.75 | - | 28.25 | 118  | 2.89 | 433     | 10.61  |  |
| 121             | 6.09 | 743  | 37.41   | 28.25 | - | 28.75 | 122  | 2.99 | 555     | 13.60  |  |
| 133             | 6.70 | 876  | 44.11   | 28.75 | - | 29.25 | 155  | 3.80 | 710     | 17.39  |  |
| 107             | 5.39 | 983  | 49.50   | 29.25 | - | 29.75 | 201  | 4.92 | 911     | 22.32  |  |
| 125             | 6.29 | 1108 | 55.79   | 29.75 | - | 30.25 | 167  | 4.09 | 1078    | 26.41  |  |
| 113             | 5.69 | 1221 | 61.48   | 30.25 | - | 30.75 | 174  | 4.26 | 1252    | 30.67  |  |
| 110             | 5.54 | 1331 | 67.02   | 30.75 | - | 31.25 | 222  | 5.44 | 1474    | 36.11  |  |
| 101             | 5.09 | 1432 | 72.10   | 31.25 | - | 31.75 | 220  | 5.39 | 1694    | 41.50  |  |
| 82              | 4.13 | 1514 | 76.23   | 31.75 | - | 32.25 | 215  | 5.27 | 1909    | 46.77  |  |
| 88              | 4.43 | 1602 | 80.66   | 32.25 | - | 32.75 | 231  | 5.66 | 2140    | 52.43  |  |
| 67              | 3.37 | 1669 | 84.04   | 32.75 | - | 33.25 | 218  | 5.34 | 2358    | 57.77  |  |
| 59              | 2.97 | 1728 | 87.01   | 33.25 | - | 33.75 | 198  | 4.85 | 2556    | 62.62  |  |
| 43              | 2.17 | 1771 | 89.17   | 33.75 | - | 34.25 | 203  | 4.97 | 2759    | 67.59  |  |
| 46              | 2.32 | 1817 | 91.49   | 34.25 | - | 34.75 | 214  | 5.24 | 2973    | 72.83  |  |
| 47              | 2.37 | 1864 | 93.86   | 34.75 | - | 35.25 | 172  | 4.21 | 3145    | 77.05  |  |
| 26              | 1.31 | 1890 | 95.17   | 35.25 | - | 35.75 | 177  | 4.34 | 3322    | 81.38  |  |
| 24              | 1.21 | 1914 | 96.37   | 35.75 | - | 36.25 | 155  | 3.80 | 3477    | 85.18  |  |
| 14              | 0.70 | 1928 | 97.08   | 36.25 | - | 36.75 | 129  | 3.16 | 3606    | 88.34  |  |
| 11              | 0.55 | 1939 | 97.63   | 36.75 | - | 37.25 | 97   | 2.38 | 3703    | 90.72  |  |
| 11              | 0.55 | 1950 | 98.19   | 37.25 | - | 37.75 | 75   | 1.84 | 3778    | 92.55  |  |
| 10              | 0.50 | 1960 | 98.69   | 37.75 | - | 38.25 | 78   | 1.91 | 3856    | 94.46  |  |
| 11              | 0.55 | 1971 | 99.24   | 38.25 | - | 38.75 | 50   | 1.22 | 3906    | 95.69  |  |
| 3               | 0.15 | 1974 | 99.40   | 38.75 | - | 39.25 | 33   | 0.81 | 3939    | 96.50  |  |
| 4               | 0.20 | 1978 | 99.60   | 39.25 | - | 39.75 | 34   | 0.83 | 3973    | 97.33  |  |
| 2               | 0.10 | 1980 | 99.70   | 39.75 | - | 40.25 | 33   | 0.81 | 4006    | 98.14  |  |
| 2               | 0.10 | 1982 | 99.80   | 40.25 | - | 40.75 | 18   | 0.44 | 4024    | 98.58  |  |
| 1               | 0.05 | 1983 | 99.85   | 40.75 | - | 41.25 | 15   | 0.37 | 4039    | 98.95  |  |
| 1               | 0.05 | 1984 | 99.90   | 41.25 | - | 41.75 | 15   | 0.37 | 4054    | 99.31  |  |
| 0               | 0.00 | 1984 | 99.90   | 41.75 | - | 42.25 | 7    | 0.17 | 4061    | 99.49  |  |
| 0               | 0.00 | 1984 | 99.90   | 42.25 | - | 42.75 | 2    | 0.05 | 4063    | 99.53  |  |
| 0               | 0.00 | 1984 | 99.90   | 42.75 | - | 43.25 | 8    | 0.20 | 4071    | 99.73  |  |
| 0               | 0.00 | 1984 | 99.90   | 43.25 | - | 43.75 | 3    | 0.07 | 4074    | 99.80  |  |
| 1               | 0.05 | 1985 | 99.95   | 43.75 | - | 44.25 | 2    | 0.05 | 4076    | 99.85  |  |
| 0               | 0.00 | 1985 | 99.95   | 44.25 | - | 44.75 | 4    | 0.10 | 4080    | 99.95  |  |
| 0               | 0.00 | 1985 | 99.95   | 44.75 | - | 45.25 | 1    | 0.02 | 4081    | 99.98  |  |
| 0               | 0.00 | 1985 | 99.95   | 45.25 | - | 45.75 | 0    | 0.00 | 4081    | 99.98  |  |
| 1               | 0.05 | 1986 | 100.00  | 45.75 | - | 46.25 | 1    | 0.02 | 4082    | 100.00 |  |

## (87) WAIST CIRCUMFERENCE (OMPHALION)

The horizontal circumference of the waist, passing over all omphalion landmarks, is measured with a tape. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 66.50       | 26.18 | 1ST  | 72.40  | 28.50 |
| 68.00       | 26.77 | 2ND  | 74.00  | 29.13 |
| 69.60       | 27.40 | 3RD  | 75.20  | 29.61 |
| 71.00       | 27.95 | 5TH  | 76.80  | 30.24 |
| 73.90       | 29.09 | 10TH | 79.70  | 31.38 |
| 76.00       | 29.92 | 15TH | 82.00  | 32.28 |
| 77.70       | 30.59 | 20TH | 83.80  | 32.99 |
| 79.00       | 31.10 | 25TH | 85.70  | 33.74 |
| 80.30       | 31.61 | 30TH | 87.50  | 34.45 |
| 81.40       | 32.05 | 35TH | 89.10  | 35.08 |
| 82.70       | 32.56 | 40TH | 90.70  | 35.71 |
| 84.00       | 33.07 | 45TH | 92.00  | 36.22 |
| 85.20       | 33.54 | 50TH | 93.70  | 36.89 |
| 86.50       | 34.06 | 55TH | 95.20  | 37.48 |
| 87.80       | 34.57 | 60TH | 96.70  | 38.07 |
| 89.50       | 35.24 | 65TH | 98.30  | 38.70 |
| 90.70       | 35.71 | 70TH | 100.00 | 39.37 |
| 92.50       | 36.42 | 75TH | 101.60 | 40.00 |
| 94.30       | 37.13 | 80TH | 103.50 | 40.75 |
| 96.40       | 37.95 | 85TH | 106.00 | 41.73 |
| 99.50       | 39.17 | 90TH | 108.60 | 42.76 |
| 104.00      | 40.94 | 95TH | 113.10 | 44.53 |
| 106.90      | 42.09 | 97TH | 115.70 | 45.55 |
| 109.00      | 42.91 | 98TH | 117.90 | 46.42 |
| 112.10      | 44.13 | 99TH | 121.40 | 47.80 |

## (87) WAIST CIRCUMFERENCE (OMPHALION)

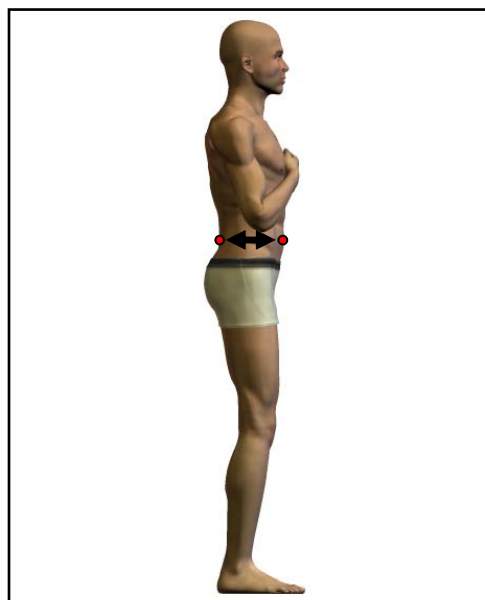
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 86.09                    | MEAN                | 33.89 |
| 0.22                     | STD ERROR (MEAN)    | 0.09  |
| 9.99                     | STANDARD DEVIATION  | 3.93  |
| 0.16                     | STD ERROR (STD DEV) | 0.06  |
| 61.10                    | MINIMUM             | 24.06 |
| 133.40                   | MAXIMUM             | 52.52 |
| SKEWNESS                 |                     | 0.47  |
| KURTOSIS                 |                     | 3.28  |
| COEFFICIENT OF VARIATION |                     | 11.6% |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 94.06                    | MEAN                | 37.03 |
| 0.17                     | STD ERROR (MEAN)    | 0.07  |
| 11.17                    | STANDARD DEVIATION  | 4.40  |
| 0.12                     | STD ERROR (STD DEV) | 0.05  |
| 64.80                    | MINIMUM             | 25.51 |
| 137.90                   | MAXIMUM             | 54.29 |
| SKEWNESS                 |                     | 0.30  |
| KURTOSIS                 |                     | 2.86  |
| COEFFICIENT OF VARIATION |                     | 11.9% |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |        |           |        |     |      |      |         |        |
|-----------------|------|------|---------|--------|-----------|--------|-----|------|------|---------|--------|
| FEMALES         |      |      |         | MALES  |           |        |     |      |      |         |        |
| F               | FPct | CumF | CumFPct |        | <u>CM</u> |        | F   | FPct | CumF | CumFPct |        |
| 3               | 0.15 | 3    | 0.15    | 60.75  | -         | 62.25  |     |      |      |         |        |
| 4               | 0.20 | 7    | 0.35    | 62.25  | -         | 63.75  |     |      |      |         |        |
| 5               | 0.25 | 12   | 0.60    | 63.75  | -         | 65.25  |     |      | 2    | 0.05    | 0.05   |
| 10              | 0.50 | 22   | 1.11    | 65.25  | -         | 66.75  | 0   | 0.00 | 2    | 0.00    | 0.05   |
| 22              | 1.11 | 44   | 2.22    | 66.75  | -         | 68.25  | 2   | 0.05 | 4    | 0.05    | 0.10   |
| 18              | 0.91 | 62   | 3.12    | 68.25  | -         | 69.75  | 5   | 0.12 | 9    | 0.12    | 0.22   |
| 43              | 2.17 | 105  | 5.29    | 69.75  | -         | 71.25  | 11  | 0.27 | 20   | 0.27    | 0.49   |
| 47              | 2.37 | 152  | 7.65    | 71.25  | -         | 72.75  | 27  | 0.66 | 47   | 0.66    | 1.15   |
| 64              | 3.22 | 216  | 10.88   | 72.75  | -         | 74.25  | 44  | 1.08 | 91   | 1.08    | 2.23   |
| 69              | 3.47 | 285  | 14.35   | 74.25  | -         | 75.75  | 64  | 1.57 | 155  | 1.57    | 3.80   |
| 91              | 4.58 | 376  | 18.93   | 75.75  | -         | 77.25  | 77  | 1.89 | 232  | 1.89    | 5.68   |
| 105             | 5.29 | 481  | 24.22   | 77.25  | -         | 78.75  | 103 | 2.52 | 335  | 2.52    | 8.21   |
| 113             | 5.69 | 594  | 29.91   | 78.75  | -         | 80.25  | 131 | 3.21 | 466  | 3.21    | 11.42  |
| 131             | 6.60 | 725  | 36.51   | 80.25  | -         | 81.75  | 129 | 3.16 | 595  | 3.16    | 14.58  |
| 115             | 5.79 | 840  | 42.30   | 81.75  | -         | 83.25  | 150 | 3.67 | 745  | 3.67    | 18.25  |
| 117             | 5.89 | 957  | 48.19   | 83.25  | -         | 84.75  | 178 | 4.36 | 923  | 4.36    | 22.61  |
| 118             | 5.94 | 1075 | 54.13   | 84.75  | -         | 86.25  | 172 | 4.21 | 1095 | 4.21    | 26.83  |
| 108             | 5.44 | 1183 | 59.57   | 86.25  | -         | 87.75  | 168 | 4.12 | 1263 | 4.12    | 30.94  |
| 100             | 5.04 | 1283 | 64.60   | 87.75  | -         | 89.25  | 180 | 4.41 | 1443 | 4.41    | 35.35  |
| 108             | 5.44 | 1391 | 70.04   | 89.25  | -         | 90.75  | 203 | 4.97 | 1646 | 4.97    | 40.32  |
| 87              | 4.38 | 1478 | 74.42   | 90.75  | -         | 92.25  | 216 | 5.29 | 1862 | 5.29    | 45.61  |
| 80              | 4.03 | 1558 | 78.45   | 92.25  | -         | 93.75  | 182 | 4.46 | 2044 | 4.46    | 50.07  |
| 74              | 3.73 | 1632 | 82.18   | 93.75  | -         | 95.25  | 202 | 4.95 | 2246 | 4.95    | 55.02  |
| 74              | 3.73 | 1706 | 85.90   | 95.25  | -         | 96.75  | 210 | 5.14 | 2456 | 5.14    | 60.17  |
| 55              | 2.77 | 1761 | 88.67   | 96.75  | -         | 98.25  | 193 | 4.73 | 2649 | 4.73    | 64.89  |
| 34              | 1.71 | 1795 | 90.38   | 98.25  | -         | 99.75  | 182 | 4.46 | 2831 | 4.46    | 69.35  |
| 36              | 1.81 | 1831 | 92.20   | 99.75  | -         | 101.25 | 191 | 4.68 | 3022 | 4.68    | 74.03  |
| 29              | 1.46 | 1860 | 93.66   | 101.25 | -         | 102.75 | 169 | 4.14 | 3191 | 4.14    | 78.17  |
| 31              | 1.56 | 1891 | 95.22   | 102.75 | -         | 104.25 | 142 | 3.48 | 3333 | 3.48    | 81.65  |
| 23              | 1.16 | 1914 | 96.37   | 104.25 | -         | 105.75 | 121 | 2.96 | 3454 | 2.96    | 84.62  |
| 16              | 0.81 | 1930 | 97.18   | 105.75 | -         | 107.25 | 126 | 3.09 | 3580 | 3.09    | 87.70  |
| 15              | 0.76 | 1945 | 97.94   | 107.25 | -         | 108.75 | 105 | 2.57 | 3685 | 2.57    | 90.27  |
| 11              | 0.55 | 1956 | 98.49   | 108.75 | -         | 110.25 | 70  | 1.71 | 3755 | 1.71    | 91.99  |
| 10              | 0.50 | 1966 | 98.99   | 110.25 | -         | 111.75 | 73  | 1.79 | 3828 | 1.79    | 93.78  |
| 4               | 0.20 | 1970 | 99.19   | 111.75 | -         | 113.25 | 55  | 1.35 | 3883 | 1.35    | 95.12  |
| 6               | 0.30 | 1976 | 99.50   | 113.25 | -         | 114.75 | 54  | 1.32 | 3937 | 1.32    | 96.45  |
| 2               | 0.10 | 1978 | 99.60   | 114.75 | -         | 116.25 | 34  | 0.83 | 3971 | 0.83    | 97.28  |
| 5               | 0.25 | 1983 | 99.85   | 116.25 | -         | 117.75 | 27  | 0.66 | 3998 | 0.66    | 97.94  |
| 0               | 0.00 | 1983 | 99.85   | 117.75 | -         | 119.25 | 26  | 0.64 | 4024 | 0.64    | 98.58  |
| 1               | 0.05 | 1984 | 99.90   | 119.25 | -         | 120.75 | 12  | 0.29 | 4036 | 0.29    | 98.87  |
| 0               | 0.00 | 1984 | 99.90   | 120.75 | -         | 122.25 | 12  | 0.29 | 4048 | 0.29    | 99.17  |
| 0               | 0.00 | 1984 | 99.90   | 122.25 | -         | 123.75 | 5   | 0.12 | 4053 | 0.12    | 99.29  |
| 0               | 0.00 | 1984 | 99.90   | 123.75 | -         | 125.25 | 5   | 0.12 | 4058 | 0.12    | 99.41  |
| 0               | 0.00 | 1984 | 99.90   | 125.25 | -         | 126.75 | 7   | 0.17 | 4065 | 0.17    | 99.58  |
| 0               | 0.00 | 1984 | 99.90   | 126.75 | -         | 128.25 | 3   | 0.07 | 4068 | 0.07    | 99.66  |
| 0               | 0.00 | 1984 | 99.90   | 128.25 | -         | 129.75 | 2   | 0.05 | 4070 | 0.05    | 99.71  |
| 1               | 0.05 | 1985 | 99.95   | 129.75 | -         | 131.25 | 5   | 0.12 | 4075 | 0.12    | 99.83  |
| 0               | 0.00 | 1985 | 99.95   | 131.25 | -         | 132.75 | 1   | 0.02 | 4076 | 0.02    | 99.85  |
| 1               | 0.05 | 1986 | 100.00  | 132.75 | -         | 134.25 | 3   | 0.07 | 4079 | 0.07    | 99.93  |
|                 |      |      |         | 134.25 | -         | 135.75 | 1   | 0.02 | 4080 | 0.02    | 99.95  |
|                 |      |      |         | 135.75 | -         | 137.25 | 1   | 0.02 | 4081 | 0.02    | 99.98  |
|                 |      |      |         | 137.25 | -         | 138.75 | 1   | 0.02 | 4082 | 0.02    | 100.00 |

## (88) WAIST DEPTH

The horizontal distance between the anterior and posterior omphalion landmarks is measured with a beam caliper. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 15.90       | 6.26  | 1ST  | 17.40 | 6.85  |
| 16.30       | 6.42  | 2ND  | 17.90 | 7.05  |
| 16.50       | 6.50  | 3RD  | 18.30 | 7.20  |
| 16.90       | 6.65  | 5TH  | 18.80 | 7.40  |
| 17.60       | 6.93  | 10TH | 19.60 | 7.72  |
| 18.20       | 7.17  | 15TH | 20.20 | 7.95  |
| 18.60       | 7.32  | 20TH | 20.70 | 8.15  |
| 19.00       | 7.48  | 25TH | 21.20 | 8.35  |
| 19.40       | 7.64  | 30TH | 21.60 | 8.50  |
| 19.80       | 7.80  | 35TH | 22.10 | 8.70  |
| 20.10       | 7.91  | 40TH | 22.50 | 8.86  |
| 20.50       | 8.07  | 45TH | 22.90 | 9.02  |
| 20.90       | 8.23  | 50TH | 23.40 | 9.21  |
| 21.30       | 8.39  | 55TH | 23.90 | 9.41  |
| 21.70       | 8.54  | 60TH | 24.30 | 9.57  |
| 22.20       | 8.74  | 65TH | 24.80 | 9.76  |
| 22.60       | 8.90  | 70TH | 25.50 | 10.04 |
| 23.20       | 9.13  | 75TH | 26.10 | 10.28 |
| 23.80       | 9.37  | 80TH | 26.70 | 10.51 |
| 24.50       | 9.65  | 85TH | 27.40 | 10.79 |
| 25.60       | 10.08 | 90TH | 28.40 | 11.18 |
| 27.10       | 10.67 | 95TH | 30.00 | 11.81 |
| 28.20       | 11.10 | 97TH | 30.90 | 12.17 |
| 28.90       | 11.38 | 98TH | 31.80 | 12.52 |
| 30.00       | 11.81 | 99TH | 32.90 | 12.95 |

## (88) WAIST DEPTH

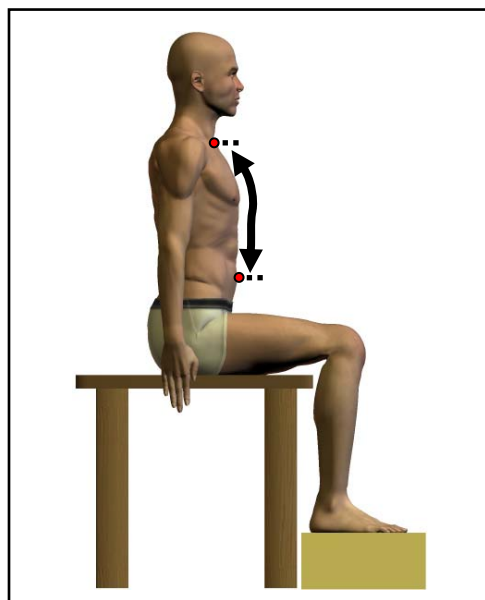
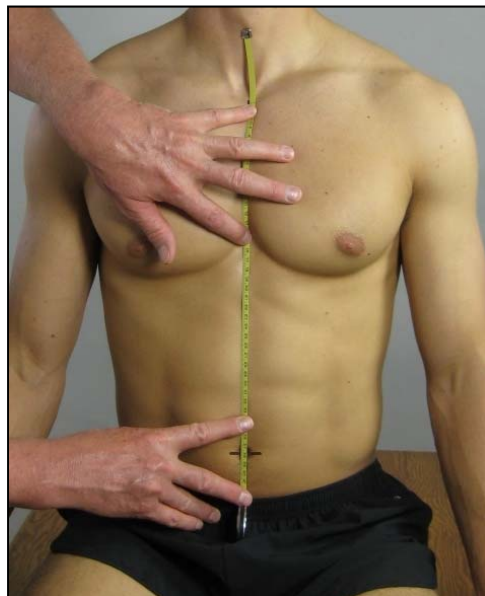
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 21.30                    |                     | 8.39  |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 3.14                     | STANDARD DEVIATION  | 1.24  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 13.80                    | MINIMUM             | 5.43  |
| 36.70                    | MAXIMUM             | 14.45 |
| SKEWNESS                 |                     | 0.75  |
| KURTOSIS                 |                     | 3.76  |
| COEFFICIENT OF VARIATION |                     | 14.7% |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 23.78                    |                     | 9.36  |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 3.47                     | STANDARD DEVIATION  | 1.37  |
| 0.04                     | STD ERROR (STD DEV) | 0.02  |
| 15.10                    | MINIMUM             | 5.94  |
| 40.60                    | MAXIMUM             | 15.98 |
| SKEWNESS                 |                     | 0.56  |
| KURTOSIS                 |                     | 3.24  |
| COEFFICIENT OF VARIATION |                     | 14.6% |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |       |      |         |       |   |       |      |      |         |        |  |
|-----------------|-------|------|---------|-------|---|-------|------|------|---------|--------|--|
| FEMALES         |       |      |         |       |   | MALES |      |      |         |        |  |
| F               | FPct  | CumF | CumFPct | CM    |   | F     | FPct | CumF | CumFPct |        |  |
| 1               | 0.05  | 1    | 0.05    | 13.25 | - | 14.00 |      |      |         |        |  |
| 3               | 0.15  | 4    | 0.20    | 14.00 | - | 14.75 |      |      |         |        |  |
| 5               | 0.25  | 9    | 0.45    | 14.75 | - | 15.50 | 1    | 0.02 | 1       | 0.02   |  |
| 30              | 1.51  | 39   | 1.96    | 15.50 | - | 16.25 | 4    | 0.10 | 5       | 0.12   |  |
| 62              | 3.12  | 101  | 5.09    | 16.25 | - | 17.00 | 6    | 0.15 | 11      | 0.27   |  |
| 117             | 5.89  | 218  | 10.98   | 17.00 | - | 17.75 | 54   | 1.32 | 65      | 1.59   |  |
| 131             | 6.60  | 349  | 17.57   | 17.75 | - | 18.50 | 82   | 2.01 | 147     | 3.60   |  |
| 211             | 10.62 | 560  | 28.20   | 18.50 | - | 19.25 | 159  | 3.90 | 306     | 7.50   |  |
| 186             | 9.37  | 746  | 37.56   | 19.25 | - | 20.00 | 230  | 5.63 | 536     | 13.13  |  |
| 218             | 10.98 | 964  | 48.54   | 20.00 | - | 20.75 | 311  | 7.62 | 847     | 20.75  |  |
| 175             | 8.81  | 1139 | 57.35   | 20.75 | - | 21.50 | 302  | 7.40 | 1149    | 28.15  |  |
| 174             | 8.76  | 1313 | 66.11   | 21.50 | - | 22.25 | 351  | 8.60 | 1500    | 36.75  |  |
| 141             | 7.10  | 1454 | 73.21   | 22.25 | - | 23.00 | 343  | 8.40 | 1843    | 45.15  |  |
| 127             | 6.39  | 1581 | 79.61   | 23.00 | - | 23.75 | 332  | 8.13 | 2175    | 53.28  |  |
| 94              | 4.73  | 1675 | 84.34   | 23.75 | - | 24.50 | 323  | 7.91 | 2498    | 61.20  |  |
| 83              | 4.18  | 1758 | 88.52   | 24.50 | - | 25.25 | 295  | 7.23 | 2793    | 68.42  |  |
| 59              | 2.97  | 1817 | 91.49   | 25.25 | - | 26.00 | 230  | 5.63 | 3023    | 74.06  |  |
| 53              | 2.67  | 1870 | 94.16   | 26.00 | - | 26.75 | 252  | 6.17 | 3275    | 80.23  |  |
| 35              | 1.76  | 1905 | 95.92   | 26.75 | - | 27.50 | 198  | 4.85 | 3473    | 85.08  |  |
| 25              | 1.26  | 1930 | 97.18   | 27.50 | - | 28.25 | 172  | 4.21 | 3645    | 89.29  |  |
| 18              | 0.91  | 1948 | 98.09   | 28.25 | - | 29.00 | 113  | 2.77 | 3758    | 92.06  |  |
| 16              | 0.81  | 1964 | 98.89   | 29.00 | - | 29.75 | 95   | 2.33 | 3853    | 94.39  |  |
| 5               | 0.25  | 1969 | 99.14   | 29.75 | - | 30.50 | 65   | 1.59 | 3918    | 95.98  |  |
| 6               | 0.30  | 1975 | 99.45   | 30.50 | - | 31.25 | 61   | 1.49 | 3979    | 97.48  |  |
| 4               | 0.20  | 1979 | 99.65   | 31.25 | - | 32.00 | 29   | 0.71 | 4008    | 98.19  |  |
| 3               | 0.15  | 1982 | 99.80   | 32.00 | - | 32.75 | 27   | 0.66 | 4035    | 98.85  |  |
| 1               | 0.05  | 1983 | 99.85   | 32.75 | - | 33.50 | 16   | 0.39 | 4051    | 99.24  |  |
| 1               | 0.05  | 1984 | 99.90   | 33.50 | - | 34.25 | 9    | 0.22 | 4060    | 99.46  |  |
| 0               | 0.00  | 1984 | 99.90   | 34.25 | - | 35.00 | 6    | 0.15 | 4066    | 99.61  |  |
| 0               | 0.00  | 1984 | 99.90   | 35.00 | - | 35.75 | 7    | 0.17 | 4073    | 99.78  |  |
| 1               | 0.05  | 1985 | 99.95   | 35.75 | - | 36.50 | 3    | 0.07 | 4076    | 99.85  |  |
| 1               | 0.05  | 1986 | 100.00  | 36.50 | - | 37.25 | 0    | 0.00 | 4076    | 99.85  |  |
|                 |       |      |         | 37.25 | - | 38.00 | 4    | 0.10 | 4080    | 99.95  |  |
|                 |       |      |         | 38.00 | - | 38.75 | 1    | 0.02 | 4081    | 99.98  |  |
|                 |       |      |         | 38.75 | - | 39.50 | 0    | 0.00 | 4081    | 99.98  |  |
|                 |       |      |         | 39.50 | - | 40.25 | 0    | 0.00 | 4081    | 99.98  |  |
|                 |       |      |         | 40.25 | - | 41.00 | 1    | 0.02 | 4082    | 100.00 |  |

## (89) WAIST FRONT LENGTH, SITTING

The surface distance between the suprasternale landmark and the anterior omphalion landmark is measured with a tape. The participant is in the anthropometric sitting position with the head in the Frankfurt plane and the arms relaxed at the sides. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 30.40       | 11.97 | 1ST  | 32.40 | 12.76 |
| 31.00       | 12.20 | 2ND  | 33.10 | 13.03 |
| 31.30       | 12.32 | 3RD  | 33.50 | 13.19 |
| 31.70       | 12.48 | 5TH  | 34.20 | 13.46 |
| 32.50       | 12.80 | 10TH | 35.10 | 13.82 |
| 33.00       | 12.99 | 15TH | 35.70 | 14.06 |
| 33.40       | 13.15 | 20TH | 36.30 | 14.29 |
| 33.80       | 13.31 | 25TH | 36.70 | 14.45 |
| 34.20       | 13.46 | 30TH | 37.20 | 14.65 |
| 34.50       | 13.58 | 35TH | 37.50 | 14.76 |
| 34.80       | 13.70 | 40TH | 37.90 | 14.92 |
| 35.20       | 13.86 | 45TH | 38.30 | 15.08 |
| 35.50       | 13.98 | 50TH | 38.60 | 15.20 |
| 35.70       | 14.06 | 55TH | 39.00 | 15.35 |
| 36.10       | 14.21 | 60TH | 39.40 | 15.51 |
| 36.40       | 14.33 | 65TH | 39.80 | 15.67 |
| 36.70       | 14.45 | 70TH | 40.20 | 15.83 |
| 37.00       | 14.57 | 75TH | 40.70 | 16.02 |
| 37.50       | 14.76 | 80TH | 41.20 | 16.22 |
| 38.00       | 14.96 | 85TH | 41.80 | 16.46 |
| 38.70       | 15.24 | 90TH | 42.70 | 16.81 |
| 39.60       | 15.59 | 95TH | 43.80 | 17.24 |
| 40.20       | 15.83 | 97TH | 44.60 | 17.56 |
| 40.60       | 15.98 | 98TH | 45.10 | 17.76 |
| 41.30       | 16.26 | 99TH | 46.00 | 18.11 |

## (89) WAIST FRONT LENGTH, SITTING

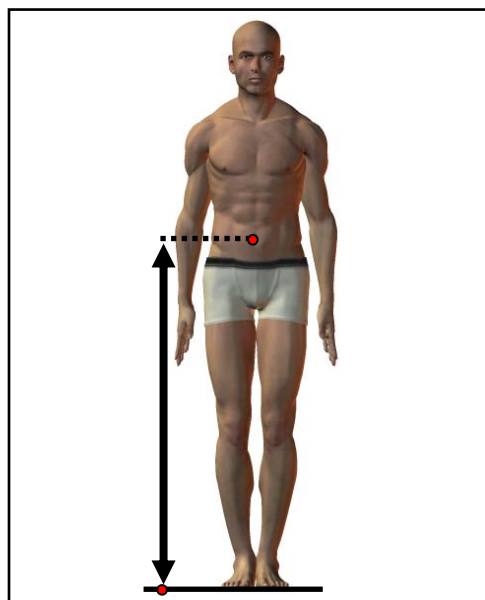
| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 35.51                    |                     | 13.98 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 2.39                     | STANDARD DEVIATION  | 0.94  |
| 0.04                     | STD ERROR (STD DEV) | 0.01  |
| 28.90                    | MINIMUM             | 11.38 |
| 43.20                    | MAXIMUM             | 17.01 |
| SKEWNESS                 |                     | 0.19  |
| KURTOSIS                 |                     | 2.84  |
| COEFFICIENT OF VARIATION |                     | 6.7%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       | MEAN                | IN    |
| 38.76                    |                     | 15.26 |
| 0.05                     | STD ERROR (MEAN)    | 0.02  |
| 2.93                     | STANDARD DEVIATION  | 1.16  |
| 0.03                     | STD ERROR (STD DEV) | 0.01  |
| 29.30                    | MINIMUM             | 11.54 |
| 49.40                    | MAXIMUM             | 19.45 |
| SKEWNESS                 |                     | 0.20  |
| KURTOSIS                 |                     | 2.97  |
| COEFFICIENT OF VARIATION |                     | 7.6%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |       |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10 | 2    | 0.10    | 28.75           | - | 29.25 |  | 2     | 0.05 | 2    | 0.05    |
| 6       | 0.30 | 8    | 0.40    | 29.25           | - | 29.75 |  | 3     | 0.07 | 5    | 0.12    |
| 8       | 0.40 | 16   | 0.81    | 29.75           | - | 30.25 |  | 3     | 0.07 | 8    | 0.20    |
| 15      | 0.76 | 31   | 1.56    | 30.25           | - | 30.75 |  | 6     | 0.15 | 14   | 0.34    |
| 24      | 1.21 | 55   | 2.77    | 30.75           | - | 31.25 |  | 11    | 0.27 | 25   | 0.61    |
| 47      | 2.37 | 102  | 5.14    | 31.25           | - | 31.75 |  | 8     | 0.20 | 33   | 0.81    |
| 66      | 3.32 | 168  | 8.46    | 31.75           | - | 32.25 |  | 29    | 0.71 | 62   | 1.52    |
| 77      | 3.88 | 245  | 12.34   | 32.25           | - | 32.75 |  | 30    | 0.73 | 92   | 2.25    |
| 117     | 5.89 | 362  | 18.23   | 32.75           | - | 33.25 |  | 64    | 1.57 | 156  | 3.82    |
| 129     | 6.50 | 491  | 24.72   | 33.25           | - | 33.75 |  | 58    | 1.42 | 214  | 5.24    |
| 120     | 6.04 | 611  | 30.77   | 33.75           | - | 34.25 |  | 123   | 3.01 | 337  | 8.26    |
| 167     | 8.41 | 778  | 39.17   | 34.25           | - | 34.75 |  | 103   | 2.52 | 440  | 10.78   |
| 151     | 7.60 | 929  | 46.78   | 34.75           | - | 35.25 |  | 176   | 4.31 | 616  | 15.09   |
| 169     | 8.51 | 1098 | 55.29   | 35.25           | - | 35.75 |  | 164   | 4.02 | 780  | 19.11   |
| 152     | 7.65 | 1250 | 62.94   | 35.75           | - | 36.25 |  | 258   | 6.32 | 1038 | 25.43   |
| 162     | 8.16 | 1412 | 71.10   | 36.25           | - | 36.75 |  | 247   | 6.05 | 1285 | 31.48   |
| 115     | 5.79 | 1527 | 76.89   | 36.75           | - | 37.25 |  | 273   | 6.69 | 1558 | 38.17   |
| 106     | 5.34 | 1633 | 82.23   | 37.25           | - | 37.75 |  | 275   | 6.74 | 1833 | 44.90   |
| 95      | 4.78 | 1728 | 87.01   | 37.75           | - | 38.25 |  | 295   | 7.23 | 2128 | 52.13   |
| 65      | 3.27 | 1793 | 90.28   | 38.25           | - | 38.75 |  | 233   | 5.71 | 2361 | 57.84   |
| 45      | 2.27 | 1838 | 92.55   | 38.75           | - | 39.25 |  | 273   | 6.69 | 2634 | 64.53   |
| 65      | 3.27 | 1903 | 95.82   | 39.25           | - | 39.75 |  | 251   | 6.15 | 2885 | 70.68   |
| 26      | 1.31 | 1929 | 97.13   | 39.75           | - | 40.25 |  | 206   | 5.05 | 3091 | 75.72   |
| 23      | 1.16 | 1952 | 98.29   | 40.25           | - | 40.75 |  | 190   | 4.65 | 3281 | 80.38   |
| 9       | 0.45 | 1961 | 98.74   | 40.75           | - | 41.25 |  | 166   | 4.07 | 3447 | 84.44   |
| 12      | 0.60 | 1973 | 99.35   | 41.25           | - | 41.75 |  | 128   | 3.14 | 3575 | 87.58   |
| 5       | 0.25 | 1978 | 99.60   | 41.75           | - | 42.25 |  | 112   | 2.74 | 3687 | 90.32   |
| 6       | 0.30 | 1984 | 99.90   | 42.25           | - | 42.75 |  | 93    | 2.28 | 3780 | 92.60   |
| 2       | 0.10 | 1986 | 100.00  | 42.75           | - | 43.25 |  | 80    | 1.96 | 3860 | 94.56   |
|         |      |      |         | 43.25           | - | 43.75 |  | 71    | 1.74 | 3931 | 96.30   |
|         |      |      |         | 43.75           | - | 44.25 |  | 39    | 0.96 | 3970 | 97.26   |
|         |      |      |         | 44.25           | - | 44.75 |  | 36    | 0.88 | 4006 | 98.14   |
|         |      |      |         | 44.75           | - | 45.25 |  | 24    | 0.59 | 4030 | 98.73   |
|         |      |      |         | 45.25           | - | 45.75 |  | 19    | 0.47 | 4049 | 99.19   |
|         |      |      |         | 45.75           | - | 46.25 |  | 14    | 0.34 | 4063 | 99.53   |
|         |      |      |         | 46.25           | - | 46.75 |  | 12    | 0.29 | 4075 | 99.83   |
|         |      |      |         | 46.75           | - | 47.25 |  | 3     | 0.07 | 4078 | 99.90   |
|         |      |      |         | 47.25           | - | 47.75 |  | 2     | 0.05 | 4080 | 99.95   |
|         |      |      |         | 47.75           | - | 48.25 |  | 0     | 0.00 | 4080 | 99.95   |
|         |      |      |         | 48.25           | - | 48.75 |  | 0     | 0.00 | 4080 | 99.95   |
|         |      |      |         | 48.75           | - | 49.25 |  | 2     | 0.05 | 4082 | 100.00  |
|         |      |      |         | 49.25           | - | 49.75 |  |       |      |      |         |

## (90) WAIST HEIGHT (OMPHALION)

The vertical distance between a standing surface and the anterior omphalion landmark is measured with an anthropometer. The participant stands erect, looking straight ahead. The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 86.70       | 34.13 | 1ST  | 94.30  | 37.13 |
| 88.00       | 34.65 | 2ND  | 95.40  | 37.56 |
| 88.90       | 35.00 | 3RD  | 96.20  | 37.87 |
| 90.00       | 35.43 | 5TH  | 97.20  | 38.27 |
| 91.80       | 36.14 | 10TH | 99.00  | 38.98 |
| 93.00       | 36.61 | 15TH | 100.10 | 39.41 |
| 93.90       | 36.97 | 20TH | 101.20 | 39.84 |
| 94.70       | 37.28 | 25TH | 102.00 | 40.16 |
| 95.30       | 37.52 | 30TH | 102.90 | 40.51 |
| 96.00       | 37.80 | 35TH | 103.60 | 40.79 |
| 96.60       | 38.03 | 40TH | 104.30 | 41.06 |
| 97.20       | 38.27 | 45TH | 104.90 | 41.30 |
| 97.70       | 38.46 | 50TH | 105.50 | 41.54 |
| 98.40       | 38.74 | 55TH | 106.20 | 41.81 |
| 99.10       | 39.02 | 60TH | 107.00 | 42.13 |
| 99.80       | 39.29 | 65TH | 107.70 | 42.40 |
| 100.60      | 39.61 | 70TH | 108.30 | 42.64 |
| 101.30      | 39.88 | 75TH | 109.00 | 42.91 |
| 102.20      | 40.24 | 80TH | 109.90 | 43.27 |
| 103.30      | 40.67 | 85TH | 111.00 | 43.70 |
| 104.60      | 41.18 | 90TH | 112.30 | 44.21 |
| 106.40      | 41.89 | 95TH | 114.50 | 45.08 |
| 107.40      | 42.28 | 97TH | 115.50 | 45.47 |
| 108.40      | 42.68 | 98TH | 116.90 | 46.02 |
| 110.10      | 43.35 | 99TH | 118.60 | 46.69 |

## (90) WAIST HEIGHT (OMPHALION)

| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 98.01                    | MEAN                | 38.59 |
| 0.11                     | STD ERROR (MEAN)    | 0.04  |
| 5.00                     | STANDARD DEVIATION  | 1.97  |
| 0.08                     | STD ERROR (STD DEV) | 0.03  |
| 80.50                    | MINIMUM             | 31.69 |
| 114.20                   | MAXIMUM             | 44.96 |
| SKEWNESS                 |                     | 0.08  |
| KURTOSIS                 |                     | 3.07  |
| COEFFICIENT OF VARIATION |                     | 5.1%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 105.65                   | MEAN                | 41.59 |
| 0.08                     | STD ERROR (MEAN)    | 0.03  |
| 5.22                     | STANDARD DEVIATION  | 2.05  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 87.60                    | MINIMUM             | 34.49 |
| 124.50                   | MAXIMUM             | 49.02 |
| SKEWNESS                 |                     | 0.12  |
| KURTOSIS                 |                     | 3.03  |
| COEFFICIENT OF VARIATION |                     | 4.9%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FEMALES |      |      |         | FREQUENCY TABLE |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-----------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM              |   |        |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10 | 2    | 0.10    | 79.55           | - | 80.55  |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 80.55           | - | 81.55  |  |       |      |      |         |
| 1       | 0.05 | 4    | 0.20    | 81.55           | - | 82.55  |  |       |      |      |         |
| 1       | 0.05 | 5    | 0.25    | 82.55           | - | 83.55  |  |       |      |      |         |
| 3       | 0.15 | 8    | 0.40    | 83.55           | - | 84.55  |  |       |      |      |         |
| 1       | 0.05 | 9    | 0.45    | 84.55           | - | 85.55  |  |       |      |      |         |
| 9       | 0.45 | 18   | 0.91    | 85.55           | - | 86.55  |  |       |      |      |         |
| 12      | 0.60 | 30   | 1.51    | 86.55           | - | 87.55  |  |       |      |      |         |
| 24      | 1.21 | 54   | 2.72    | 87.55           | - | 88.55  |  | 2     | 0.05 | 2    | 0.05    |
| 22      | 1.11 | 76   | 3.83    | 88.55           | - | 89.55  |  | 1     | 0.02 | 3    | 0.07    |
| 51      | 2.57 | 127  | 6.39    | 89.55           | - | 90.55  |  | 1     | 0.02 | 4    | 0.10    |
| 54      | 2.72 | 181  | 9.11    | 90.55           | - | 91.55  |  | 3     | 0.07 | 7    | 0.17    |
| 73      | 3.68 | 254  | 12.79   | 91.55           | - | 92.55  |  | 11    | 0.27 | 18   | 0.44    |
| 102     | 5.14 | 356  | 17.93   | 92.55           | - | 93.55  |  | 11    | 0.27 | 29   | 0.71    |
| 122     | 6.14 | 478  | 24.07   | 93.55           | - | 94.55  |  | 17    | 0.42 | 46   | 1.13    |
| 158     | 7.96 | 636  | 32.02   | 94.55           | - | 95.55  |  | 40    | 0.98 | 86   | 2.11    |
| 153     | 7.70 | 789  | 39.73   | 95.55           | - | 96.55  |  | 68    | 1.67 | 154  | 3.77    |
| 169     | 8.51 | 958  | 48.24   | 96.55           | - | 97.55  |  | 84    | 2.06 | 238  | 5.83    |
| 151     | 7.60 | 1109 | 55.84   | 97.55           | - | 98.55  |  | 102   | 2.50 | 340  | 8.33    |
| 146     | 7.35 | 1255 | 63.19   | 98.55           | - | 99.55  |  | 162   | 3.97 | 502  | 12.30   |
| 132     | 6.65 | 1387 | 69.84   | 99.55           | - | 100.55 |  | 187   | 4.58 | 689  | 16.88   |
| 135     | 6.80 | 1522 | 76.64   | 100.55          | - | 101.55 |  | 203   | 4.97 | 892  | 21.85   |
| 98      | 4.93 | 1620 | 81.57   | 101.55          | - | 102.55 |  | 249   | 6.10 | 1141 | 27.95   |
| 95      | 4.78 | 1715 | 86.35   | 102.55          | - | 103.55 |  | 275   | 6.74 | 1416 | 34.69   |
| 67      | 3.37 | 1782 | 89.73   | 103.55          | - | 104.55 |  | 307   | 7.52 | 1723 | 42.21   |
| 56      | 2.82 | 1838 | 92.55   | 104.55          | - | 105.55 |  | 335   | 8.21 | 2058 | 50.42   |
| 56      | 2.82 | 1894 | 95.37   | 105.55          | - | 106.55 |  | 279   | 6.83 | 2337 | 57.25   |
| 38      | 1.91 | 1932 | 97.28   | 106.55          | - | 107.55 |  | 280   | 6.86 | 2617 | 64.11   |
| 16      | 0.81 | 1948 | 98.09   | 107.55          | - | 108.55 |  | 318   | 7.79 | 2935 | 71.90   |
| 13      | 0.65 | 1961 | 98.74   | 108.55          | - | 109.55 |  | 240   | 5.88 | 3175 | 77.78   |
| 8       | 0.40 | 1969 | 99.14   | 109.55          | - | 110.55 |  | 211   | 5.17 | 3386 | 82.95   |
| 7       | 0.35 | 1976 | 99.50   | 110.55          | - | 111.55 |  | 185   | 4.53 | 3571 | 87.48   |
| 5       | 0.25 | 1981 | 99.75   | 111.55          | - | 112.55 |  | 131   | 3.21 | 3702 | 90.69   |
| 4       | 0.20 | 1985 | 99.95   | 112.55          | - | 113.55 |  | 117   | 2.87 | 3819 | 93.56   |
| 1       | 0.05 | 1986 | 100.00  | 113.55          | - | 114.55 |  | 66    | 1.62 | 3885 | 95.17   |
|         |      |      |         | 114.55          | - | 115.55 |  | 76    | 1.86 | 3961 | 97.04   |
|         |      |      |         | 115.55          | - | 116.55 |  | 28    | 0.69 | 3989 | 97.72   |
|         |      |      |         | 116.55          | - | 117.55 |  | 31    | 0.76 | 4020 | 98.48   |
|         |      |      |         | 117.55          | - | 118.55 |  | 19    | 0.47 | 4039 | 98.95   |
|         |      |      |         | 118.55          | - | 119.55 |  | 14    | 0.34 | 4053 | 99.29   |
|         |      |      |         | 119.55          | - | 120.55 |  | 19    | 0.47 | 4072 | 99.76   |
|         |      |      |         | 120.55          | - | 121.55 |  | 3     | 0.07 | 4075 | 99.83   |
|         |      |      |         | 121.55          | - | 122.55 |  | 1     | 0.02 | 4076 | 99.85   |
|         |      |      |         | 122.25          | - | 123.25 |  | 4     | 0.10 | 4080 | 99.95   |
|         |      |      |         | 123.25          | - | 124.25 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 124.25          | - | 125.25 |  | 1     | 0.02 | 4082 | 100.00  |

## (91) WEIGHT

The weight of the participant is taken to the nearest tenth of a kilogram. The participant stands on the platform of a scale with the weight distributed evenly on both feet.



| PERCENTILES |           |      |           |           |
|-------------|-----------|------|-----------|-----------|
| FEMALES     |           |      | MALES     |           |
| <u>KG</u>   | <u>LB</u> |      | <u>KG</u> | <u>LB</u> |
| 46.40       | 102.29    | 1ST  | 57.80     | 127.43    |
| 48.00       | 105.82    | 2ND  | 60.00     | 132.28    |
| 49.90       | 110.01    | 3RD  | 61.90     | 136.46    |
| 51.30       | 113.10    | 5TH  | 64.40     | 141.98    |
| 54.60       | 120.37    | 10TH | 68.20     | 150.35    |
| 56.70       | 125.00    | 15TH | 70.80     | 156.09    |
| 58.50       | 128.97    | 20TH | 73.40     | 161.82    |
| 60.10       | 132.50    | 25TH | 75.60     | 166.67    |
| 61.60       | 135.80    | 30TH | 77.40     | 170.64    |
| 63.10       | 139.11    | 35TH | 79.20     | 174.60    |
| 64.50       | 142.20    | 40TH | 81.00     | 178.57    |
| 65.70       | 144.84    | 45TH | 82.80     | 182.54    |
| 66.80       | 147.27    | 50TH | 84.60     | 186.51    |
| 68.00       | 149.91    | 55TH | 86.40     | 190.48    |
| 69.50       | 153.22    | 60TH | 88.00     | 194.00    |
| 70.80       | 156.09    | 65TH | 89.80     | 197.97    |
| 72.60       | 160.05    | 70TH | 92.00     | 202.82    |
| 74.60       | 164.46    | 75TH | 94.40     | 208.11    |
| 76.40       | 168.43    | 80TH | 96.60     | 212.96    |
| 78.90       | 173.94    | 85TH | 100.00    | 220.46    |
| 82.40       | 181.66    | 90TH | 104.40    | 230.16    |
| 87.10       | 192.02    | 95TH | 110.70    | 244.05    |
| 91.40       | 201.50    | 97TH | 115.10    | 253.75    |
| 93.40       | 205.91    | 98TH | 118.90    | 262.13    |
| 98.30       | 216.71    | 99TH | 124.70    | 274.91    |

## (91) WEIGHT

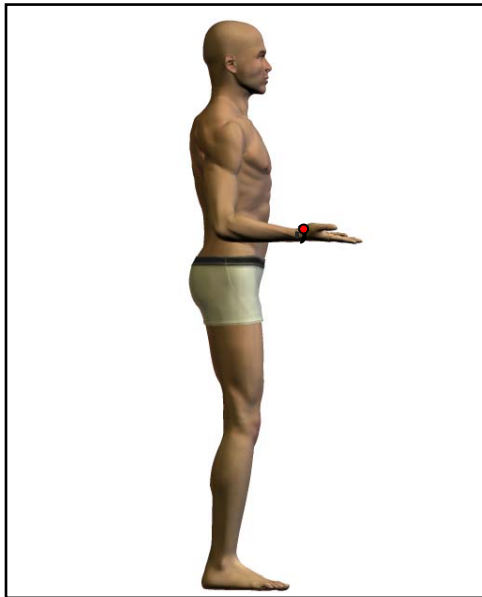
| FEMALES                  |                     |           |
|--------------------------|---------------------|-----------|
| <u>KG</u>                |                     | <u>LB</u> |
| 67.76                    | MEAN                | 149.38    |
| 0.25                     | STD ERROR (MEAN)    | 0.54      |
| 10.98                    | STANDARD DEVIATION  | 24.22     |
| 0.17                     | STD ERROR (STD DEV) | 0.38      |
| 35.80                    | MINIMUM             | 78.92     |
| 119.60                   | MAXIMUM             | 263.67    |
| SKEWNESS                 |                     | 0.56      |
| KURTOSIS                 |                     | 3.67      |
| COEFFICIENT OF VARIATION |                     | 16.2%     |
| NUMBER OF PARTICIPANTS   |                     | 1986      |

| MALES                    |                     |           |
|--------------------------|---------------------|-----------|
| <u>KG</u>                |                     | <u>LB</u> |
| 85.52                    | MEAN                | 188.55    |
| 0.22                     | STD ERROR (MEAN)    | 0.49      |
| 14.22                    | STANDARD DEVIATION  | 31.35     |
| 0.16                     | STD ERROR (STD DEV) | 0.35      |
| 39.30                    | MINIMUM             | 86.64     |
| 144.20                   | MAXIMUM             | 317.90    |
| SKEWNESS                 |                     | 0.48      |
| KURTOSIS                 |                     | 3.36      |
| COEFFICIENT OF VARIATION |                     | 16.6%     |
| NUMBER OF PARTICIPANTS   |                     | 4082      |

| FREQUENCY TABLE |      |      |         |           |   |        |  |       |      |      |         |
|-----------------|------|------|---------|-----------|---|--------|--|-------|------|------|---------|
| FEMALES         |      |      |         |           |   |        |  | MALES |      |      |         |
| F               | FPct | CumF | CumFPct | <u>KG</u> |   |        |  | F     | FPct | CumF | CumFPct |
| 1               | 0.05 | 1    | 0.05    | 34.75     | - | 37.00  |  |       |      |      |         |
| 0               | 0.00 | 1    | 0.05    | 37.00     | - | 39.25  |  |       |      |      |         |
| 1               | 0.05 | 2    | 0.10    | 39.25     | - | 41.50  |  | 1     | 0.02 | 1    | 0.02    |
| 7               | 0.35 | 9    | 0.45    | 41.50     | - | 43.75  |  | 0     | 0.00 | 1    | 0.02    |
| 7               | 0.35 | 16   | 0.81    | 43.75     | - | 46.00  |  | 1     | 0.02 | 2    | 0.05    |
| 25              | 1.26 | 41   | 2.06    | 46.00     | - | 48.25  |  | 2     | 0.05 | 4    | 0.10    |
| 37              | 1.86 | 78   | 3.93    | 48.25     | - | 50.50  |  | 0     | 0.00 | 4    | 0.10    |
| 64              | 3.22 | 142  | 7.15    | 50.50     | - | 52.75  |  | 2     | 0.05 | 6    | 0.15    |
| 78              | 3.93 | 220  | 11.08   | 52.75     | - | 55.00  |  | 10    | 0.24 | 16   | 0.39    |
| 100             | 5.04 | 320  | 16.11   | 55.00     | - | 57.25  |  | 20    | 0.49 | 36   | 0.88    |
| 141             | 7.10 | 461  | 23.21   | 57.25     | - | 59.50  |  | 34    | 0.83 | 70   | 1.71    |
| 150             | 7.55 | 611  | 30.77   | 59.50     | - | 61.75  |  | 48    | 1.18 | 118  | 2.89    |
| 136             | 6.85 | 747  | 37.61   | 61.75     | - | 64.00  |  | 74    | 1.81 | 192  | 4.70    |
| 196             | 9.87 | 943  | 47.48   | 64.00     | - | 66.25  |  | 104   | 2.55 | 296  | 7.25    |
| 175             | 8.81 | 1118 | 56.29   | 66.25     | - | 68.50  |  | 133   | 3.26 | 429  | 10.51   |
| 168             | 8.46 | 1286 | 64.75   | 68.50     | - | 70.75  |  | 175   | 4.29 | 604  | 14.80   |
| 123             | 6.19 | 1409 | 70.95   | 70.75     | - | 73.00  |  | 179   | 4.39 | 783  | 19.18   |
| 119             | 5.99 | 1528 | 76.94   | 73.00     | - | 75.25  |  | 207   | 5.07 | 990  | 24.25   |
| 109             | 5.49 | 1637 | 82.43   | 75.25     | - | 77.50  |  | 235   | 5.76 | 1225 | 30.01   |
| 86              | 4.33 | 1723 | 86.76   | 77.50     | - | 79.75  |  | 269   | 6.59 | 1494 | 36.60   |
| 49              | 2.47 | 1772 | 89.22   | 79.75     | - | 82.00  |  | 251   | 6.15 | 1745 | 42.75   |
| 67              | 3.37 | 1839 | 92.60   | 82.00     | - | 84.25  |  | 256   | 6.27 | 2001 | 49.02   |
| 40              | 2.01 | 1879 | 94.61   | 84.25     | - | 86.50  |  | 252   | 6.17 | 2253 | 55.19   |
| 26              | 1.31 | 1905 | 95.92   | 86.50     | - | 88.75  |  | 286   | 7.01 | 2539 | 62.20   |
| 20              | 1.01 | 1925 | 96.93   | 88.75     | - | 91.00  |  | 225   | 5.51 | 2764 | 67.71   |
| 19              | 0.96 | 1944 | 97.89   | 91.00     | - | 93.25  |  | 199   | 4.88 | 2963 | 72.59   |
| 15              | 0.76 | 1959 | 98.64   | 93.25     | - | 95.50  |  | 194   | 4.75 | 3157 | 77.34   |
| 7               | 0.35 | 1966 | 98.99   | 95.50     | - | 97.75  |  | 190   | 4.65 | 3347 | 81.99   |
| 8               | 0.40 | 1974 | 99.40   | 97.75     | - | 100.00 |  | 122   | 2.99 | 3469 | 84.98   |
| 3               | 0.15 | 1977 | 99.55   | 100.00    | - | 102.25 |  | 124   | 3.04 | 3593 | 88.02   |
| 1               | 0.05 | 1978 | 99.60   | 102.25    | - | 104.50 |  | 81    | 1.98 | 3674 | 90.00   |
| 2               | 0.10 | 1980 | 99.70   | 104.50    | - | 106.75 |  | 90    | 2.20 | 3764 | 92.21   |
| 3               | 0.15 | 1983 | 99.85   | 106.75    | - | 109.00 |  | 63    | 1.54 | 3827 | 93.75   |
| 0               | 0.00 | 1983 | 99.85   | 109.00    | - | 111.25 |  | 65    | 1.59 | 3892 | 95.35   |
| 1               | 0.05 | 1984 | 99.90   | 111.25    | - | 113.50 |  | 41    | 1.00 | 3933 | 96.35   |
| 0               | 0.00 | 1984 | 99.90   | 113.50    | - | 115.75 |  | 32    | 0.78 | 3965 | 97.13   |
| 1               | 0.05 | 1985 | 99.95   | 115.75    | - | 118.00 |  | 26    | 0.64 | 3991 | 97.77   |
| 1               | 0.05 | 1986 | 100.00  | 118.00    | - | 120.25 |  | 24    | 0.59 | 4015 | 98.36   |
|                 |      |      |         | 120.25    | - | 122.50 |  | 18    | 0.44 | 4033 | 98.80   |
|                 |      |      |         | 122.50    | - | 124.75 |  | 9     | 0.22 | 4042 | 99.02   |
|                 |      |      |         | 124.75    | - | 127.00 |  | 13    | 0.32 | 4055 | 99.34   |
|                 |      |      |         | 127.00    | - | 129.25 |  | 7     | 0.17 | 4062 | 99.51   |
|                 |      |      |         | 129.25    | - | 131.50 |  | 5     | 0.12 | 4067 | 99.63   |
|                 |      |      |         | 131.50    | - | 133.75 |  | 4     | 0.10 | 4071 | 99.73   |
|                 |      |      |         | 133.75    | - | 136.00 |  | 4     | 0.10 | 4075 | 99.83   |
|                 |      |      |         | 136.00    | - | 138.25 |  | 3     | 0.07 | 4078 | 99.90   |
|                 |      |      |         | 138.25    | - | 140.50 |  | 1     | 0.02 | 4079 | 99.93   |
|                 |      |      |         | 140.50    | - | 142.75 |  | 1     | 0.02 | 4080 | 99.95   |
|                 |      |      |         | 142.75    | - | 145.00 |  | 2     | 0.05 | 4082 | 100.00  |

## (92) WRIST CIRCUMFERENCE

The circumference of the wrist, perpendicular to the long axis of the forearm, is measured with a tape passing over the stylium landmark. The participant extends the right arm forward with the palm up.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 13.80       | 5.43 | 1ST  | 15.60 | 6.14 |
| 14.00       | 5.51 | 2ND  | 15.80 | 6.22 |
| 14.10       | 5.55 | 3RD  | 16.00 | 6.30 |
| 14.20       | 5.59 | 5TH  | 16.20 | 6.38 |
| 14.50       | 5.71 | 10TH | 16.50 | 6.50 |
| 14.70       | 5.79 | 15TH | 16.70 | 6.57 |
| 14.80       | 5.83 | 20TH | 16.80 | 6.61 |
| 15.00       | 5.91 | 25TH | 17.00 | 6.69 |
| 15.00       | 5.91 | 30TH | 17.10 | 6.73 |
| 15.20       | 5.98 | 35TH | 17.20 | 6.77 |
| 15.30       | 6.02 | 40TH | 17.40 | 6.85 |
| 15.30       | 6.02 | 45TH | 17.50 | 6.89 |
| 15.40       | 6.06 | 50TH | 17.60 | 6.93 |
| 15.50       | 6.10 | 55TH | 17.70 | 6.97 |
| 15.60       | 6.14 | 60TH | 17.80 | 7.01 |
| 15.70       | 6.18 | 65TH | 17.90 | 7.05 |
| 15.90       | 6.26 | 70TH | 18.00 | 7.09 |
| 16.00       | 6.30 | 75TH | 18.20 | 7.17 |
| 16.20       | 6.38 | 80TH | 18.30 | 7.20 |
| 16.30       | 6.42 | 85TH | 18.50 | 7.28 |
| 16.50       | 6.50 | 90TH | 18.70 | 7.36 |
| 16.80       | 6.61 | 95TH | 19.10 | 7.52 |
| 17.00       | 6.69 | 97TH | 19.40 | 7.64 |
| 17.20       | 6.77 | 98TH | 19.60 | 7.72 |
| 17.40       | 6.85 | 99TH | 19.80 | 7.80 |

## (92) WRIST CIRCUMFERENCE

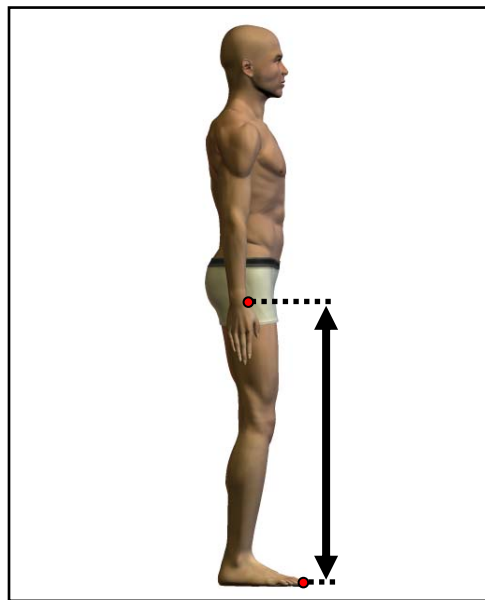
| FEMALES                  |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 15.48                    |                     | 6.09 |
| 0.02                     | STD ERROR (MEAN)    | 0.01 |
| 0.78                     | STANDARD DEVIATION  | 0.31 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 12.40                    | MINIMUM             | 4.88 |
| 18.30                    | MAXIMUM             | 7.20 |
| SKEWNESS                 |                     | 0.25 |
| KURTOSIS                 |                     | 3.21 |
| COEFFICIENT OF VARIATION |                     | 5.1% |
| NUMBER OF PARTICIPANTS   |                     | 1986 |

| MALES                    |                     |      |
|--------------------------|---------------------|------|
| CM                       | MEAN                | IN   |
| 17.59                    |                     | 6.93 |
| 0.01                     | STD ERROR (MEAN)    | 0.01 |
| 0.90                     | STANDARD DEVIATION  | 0.35 |
| 0.01                     | STD ERROR (STD DEV) | 0.00 |
| 14.10                    | MINIMUM             | 5.55 |
| 21.60                    | MAXIMUM             | 8.50 |
| SKEWNESS                 |                     | 0.19 |
| KURTOSIS                 |                     | 3.34 |
| COEFFICIENT OF VARIATION |                     | 5.1% |
| NUMBER OF PARTICIPANTS   |                     | 4082 |

| FREQUENCY TABLE |       |      |         |       |       |       |      |         |      |
|-----------------|-------|------|---------|-------|-------|-------|------|---------|------|
| FEMALES         |       |      |         |       | MALES |       |      |         |      |
| F               | FPct  | CumF | CumFPct | CM    | F     | FPct  | CumF | CumFPct |      |
| 1               | 0.05  | 1    | 0.05    | 12.35 | -     | 12.55 |      |         |      |
| 0               | 0.00  | 1    | 0.05    | 12.55 | -     | 12.75 |      |         |      |
| 0               | 0.00  | 1    | 0.05    | 12.75 | -     | 12.95 |      |         |      |
| 0               | 0.00  | 1    | 0.05    | 12.95 | -     | 13.15 |      |         |      |
| 1               | 0.05  | 2    | 0.10    | 13.15 | -     | 13.35 |      |         |      |
| 7               | 0.35  | 9    | 0.45    | 13.35 | -     | 13.55 |      |         |      |
| 7               | 0.35  | 16   | 0.81    | 13.55 | -     | 13.75 |      |         |      |
| 17              | 0.86  | 33   | 1.66    | 13.75 | -     | 13.95 |      |         |      |
| 32              | 1.61  | 65   | 3.27    | 13.95 | -     | 14.15 | 1    | 0.02    | 1    |
| 64              | 3.22  | 129  | 6.50    | 14.15 | -     | 14.35 | 0    | 0.00    | 1    |
| 91              | 4.58  | 220  | 11.08   | 14.35 | -     | 14.55 | 0    | 0.00    | 1    |
| 135             | 6.80  | 355  | 17.88   | 14.55 | -     | 14.75 | 0    | 0.00    | 1    |
| 122             | 6.14  | 477  | 24.02   | 14.75 | -     | 14.95 | 3    | 0.07    | 4    |
| 201             | 10.12 | 678  | 34.14   | 14.95 | -     | 15.15 | 3    | 0.07    | 7    |
| 224             | 11.28 | 902  | 45.42   | 15.15 | -     | 15.35 | 12   | 0.29    | 19   |
| 232             | 11.68 | 1134 | 57.10   | 15.35 | -     | 15.55 | 19   | 0.47    | 38   |
| 161             | 8.11  | 1295 | 65.21   | 15.55 | -     | 15.75 | 26   | 0.64    | 64   |
| 153             | 7.70  | 1448 | 72.91   | 15.75 | -     | 15.95 | 54   | 1.32    | 118  |
| 138             | 6.95  | 1586 | 79.86   | 15.95 | -     | 16.15 | 82   | 2.01    | 200  |
| 130             | 6.55  | 1716 | 86.40   | 16.15 | -     | 16.35 | 105  | 2.57    | 305  |
| 97              | 4.88  | 1813 | 91.29   | 16.35 | -     | 16.55 | 192  | 4.70    | 497  |
| 60              | 3.02  | 1873 | 94.31   | 16.55 | -     | 16.75 | 204  | 5.00    | 701  |
| 38              | 1.91  | 1911 | 96.22   | 16.75 | -     | 16.95 | 244  | 5.98    | 945  |
| 33              | 1.66  | 1944 | 97.89   | 16.95 | -     | 17.15 | 328  | 8.04    | 1273 |
| 18              | 0.91  | 1962 | 98.79   | 17.15 | -     | 17.35 | 347  | 8.50    | 1620 |
| 7               | 0.35  | 1969 | 99.14   | 17.35 | -     | 17.55 | 394  | 9.65    | 2014 |
| 6               | 0.30  | 1975 | 99.45   | 17.55 | -     | 17.75 | 343  | 8.40    | 2357 |
| 3               | 0.15  | 1978 | 99.60   | 17.75 | -     | 17.95 | 337  | 8.26    | 2694 |
| 4               | 0.20  | 1982 | 99.80   | 17.95 | -     | 18.15 | 340  | 8.33    | 3034 |
| 4               | 0.20  | 1986 | 100.00  | 18.15 | -     | 18.35 | 281  | 6.88    | 3315 |
|                 |       |      |         | 18.35 | -     | 18.55 | 218  | 5.34    | 3533 |
|                 |       |      |         | 18.55 | -     | 18.75 | 161  | 3.94    | 3694 |
|                 |       |      |         | 18.75 | -     | 18.95 | 113  | 2.77    | 3807 |
|                 |       |      |         | 18.95 | -     | 19.15 | 95   | 2.33    | 3902 |
|                 |       |      |         | 19.15 | -     | 19.35 | 57   | 1.40    | 3959 |
|                 |       |      |         | 19.35 | -     | 19.55 | 41   | 1.00    | 4000 |
|                 |       |      |         | 19.55 | -     | 19.75 | 28   | 0.69    | 4028 |
|                 |       |      |         | 19.75 | -     | 19.95 | 19   | 0.47    | 4047 |
|                 |       |      |         | 19.95 | -     | 20.15 | 15   | 0.37    | 4062 |
|                 |       |      |         | 20.15 | -     | 20.35 | 7    | 0.17    | 4069 |
|                 |       |      |         | 20.35 | -     | 20.55 | 5    | 0.12    | 4074 |
|                 |       |      |         | 20.55 | -     | 20.75 | 3    | 0.07    | 4077 |
|                 |       |      |         | 20.75 | -     | 20.95 | 1    | 0.02    | 4078 |
|                 |       |      |         | 20.95 | -     | 21.15 | 1    | 0.02    | 4079 |
|                 |       |      |         | 21.15 | -     | 21.35 | 2    | 0.05    | 4081 |
|                 |       |      |         | 21.35 | -     | 21.55 | 0    | 0.00    | 4081 |
|                 |       |      |         | 21.55 | -     | 21.75 | 1    | 0.02    | 4082 |

## (93) WRIST HEIGHT

The vertical distance between a standing surface and the stylium landmark is measured with an anthropometer. The participant stands erect, looking straight ahead with the heels together and the weight distributed equally on both feet. The shoulders are relaxed, and the arms are extended downwards with the elbow, wrist, and fingers held rigidly straight. The arms lightly touch the sides. The measurement is taken at the maximum point of quiet respiration.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 71.00       | 27.95 | 1ST  | 75.30 | 29.65 |
| 71.90       | 28.31 | 2ND  | 76.10 | 29.96 |
| 72.50       | 28.54 | 3RD  | 77.00 | 30.31 |
| 73.20       | 28.82 | 5TH  | 78.00 | 30.71 |
| 74.50       | 29.33 | 10TH | 79.50 | 31.30 |
| 75.40       | 29.69 | 15TH | 80.40 | 31.65 |
| 76.20       | 30.00 | 20TH | 81.30 | 32.01 |
| 76.90       | 30.28 | 25TH | 81.90 | 32.24 |
| 77.40       | 30.47 | 30TH | 82.50 | 32.48 |
| 77.90       | 30.67 | 35TH | 83.10 | 32.72 |
| 78.40       | 30.87 | 40TH | 83.70 | 32.95 |
| 78.90       | 31.06 | 45TH | 84.20 | 33.15 |
| 79.40       | 31.26 | 50TH | 84.70 | 33.35 |
| 79.80       | 31.42 | 55TH | 85.20 | 33.54 |
| 80.20       | 31.57 | 60TH | 85.80 | 33.78 |
| 80.80       | 31.81 | 65TH | 86.30 | 33.98 |
| 81.30       | 32.01 | 70TH | 86.90 | 34.21 |
| 81.90       | 32.24 | 75TH | 87.50 | 34.45 |
| 82.50       | 32.48 | 80TH | 88.20 | 34.72 |
| 83.20       | 32.76 | 85TH | 89.00 | 35.04 |
| 84.30       | 33.19 | 90TH | 90.20 | 35.51 |
| 86.00       | 33.86 | 95TH | 91.70 | 36.10 |
| 86.90       | 34.21 | 97TH | 92.80 | 36.54 |
| 87.60       | 34.49 | 98TH | 93.60 | 36.85 |
| 88.90       | 35.00 | 99TH | 94.70 | 37.28 |

## (93) WRIST HEIGHT

| FEMALES                  |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 79.42                    | MEAN                | 31.27 |
| 0.09                     | STD ERROR (MEAN)    | 0.03  |
| 3.82                     | STANDARD DEVIATION  | 1.50  |
| 0.06                     | STD ERROR (STD DEV) | 0.02  |
| 67.20                    | MINIMUM             | 26.46 |
| 94.10                    | MAXIMUM             | 37.05 |
| SKEWNESS                 |                     | 0.17  |
| KURTOSIS                 |                     | 3.11  |
| COEFFICIENT OF VARIATION |                     | 4.8%  |
| NUMBER OF PARTICIPANTS   |                     | 1986  |

| MALES                    |                     |       |
|--------------------------|---------------------|-------|
| CM                       |                     | IN    |
| 84.75                    | MEAN                | 33.37 |
| 0.07                     | STD ERROR (MEAN)    | 0.03  |
| 4.17                     | STANDARD DEVIATION  | 1.64  |
| 0.05                     | STD ERROR (STD DEV) | 0.02  |
| 69.50                    | MINIMUM             | 27.36 |
| 100.90                   | MAXIMUM             | 39.72 |
| SKEWNESS                 |                     | 0.11  |
| KURTOSIS                 |                     | 3.08  |
| COEFFICIENT OF VARIATION |                     | 4.9%  |
| NUMBER OF PARTICIPANTS   |                     | 4082  |

| FREQUENCY TABLE |      |      |         |        |   |        |  |     |      |      |         |
|-----------------|------|------|---------|--------|---|--------|--|-----|------|------|---------|
| FEMALES         |      |      |         |        |   |        |  |     |      |      |         |
| F               | FPct | CumF | CumFPct | CM     |   |        |  | F   | FPct | CumF | CumFPct |
| 1               | 0.05 | 1    | 0.05    | 66.75  | - | 67.50  |  |     |      |      |         |
| 0               | 0.00 | 1    | 0.05    | 67.50  | - | 68.25  |  |     |      |      |         |
| 2               | 0.10 | 3    | 0.15    | 68.25  | - | 69.00  |  |     |      |      |         |
| 3               | 0.15 | 6    | 0.30    | 69.00  | - | 69.75  |  |     |      |      |         |
| 6               | 0.30 | 12   | 0.60    | 69.75  | - | 70.50  |  | 1   | 0.02 | 1    | 0.02    |
| 14              | 0.70 | 26   | 1.31    | 70.50  | - | 71.25  |  | 0   | 0.00 | 1    | 0.02    |
| 15              | 0.76 | 41   | 2.06    | 71.25  | - | 72.00  |  | 1   | 0.02 | 2    | 0.05    |
| 31              | 1.56 | 72   | 3.63    | 72.00  | - | 72.75  |  | 2   | 0.05 | 4    | 0.10    |
| 43              | 2.17 | 115  | 5.79    | 72.75  | - | 73.50  |  | 2   | 0.05 | 6    | 0.15    |
| 57              | 2.87 | 172  | 8.66    | 73.50  | - | 74.25  |  | 10  | 0.24 | 16   | 0.39    |
| 74              | 3.73 | 246  | 12.39   | 74.25  | - | 75.00  |  | 10  | 0.24 | 26   | 0.64    |
| 87              | 4.38 | 333  | 16.77   | 75.00  | - | 75.75  |  | 37  | 0.91 | 63   | 1.54    |
| 99              | 4.98 | 432  | 21.75   | 75.75  | - | 76.50  |  | 34  | 0.83 | 97   | 2.38    |
| 118             | 5.94 | 550  | 27.69   | 76.50  | - | 77.25  |  | 42  | 1.03 | 139  | 3.41    |
| 147             | 7.40 | 697  | 35.10   | 77.25  | - | 78.00  |  | 57  | 1.40 | 196  | 4.80    |
| 157             | 7.91 | 854  | 43.00   | 78.00  | - | 78.75  |  | 89  | 2.18 | 285  | 6.98    |
| 164             | 8.26 | 1018 | 51.26   | 78.75  | - | 79.50  |  | 118 | 2.89 | 403  | 9.87    |
| 175             | 8.81 | 1193 | 60.07   | 79.50  | - | 80.25  |  | 174 | 4.26 | 577  | 14.14   |
| 129             | 6.50 | 1322 | 66.57   | 80.25  | - | 81.00  |  | 168 | 4.12 | 745  | 18.25   |
| 140             | 7.05 | 1462 | 73.62   | 81.00  | - | 81.75  |  | 234 | 5.73 | 979  | 23.98   |
| 122             | 6.14 | 1584 | 79.76   | 81.75  | - | 82.50  |  | 211 | 5.17 | 1190 | 29.15   |
| 111             | 5.59 | 1695 | 85.35   | 82.50  | - | 83.25  |  | 278 | 6.81 | 1468 | 35.96   |
| 58              | 2.92 | 1753 | 88.27   | 83.25  | - | 84.00  |  | 267 | 6.54 | 1735 | 42.50   |
| 64              | 3.22 | 1817 | 91.49   | 84.00  | - | 84.75  |  | 316 | 7.74 | 2051 | 50.24   |
| 39              | 1.96 | 1856 | 93.45   | 84.75  | - | 85.50  |  | 283 | 6.93 | 2334 | 57.18   |
| 39              | 1.96 | 1895 | 95.42   | 85.50  | - | 86.25  |  | 305 | 7.47 | 2639 | 64.65   |
| 33              | 1.66 | 1928 | 97.08   | 86.25  | - | 87.00  |  | 246 | 6.03 | 2885 | 70.68   |
| 22              | 1.11 | 1950 | 98.19   | 87.00  | - | 87.75  |  | 277 | 6.79 | 3162 | 77.46   |
| 12              | 0.60 | 1962 | 98.79   | 87.75  | - | 88.50  |  | 171 | 4.19 | 3333 | 81.65   |
| 7               | 0.35 | 1969 | 99.14   | 88.50  | - | 89.25  |  | 184 | 4.51 | 3517 | 86.16   |
| 5               | 0.25 | 1974 | 99.40   | 89.25  | - | 90.00  |  | 115 | 2.82 | 3632 | 88.98   |
| 7               | 0.35 | 1981 | 99.75   | 90.00  | - | 90.75  |  | 135 | 3.31 | 3767 | 92.28   |
| 2               | 0.10 | 1983 | 99.85   | 90.75  | - | 91.50  |  | 91  | 2.23 | 3858 | 94.51   |
| 1               | 0.05 | 1984 | 99.90   | 91.50  | - | 92.25  |  | 65  | 1.59 | 3923 | 96.10   |
| 1               | 0.05 | 1985 | 99.95   | 92.25  | - | 93.00  |  | 44  | 1.08 | 3967 | 97.18   |
| 0               | 0.00 | 1985 | 99.95   | 93.00  | - | 93.75  |  | 45  | 1.10 | 4012 | 98.29   |
| 1               | 0.05 | 1986 | 100.00  | 93.75  | - | 94.50  |  | 24  | 0.59 | 4036 | 98.87   |
|                 |      |      |         | 94.50  | - | 95.25  |  | 14  | 0.34 | 4050 | 99.22   |
|                 |      |      |         | 95.25  | - | 96.00  |  | 13  | 0.32 | 4063 | 99.53   |
|                 |      |      |         | 96.00  | - | 96.75  |  | 6   | 0.15 | 4069 | 99.68   |
|                 |      |      |         | 96.75  | - | 97.50  |  | 4   | 0.10 | 4073 | 99.78   |
|                 |      |      |         | 97.50  | - | 98.25  |  | 3   | 0.07 | 4076 | 99.85   |
|                 |      |      |         | 98.25  | - | 99.00  |  | 0   | 0.00 | 4076 | 99.85   |
|                 |      |      |         | 99.00  | - | 99.75  |  | 4   | 0.10 | 4080 | 99.95   |
|                 |      |      |         | 99.75  | - | 100.50 |  | 0   | 0.00 | 4080 | 99.95   |
|                 |      |      |         | 100.50 | - | 101.25 |  | 2   | 0.05 | 4082 | 100.00  |

## CHAPTER V

### THE DERIVED DIMENSIONS

While time and cost demand a reasonable limit to the number of dimensions that can be measured in an anthropometric survey, many additional dimensions can be calculated from the measured data. Forty-one additional dimensions, concentrated in areas applicable to clothing, workspace, and analog design, were derived from the measured dimensions in this survey. These derived dimensions are intended to meet some of the more specialized needs of designers and engineers, though users should be cautioned that derived dimensions may not be as reliable as data obtained by direct measurement.

Generally, derived dimensions are calculated from directly measured dimensions, one at a time, for each individual. The summary statistics are calculated from those individual values. In some cases, particularly those involving functional reaches with different hand positions, a component dimension was not measured in this survey, but was measured previously in ANSUR. In those cases the ANSUR male and female mean values were used in the calculations of derived dimensions for each participant. For example, to calculate Index Finger Reach for males, 12.44 cm (the male ANSUR mean of Wrist-Thumbtip Length) was subtracted from each male participant's measured Thumbtip Reach, and 18.80 cm (the male ANSUR mean of Wrist-Index Finger Length) was added to that amount. All the ANSUR mean values used in these calculations are seen in Table 20.

TABLE 20

ANSUR Mean Values Used in Derived Dimensions  
(values in cm)

| Dimension                   | Males | Females |
|-----------------------------|-------|---------|
| Hand Length                 | 19.38 | 18.05   |
| Wrist-Center of Grip Length | 6.97  | 6.63    |
| Wrist-Index Finger Length   | 18.08 | 16.92   |
| Wrist-Thumbtip Length       | 12.44 | 11.76   |
| Wrist-Wall Length           | 68.09 | 61.98   |

This approach is sound because the ANSUR II pilot study (Paquette et al., 2009) showed that no secular change in Hand Length has occurred in the last two decades and there is no empirical evidence to suggest that current finger lengths are now different with respect to Hand Length.

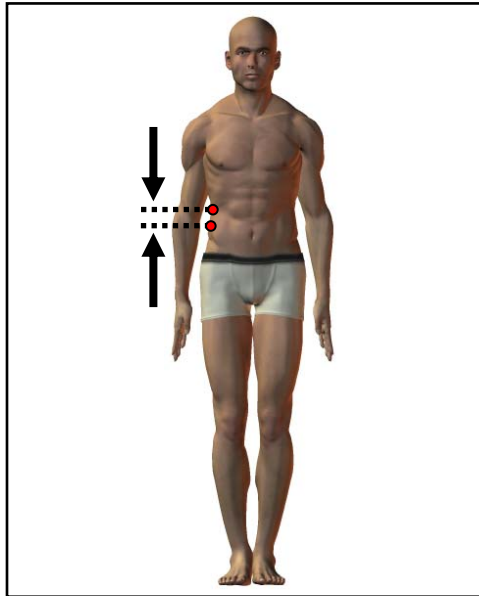
Two dimensions which were derived in ANSUR were directly measured in this survey. Forearm-Center of Grip (termed Elbow-Center of Grip in ANSUR) was measured with a modified beam caliper, as the intervening years since ANSUR had shown that it was an extremely useful dimension and thus would be better measured

than calculated. Thumbtip Reach was also measured directly, this time using it as the anchor dimension from which other reaches could be calculated.

A visual index, designed to assist the reader in locating particular derived dimensions whose names may be unfamiliar, appears in Appendix D. The numbers on the visual index correspond to the derived dimension number. Completing this section are the data pages, which include brief measurement descriptions, summary statistics, and percentile and frequency tables.

## (D1) ABDOMINAL LINK

The vertical distance between the tenth rib landmark and the iliocristale landmark on the right side is calculated as follows: TENTH RIB HEIGHT minus ILIOCRISTALE HEIGHT.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 3.10        | 1.22 | 1ST  | 2.40  | 0.94 |
| 3.40        | 1.34 | 2ND  | 2.80  | 1.10 |
| 3.60        | 1.42 | 3RD  | 3.00  | 1.18 |
| 3.90        | 1.54 | 5TH  | 3.30  | 1.30 |
| 4.40        | 1.73 | 10TH | 3.80  | 1.50 |
| 4.70        | 1.85 | 15TH | 4.10  | 1.61 |
| 5.00        | 1.97 | 20TH | 4.40  | 1.73 |
| 5.20        | 2.05 | 25TH | 4.70  | 1.85 |
| 5.50        | 2.17 | 30TH | 4.90  | 1.93 |
| 5.60        | 2.20 | 35TH | 5.10  | 2.01 |
| 5.70        | 2.24 | 40TH | 5.30  | 2.09 |
| 5.90        | 2.32 | 45TH | 5.60  | 2.20 |
| 6.00        | 2.36 | 50TH | 5.80  | 2.28 |
| 6.20        | 2.44 | 55TH | 6.00  | 2.36 |
| 6.30        | 2.48 | 60TH | 6.20  | 2.44 |
| 6.50        | 2.56 | 65TH | 6.50  | 2.56 |
| 6.60        | 2.60 | 70TH | 6.80  | 2.68 |
| 6.80        | 2.68 | 75TH | 7.10  | 2.80 |
| 7.10        | 2.80 | 80TH | 7.40  | 2.91 |
| 7.30        | 2.87 | 85TH | 7.70  | 3.03 |
| 7.70        | 3.03 | 90TH | 8.20  | 3.23 |
| 8.20        | 3.23 | 95TH | 8.90  | 3.50 |
| 8.70        | 3.43 | 97TH | 9.40  | 3.70 |
| 9.00        | 3.54 | 98TH | 9.70  | 3.82 |
| 9.60        | 3.78 | 99TH | 10.30 | 4.06 |

## (D1) ABDOMINAL LINK

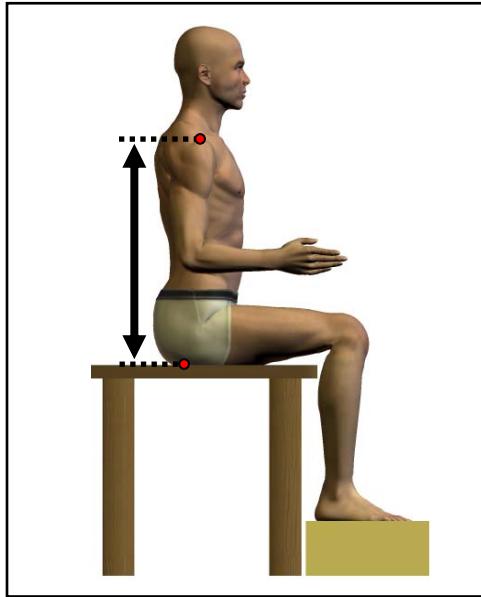
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 6.05                     | MEAN                 | 2.38  |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 1.32                     | STANDARD DEVIATION   | 0.52  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 0.00                     | MINIMUM              | 0.00  |
| 12.00                    | MAXIMUM              | 4.72  |
| SKEWNESS                 |                      | 0.16  |
| KURTOSIS                 |                      | 3.76  |
| COEFFICIENT OF VARIATION |                      | 21.8% |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 5.90                     | MEAN                 | 2.32  |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 1.71                     | STANDARD DEVIATION   | 0.68  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 1.30                     | MINIMUM              | 0.51  |
| 12.40                    | MAXIMUM              | 4.88  |
| SKEWNESS                 |                      | 0.34  |
| KURTOSIS                 |                      | 2.92  |
| COEFFICIENT OF VARIATION |                      | 29.0% |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | -0.05       | - | 0.20  |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 0.20        | - | 0.45  |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 0.45        | - | 0.70  |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 0.70        | - | 0.95  |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 0.95        | - | 1.20  |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 1.20        | - | 1.45  |  | 1     | 0.02 | 1    | 0.02    |
| 0       | 0.00 | 2    | 0.10    | 1.45        | - | 1.70  |  | 2     | 0.05 | 3    | 0.07    |
| 2       | 0.10 | 4    | 0.20    | 1.70        | - | 1.95  |  | 2     | 0.05 | 5    | 0.12    |
| 0       | 0.00 | 4    | 0.20    | 1.95        | - | 2.20  |  | 9     | 0.22 | 14   | 0.34    |
| 1       | 0.05 | 5    | 0.25    | 2.20        | - | 2.45  |  | 29    | 0.71 | 43   | 1.05    |
| 3       | 0.15 | 8    | 0.40    | 2.45        | - | 2.70  |  | 23    | 0.56 | 66   | 1.62    |
| 9       | 0.45 | 17   | 0.86    | 2.70        | - | 2.95  |  | 39    | 0.96 | 105  | 2.57    |
| 8       | 0.40 | 25   | 1.26    | 2.95        | - | 3.20  |  | 48    | 1.18 | 153  | 3.75    |
| 22      | 1.11 | 47   | 2.37    | 3.20        | - | 3.45  |  | 112   | 2.74 | 265  | 6.49    |
| 17      | 0.86 | 64   | 3.22    | 3.45        | - | 3.70  |  | 92    | 2.25 | 357  | 8.75    |
| 40      | 2.01 | 104  | 5.24    | 3.70        | - | 3.95  |  | 145   | 3.55 | 502  | 12.30   |
| 38      | 1.91 | 142  | 7.15    | 3.95        | - | 4.20  |  | 130   | 3.18 | 632  | 15.48   |
| 70      | 3.52 | 212  | 10.67   | 4.20        | - | 4.45  |  | 223   | 5.46 | 855  | 20.95   |
| 65      | 3.27 | 277  | 13.95   | 4.45        | - | 4.70  |  | 164   | 4.02 | 1019 | 24.96   |
| 106     | 5.34 | 383  | 19.28   | 4.70        | - | 4.95  |  | 268   | 6.57 | 1287 | 31.53   |
| 83      | 4.18 | 466  | 23.46   | 4.95        | - | 5.20  |  | 201   | 4.92 | 1488 | 36.45   |
| 129     | 6.50 | 595  | 29.96   | 5.20        | - | 5.45  |  | 266   | 6.52 | 1754 | 42.97   |
| 133     | 6.70 | 728  | 36.66   | 5.45        | - | 5.70  |  | 171   | 4.19 | 1925 | 47.16   |
| 198     | 9.97 | 926  | 46.63   | 5.70        | - | 5.95  |  | 250   | 6.12 | 2175 | 53.28   |
| 154     | 7.75 | 1080 | 54.38   | 5.95        | - | 6.20  |  | 171   | 4.19 | 2346 | 57.47   |
| 194     | 9.77 | 1274 | 64.15   | 6.20        | - | 6.45  |  | 260   | 6.37 | 2606 | 63.84   |
| 129     | 6.50 | 1403 | 70.64   | 6.45        | - | 6.70  |  | 149   | 3.65 | 2755 | 67.49   |
| 131     | 6.60 | 1534 | 77.24   | 6.70        | - | 6.95  |  | 225   | 5.51 | 2980 | 73.00   |
| 85      | 4.28 | 1619 | 81.52   | 6.95        | - | 7.20  |  | 149   | 3.65 | 3129 | 76.65   |
| 104     | 5.24 | 1723 | 86.76   | 7.20        | - | 7.45  |  | 192   | 4.70 | 3321 | 81.36   |
| 52      | 2.62 | 1775 | 89.38   | 7.45        | - | 7.70  |  | 119   | 2.92 | 3440 | 84.27   |
| 72      | 3.63 | 1847 | 93.00   | 7.70        | - | 7.95  |  | 140   | 3.43 | 3580 | 87.70   |
| 33      | 1.66 | 1880 | 94.66   | 7.95        | - | 8.20  |  | 77    | 1.89 | 3657 | 89.59   |
| 28      | 1.41 | 1908 | 96.07   | 8.20        | - | 8.45  |  | 125   | 3.06 | 3782 | 92.65   |
| 15      | 0.76 | 1923 | 96.83   | 8.45        | - | 8.70  |  | 39    | 0.96 | 3821 | 93.61   |
| 22      | 1.11 | 1945 | 97.94   | 8.70        | - | 8.95  |  | 71    | 1.74 | 3892 | 95.35   |
| 9       | 0.45 | 1954 | 98.39   | 8.95        | - | 9.20  |  | 39    | 0.96 | 3931 | 96.30   |
| 7       | 0.35 | 1961 | 98.74   | 9.20        | - | 9.45  |  | 47    | 1.15 | 3978 | 97.45   |
| 6       | 0.30 | 1967 | 99.04   | 9.45        | - | 9.70  |  | 19    | 0.47 | 3997 | 97.92   |
| 7       | 0.35 | 1974 | 99.40   | 9.70        | - | 9.95  |  | 24    | 0.59 | 4021 | 98.51   |
| 3       | 0.15 | 1977 | 99.55   | 9.95        | - | 10.20 |  | 14    | 0.34 | 4035 | 98.85   |
| 5       | 0.25 | 1982 | 99.80   | 10.20       | - | 10.45 |  | 15    | 0.37 | 4050 | 99.22   |
| 2       | 0.10 | 1984 | 99.90   | 10.45       | - | 10.70 |  | 9     | 0.22 | 4059 | 99.44   |
| 1       | 0.05 | 1985 | 99.95   | 10.70       | - | 10.95 |  | 9     | 0.22 | 4068 | 99.66   |
| 0       | 0.00 | 1985 | 99.95   | 10.95       | - | 11.20 |  | 4     | 0.10 | 4072 | 99.76   |
| 0       | 0.00 | 1985 | 99.95   | 11.20       | - | 11.45 |  | 5     | 0.12 | 4077 | 99.88   |
| 0       | 0.00 | 1985 | 99.95   | 11.45       | - | 11.70 |  | 0     | 0.00 | 4077 | 99.88   |
| 0       | 0.00 | 1985 | 99.95   | 11.70       | - | 11.95 |  | 1     | 0.02 | 4078 | 99.90   |
| 1       | 0.05 | 1986 | 100.00  | 11.95       | - | 12.20 |  | 1     | 0.02 | 4079 | 99.93   |
|         |      |      |         | 12.20       | - | 12.45 |  | 3     | 0.07 | 4082 | 100.00  |

## (D2) ACROMIAL HEIGHT, SITTING

The vertical distance between a sitting surface and the right acromion landmark is calculated as follows: SITTING HEIGHT minus (STATURE minus ACROMIAL HEIGHT).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 50.00       | 19.69 | 1ST  | 53.00 | 20.87 |
| 50.80       | 20.00 | 2ND  | 54.00 | 21.26 |
| 51.00       | 20.08 | 3RD  | 54.50 | 21.46 |
| 51.50       | 20.28 | 5TH  | 55.20 | 21.73 |
| 52.70       | 20.75 | 10TH | 56.40 | 22.20 |
| 53.50       | 21.06 | 15TH | 57.20 | 22.52 |
| 53.90       | 21.22 | 20TH | 57.70 | 22.72 |
| 54.40       | 21.42 | 25TH | 58.20 | 22.91 |
| 54.80       | 21.57 | 30TH | 58.60 | 23.07 |
| 55.20       | 21.73 | 35TH | 59.10 | 23.27 |
| 55.60       | 21.89 | 40TH | 59.50 | 23.43 |
| 56.00       | 22.05 | 45TH | 59.90 | 23.58 |
| 56.40       | 22.20 | 50TH | 60.30 | 23.74 |
| 56.70       | 22.32 | 55TH | 60.60 | 23.86 |
| 57.10       | 22.48 | 60TH | 61.00 | 24.02 |
| 57.40       | 22.60 | 65TH | 61.50 | 24.21 |
| 57.80       | 22.76 | 70TH | 61.90 | 24.37 |
| 58.20       | 22.91 | 75TH | 62.40 | 24.57 |
| 58.70       | 23.11 | 80TH | 62.90 | 24.76 |
| 59.20       | 23.31 | 85TH | 63.50 | 25.00 |
| 59.80       | 23.54 | 90TH | 64.20 | 25.28 |
| 60.90       | 23.98 | 95TH | 65.30 | 25.71 |
| 61.60       | 24.25 | 97TH | 66.10 | 26.02 |
| 62.10       | 24.45 | 98TH | 66.70 | 26.26 |
| 62.90       | 24.76 | 99TH | 67.60 | 26.61 |

## (D2) ACROMIAL HEIGHT, SITTING

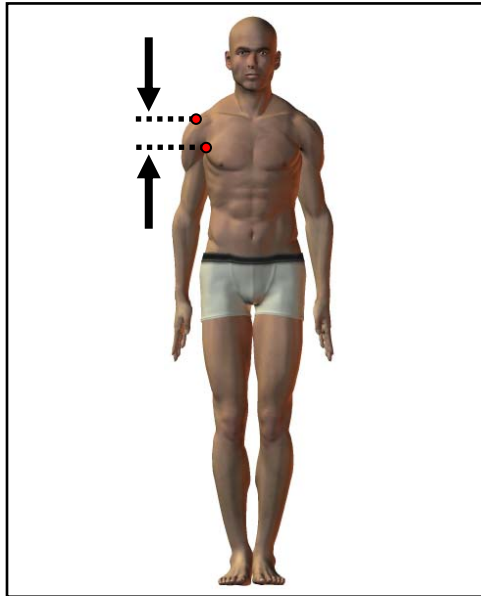
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 56.32                    | MEAN                 | 22.18 |
| 0.06                     | STD. ERROR (MEAN)    | 0.02  |
| 2.78                     | STANDARD DEVIATION   | 1.10  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 47.60                    | MINIMUM              | 18.74 |
| 64.90                    | MAXIMUM              | 25.55 |
| SKEWNESS                 |                      | 0.01  |
| KURTOSIS                 |                      | 2.86  |
| COEFFICIENT OF VARIATION |                      | 4.9%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 60.28                    | MEAN                 | 23.73 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 3.08                     | STANDARD DEVIATION   | 1.21  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 50.10                    | MINIMUM              | 19.72 |
| 71.40                    | MAXIMUM              | 28.11 |
| SKEWNESS                 |                      | 0.01  |
| KURTOSIS                 |                      | 3.03  |
| COEFFICIENT OF VARIATION |                      | 5.1%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 47.25       | - | 47.75 |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 47.75       | - | 48.25 |      |      |         |
| 2       | 0.10 | 4    | 0.20    | 48.25       | - | 48.75 |      |      |         |
| 1       | 0.05 | 5    | 0.25    | 48.75       | - | 49.25 |      |      |         |
| 11      | 0.55 | 16   | 0.81    | 49.25       | - | 49.75 |      |      |         |
| 8       | 0.40 | 24   | 1.21    | 49.75       | - | 50.25 | 2    | 0.05 | 0.05    |
| 15      | 0.76 | 39   | 1.96    | 50.25       | - | 50.75 | 4    | 0.10 | 0.15    |
| 37      | 1.86 | 76   | 3.83    | 50.75       | - | 51.25 | 0    | 0.00 | 0.15    |
| 34      | 1.71 | 110  | 5.54    | 51.25       | - | 51.75 | 8    | 0.20 | 0.34    |
| 35      | 1.76 | 145  | 7.30    | 51.75       | - | 52.25 | 7    | 0.17 | 0.51    |
| 59      | 2.97 | 204  | 10.27   | 52.25       | - | 52.75 | 11   | 0.27 | 0.78    |
| 61      | 3.07 | 265  | 13.34   | 52.75       | - | 53.25 | 21   | 0.51 | 1.30    |
| 88      | 4.43 | 353  | 17.77   | 53.25       | - | 53.75 | 22   | 0.54 | 1.84    |
| 118     | 5.94 | 471  | 23.72   | 53.75       | - | 54.25 | 29   | 0.71 | 2.55    |
| 110     | 5.54 | 581  | 29.25   | 54.25       | - | 54.75 | 43   | 1.05 | 3.60    |
| 121     | 6.09 | 702  | 35.35   | 54.75       | - | 55.25 | 67   | 1.64 | 5.24    |
| 122     | 6.14 | 824  | 41.49   | 55.25       | - | 55.75 | 72   | 1.76 | 7.01    |
| 130     | 6.55 | 954  | 48.04   | 55.75       | - | 56.25 | 100  | 2.45 | 9.46    |
| 146     | 7.35 | 1100 | 55.39   | 56.25       | - | 56.75 | 102  | 2.50 | 11.95   |
| 141     | 7.10 | 1241 | 62.49   | 56.75       | - | 57.25 | 157  | 3.85 | 15.80   |
| 135     | 6.80 | 1376 | 69.28   | 57.25       | - | 57.75 | 187  | 4.58 | 20.38   |
| 129     | 6.50 | 1505 | 75.78   | 57.75       | - | 58.25 | 198  | 4.85 | 25.23   |
| 96      | 4.83 | 1601 | 80.61   | 58.25       | - | 58.75 | 235  | 5.76 | 30.99   |
| 101     | 5.09 | 1702 | 85.70   | 58.75       | - | 59.25 | 245  | 6.00 | 36.99   |
| 74      | 3.73 | 1776 | 89.43   | 59.25       | - | 59.75 | 269  | 6.59 | 43.58   |
| 62      | 3.12 | 1838 | 92.55   | 59.75       | - | 60.25 | 259  | 6.34 | 49.93   |
| 35      | 1.76 | 1873 | 94.31   | 60.25       | - | 60.75 | 266  | 6.52 | 56.44   |
| 37      | 1.86 | 1910 | 96.17   | 60.75       | - | 61.25 | 251  | 6.15 | 62.59   |
| 24      | 1.21 | 1934 | 97.38   | 61.25       | - | 61.75 | 227  | 5.56 | 68.15   |
| 17      | 0.86 | 1951 | 98.24   | 61.75       | - | 62.25 | 218  | 5.34 | 73.49   |
| 13      | 0.65 | 1964 | 98.89   | 62.25       | - | 62.75 | 221  | 5.41 | 78.91   |
| 8       | 0.40 | 1972 | 99.30   | 62.75       | - | 63.25 | 165  | 4.04 | 82.95   |
| 7       | 0.35 | 1979 | 99.65   | 63.25       | - | 63.75 | 158  | 3.87 | 86.82   |
| 3       | 0.15 | 1982 | 99.80   | 63.75       | - | 64.25 | 137  | 3.36 | 90.18   |
| 3       | 0.15 | 1985 | 99.95   | 64.25       | - | 64.75 | 101  | 2.47 | 92.65   |
| 1       | 0.05 | 1986 | 100.00  | 64.75       | - | 65.25 | 90   | 2.20 | 94.86   |
|         |      |      |         | 65.25       | - | 65.75 | 60   | 1.47 | 96.33   |
|         |      |      |         | 65.75       | - | 66.25 | 45   | 1.10 | 97.43   |
|         |      |      |         | 66.25       | - | 66.75 | 30   | 0.73 | 98.16   |
|         |      |      |         | 66.75       | - | 67.25 | 17   | 0.42 | 98.58   |
|         |      |      |         | 67.25       | - | 67.75 | 25   | 0.61 | 99.19   |
|         |      |      |         | 67.75       | - | 68.25 | 10   | 0.24 | 99.44   |
|         |      |      |         | 68.25       | - | 68.75 | 10   | 0.24 | 99.68   |
|         |      |      |         | 68.75       | - | 69.25 | 5    | 0.12 | 99.80   |
|         |      |      |         | 69.25       | - | 69.75 | 3    | 0.07 | 99.88   |
|         |      |      |         | 69.75       | - | 70.25 | 3    | 0.07 | 99.95   |
|         |      |      |         | 70.25       | - | 70.75 | 1    | 0.02 | 99.98   |
|         |      |      |         | 70.75       | - | 71.25 | 0    | 0.00 | 99.98   |
|         |      |      |         | 71.25       | - | 71.75 | 1    | 0.02 | 100.00  |

### (D3) ACROMION-AXILLA LENGTH

The vertical distance between the acromion right landmark and the anterior-scye-on-the-torso landmark of a participant standing erect with the arms relaxed at the sides is calculated as follows: ACROMIAL HEIGHT minus AXILLA HEIGHT.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 7.10        | 2.80 | 1ST  | 8.50  | 3.35 |
| 7.50        | 2.95 | 2ND  | 8.80  | 3.46 |
| 7.70        | 3.03 | 3RD  | 9.00  | 3.54 |
| 7.80        | 3.07 | 5TH  | 9.20  | 3.62 |
| 8.20        | 3.23 | 10TH | 9.70  | 3.82 |
| 8.50        | 3.35 | 15TH | 9.90  | 3.90 |
| 8.70        | 3.43 | 20TH | 10.10 | 3.98 |
| 8.80        | 3.46 | 25TH | 10.30 | 4.06 |
| 9.00        | 3.54 | 30TH | 10.50 | 4.13 |
| 9.20        | 3.62 | 35TH | 10.70 | 4.21 |
| 9.30        | 3.66 | 40TH | 10.80 | 4.25 |
| 9.40        | 3.70 | 45TH | 11.00 | 4.33 |
| 9.50        | 3.74 | 50TH | 11.10 | 4.37 |
| 9.70        | 3.82 | 55TH | 11.30 | 4.45 |
| 9.80        | 3.86 | 60TH | 11.40 | 4.49 |
| 10.00       | 3.94 | 65TH | 11.60 | 4.57 |
| 10.20       | 4.02 | 70TH | 11.80 | 4.65 |
| 10.30       | 4.06 | 75TH | 12.00 | 4.72 |
| 10.60       | 4.17 | 80TH | 12.20 | 4.80 |
| 10.80       | 4.25 | 85TH | 12.40 | 4.88 |
| 11.10       | 4.37 | 90TH | 12.70 | 5.00 |
| 11.50       | 4.53 | 95TH | 13.20 | 5.20 |
| 11.70       | 4.61 | 97TH | 13.50 | 5.31 |
| 11.90       | 4.69 | 98TH | 13.80 | 5.43 |
| 12.40       | 4.88 | 99TH | 14.20 | 5.59 |

### (D3) ACROMION-AXILLA LENGTH

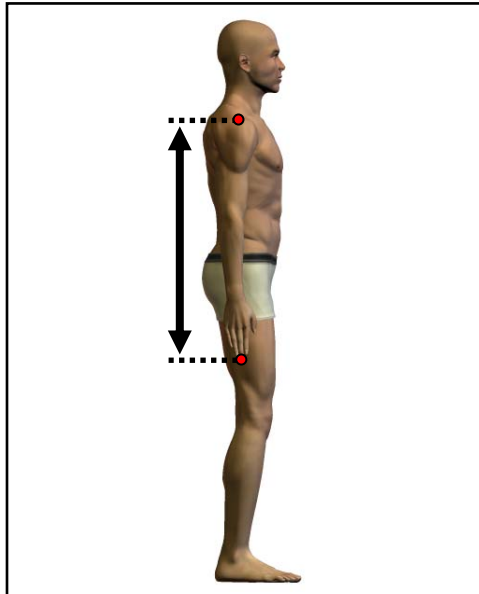
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 9.61                     | MEAN                 | 3.78  |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 1.12                     | STANDARD DEVIATION   | 0.44  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 5.80                     | MINIMUM              | 2.28  |
| 14.50                    | MAXIMUM              | 5.71  |
| SKEWNESS                 |                      | 0.23  |
| KURTOSIS                 |                      | 3.23  |
| COEFFICIENT OF VARIATION |                      | 11.6% |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 11.17                    | MEAN                 | 4.40  |
| 0.02                     | STD. ERROR (MEAN)    | 0.01  |
| 1.21                     | STANDARD DEVIATION   | 0.48  |
| 0.01                     | STD. ERROR (STD.DEV) | 0.01  |
| 6.80                     | MINIMUM              | 2.68  |
| 16.40                    | MAXIMUM              | 6.46  |
| SKEWNESS                 |                      | 0.18  |
| KURTOSIS                 |                      | 3.20  |
| COEFFICIENT OF VARIATION |                      | 10.8% |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   |       |  | MALES |       |      |         |
|---------|-------|------|---------|-------------|---|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   |       |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 5.75        | - | 6.00  |  |       |       |      |         |
| 1       | 0.05  | 2    | 0.10    | 6.00        | - | 6.25  |  |       |       |      |         |
| 2       | 0.10  | 4    | 0.20    | 6.25        | - | 6.50  |  |       |       |      |         |
| 4       | 0.20  | 8    | 0.40    | 6.50        | - | 6.75  |  |       |       |      |         |
| 4       | 0.20  | 12   | 0.60    | 6.75        | - | 7.00  |  | 1     | 0.02  | 1    | 0.02    |
| 9       | 0.45  | 21   | 1.06    | 7.00        | - | 7.25  |  | 1     | 0.02  | 2    | 0.05    |
| 13      | 0.65  | 34   | 1.71    | 7.25        | - | 7.50  |  | 2     | 0.05  | 4    | 0.10    |
| 37      | 1.86  | 71   | 3.58    | 7.50        | - | 7.75  |  | 5     | 0.12  | 9    | 0.22    |
| 54      | 2.72  | 125  | 6.29    | 7.75        | - | 8.00  |  | 3     | 0.07  | 12   | 0.29    |
| 97      | 4.88  | 222  | 11.18   | 8.00        | - | 8.25  |  | 11    | 0.27  | 23   | 0.56    |
| 66      | 3.32  | 288  | 14.50   | 8.25        | - | 8.50  |  | 16    | 0.39  | 39   | 0.96    |
| 157     | 7.91  | 445  | 22.41   | 8.50        | - | 8.75  |  | 37    | 0.91  | 76   | 1.86    |
| 124     | 6.24  | 569  | 28.65   | 8.75        | - | 9.00  |  | 41    | 1.00  | 117  | 2.87    |
| 183     | 9.21  | 752  | 37.87   | 9.00        | - | 9.25  |  | 92    | 2.25  | 209  | 5.12    |
| 164     | 8.26  | 916  | 46.12   | 9.25        | - | 9.50  |  | 87    | 2.13  | 296  | 7.25    |
| 228     | 11.48 | 1144 | 57.60   | 9.50        | - | 9.75  |  | 164   | 4.02  | 460  | 11.27   |
| 128     | 6.45  | 1272 | 64.05   | 9.75        | - | 10.00 |  | 164   | 4.02  | 624  | 15.29   |
| 162     | 8.16  | 1434 | 72.21   | 10.00       | - | 10.25 |  | 303   | 7.42  | 927  | 22.71   |
| 107     | 5.39  | 1541 | 77.59   | 10.25       | - | 10.50 |  | 242   | 5.93  | 1169 | 28.64   |
| 138     | 6.95  | 1679 | 84.54   | 10.50       | - | 10.75 |  | 349   | 8.55  | 1518 | 37.19   |
| 73      | 3.68  | 1752 | 88.22   | 10.75       | - | 11.00 |  | 255   | 6.25  | 1773 | 43.43   |
| 84      | 4.23  | 1836 | 92.45   | 11.00       | - | 11.25 |  | 418   | 10.24 | 2191 | 53.67   |
| 37      | 1.86  | 1873 | 94.31   | 11.25       | - | 11.50 |  | 275   | 6.74  | 2466 | 60.41   |
| 54      | 2.72  | 1927 | 97.03   | 11.50       | - | 11.75 |  | 387   | 9.48  | 2853 | 69.89   |
| 20      | 1.01  | 1947 | 98.04   | 11.75       | - | 12.00 |  | 200   | 4.90  | 3053 | 74.79   |
| 16      | 0.81  | 1963 | 98.84   | 12.00       | - | 12.25 |  | 293   | 7.18  | 3346 | 81.97   |
| 5       | 0.25  | 1968 | 99.09   | 12.25       | - | 12.50 |  | 159   | 3.90  | 3505 | 85.86   |
| 7       | 0.35  | 1975 | 99.45   | 12.50       | - | 12.75 |  | 188   | 4.61  | 3693 | 90.47   |
| 4       | 0.20  | 1979 | 99.65   | 12.75       | - | 13.00 |  | 90    | 2.20  | 3783 | 92.68   |
| 3       | 0.15  | 1982 | 99.80   | 13.00       | - | 13.25 |  | 99    | 2.43  | 3882 | 95.10   |
| 1       | 0.05  | 1983 | 99.85   | 13.25       | - | 13.50 |  | 53    | 1.30  | 3935 | 96.40   |
| 1       | 0.05  | 1984 | 99.90   | 13.50       | - | 13.75 |  | 61    | 1.49  | 3996 | 97.89   |
| 1       | 0.05  | 1985 | 99.95   | 13.75       | - | 14.00 |  | 23    | 0.56  | 4019 | 98.46   |
| 0       | 0.00  | 1985 | 99.95   | 14.00       | - | 14.25 |  | 28    | 0.69  | 4047 | 99.14   |
| 0       | 0.00  | 1985 | 99.95   | 14.25       | - | 14.50 |  | 9     | 0.22  | 4056 | 99.36   |
| 1       | 0.05  | 1986 | 100.00  | 14.50       | - | 14.75 |  | 13    | 0.32  | 4069 | 99.68   |
|         |       |      |         | 14.75       | - | 15.00 |  | 5     | 0.12  | 4074 | 99.80   |
|         |       |      |         | 15.00       | - | 15.25 |  | 5     | 0.12  | 4079 | 99.93   |
|         |       |      |         | 15.25       | - | 15.50 |  | 0     | 0.00  | 4079 | 99.93   |
|         |       |      |         | 15.50       | - | 15.75 |  | 1     | 0.02  | 4080 | 99.95   |
|         |       |      |         | 15.75       | - | 16.00 |  | 0     | 0.00  | 4080 | 99.95   |
|         |       |      |         | 16.00       | - | 16.25 |  | 1     | 0.02  | 4081 | 99.98   |
|         |       |      |         | 16.25       | - | 16.50 |  | 1     | 0.02  | 4082 | 100.00  |

## (D4) ARM LENGTH

The vertical distance between the acromion right landmark and the dactylion III landmark of a participant standing erect with the arms straight at the sides is calculated as follows: ACROMIAL HEIGHT minus WRIST HEIGHT plus HAND LENGTH.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 63.90       | 25.16 | 1ST  | 70.10 | 27.60 |
| 65.00       | 25.59 | 2ND  | 71.00 | 27.95 |
| 65.50       | 25.79 | 3RD  | 71.60 | 28.19 |
| 66.30       | 26.10 | 5TH  | 72.40 | 28.50 |
| 67.50       | 26.57 | 10TH | 73.70 | 29.02 |
| 68.50       | 26.97 | 15TH | 74.60 | 29.37 |
| 69.20       | 27.24 | 20TH | 75.30 | 29.65 |
| 69.80       | 27.48 | 25TH | 75.90 | 29.88 |
| 70.20       | 27.64 | 30TH | 76.60 | 30.16 |
| 70.70       | 27.83 | 35TH | 77.10 | 30.35 |
| 71.10       | 27.99 | 40TH | 77.60 | 30.55 |
| 71.50       | 28.15 | 45TH | 78.10 | 30.75 |
| 72.00       | 28.35 | 50TH | 78.60 | 30.94 |
| 72.50       | 28.54 | 55TH | 79.10 | 31.14 |
| 73.00       | 28.74 | 60TH | 79.60 | 31.34 |
| 73.40       | 28.90 | 65TH | 80.10 | 31.54 |
| 74.10       | 29.17 | 70TH | 80.60 | 31.73 |
| 74.70       | 29.41 | 75TH | 81.10 | 31.93 |
| 75.40       | 29.69 | 80TH | 81.80 | 32.20 |
| 76.20       | 30.00 | 85TH | 82.60 | 32.52 |
| 77.20       | 30.39 | 90TH | 83.60 | 32.91 |
| 78.50       | 30.91 | 95TH | 85.30 | 33.58 |
| 79.40       | 31.26 | 97TH | 86.20 | 33.94 |
| 79.90       | 31.46 | 98TH | 87.00 | 34.25 |
| 81.00       | 31.89 | 99TH | 88.30 | 34.76 |

## (D4) ARM LENGTH

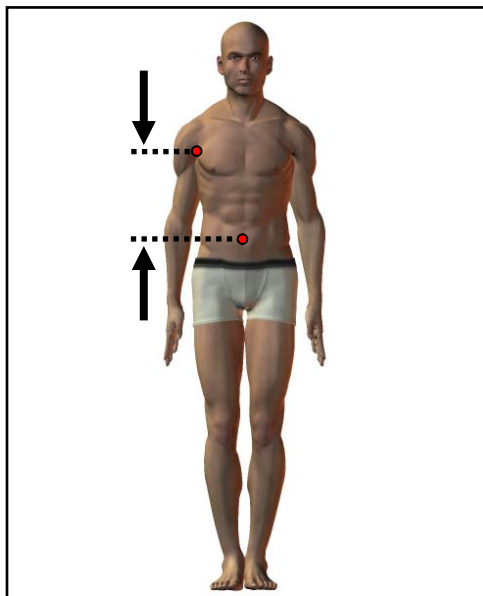
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 72.20                    | MEAN                 | 28.42 |
| 0.08                     | STD. ERROR (MEAN)    | 0.03  |
| 3.73                     | STANDARD DEVIATION   | 1.47  |
| 0.06                     | STD. ERROR (STD.DEV) | 0.02  |
| 56.70                    | MINIMUM              | 22.32 |
| 86.60                    | MAXIMUM              | 34.09 |
| SKEWNESS                 |                      | 0.11  |
| KURTOSIS                 |                      | 3.21  |
| COEFFICIENT OF VARIATION |                      | 5.2%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 78.65                    | MEAN                 | 30.96 |
| 0.06                     | STD. ERROR (MEAN)    | 0.02  |
| 3.89                     | STANDARD DEVIATION   | 1.53  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 66.20                    | MINIMUM              | 26.06 |
| 96.10                    | MAXIMUM              | 37.83 |
| SKEWNESS                 |                      | 0.17  |
| KURTOSIS                 |                      | 3.16  |
| COEFFICIENT OF VARIATION |                      | 5.0%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   |       |  | MALES |       |      |         |
|---------|-------|------|---------|-------------|---|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   | CM    |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 56.55       | - | 57.55 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 57.55       | - | 58.55 |  |       |       |      |         |
| 2       | 0.10  | 3    | 0.15    | 58.55       | - | 59.55 |  |       |       |      |         |
| 0       | 0.00  | 3    | 0.15    | 59.55       | - | 60.55 |  |       |       |      |         |
| 2       | 0.10  | 5    | 0.25    | 60.55       | - | 61.55 |  |       |       |      |         |
| 7       | 0.35  | 12   | 0.60    | 61.55       | - | 62.55 |  |       |       |      |         |
| 7       | 0.35  | 19   | 0.96    | 62.55       | - | 63.55 |  |       |       |      |         |
| 6       | 0.30  | 25   | 1.26    | 63.55       | - | 64.55 |  |       |       |      |         |
| 36      | 1.81  | 61   | 3.07    | 64.55       | - | 65.55 |  |       |       |      |         |
| 56      | 2.82  | 117  | 5.89    | 65.55       | - | 66.55 |  | 3     | 0.07  | 3    | 0.07    |
| 84      | 4.23  | 201  | 10.12   | 66.55       | - | 67.55 |  | 3     | 0.07  | 6    | 0.15    |
| 107     | 5.39  | 308  | 15.51   | 67.55       | - | 68.55 |  | 10    | 0.24  | 16   | 0.39    |
| 143     | 7.20  | 451  | 22.71   | 68.55       | - | 69.55 |  | 7     | 0.17  | 23   | 0.56    |
| 226     | 11.38 | 677  | 34.09   | 69.55       | - | 70.55 |  | 36    | 0.88  | 59   | 1.45    |
| 231     | 11.63 | 908  | 45.72   | 70.55       | - | 71.55 |  | 58    | 1.42  | 117  | 2.87    |
| 199     | 10.02 | 1107 | 55.74   | 71.55       | - | 72.55 |  | 110   | 2.69  | 227  | 5.56    |
| 206     | 10.37 | 1313 | 66.11   | 72.55       | - | 73.55 |  | 164   | 4.02  | 391  | 9.58    |
| 155     | 7.80  | 1468 | 73.92   | 73.55       | - | 74.55 |  | 201   | 4.92  | 592  | 14.50   |
| 149     | 7.50  | 1617 | 81.42   | 74.55       | - | 75.55 |  | 296   | 7.25  | 888  | 21.75   |
| 108     | 5.44  | 1725 | 86.86   | 75.55       | - | 76.55 |  | 328   | 8.04  | 1216 | 29.79   |
| 97      | 4.88  | 1822 | 91.74   | 76.55       | - | 77.55 |  | 388   | 9.51  | 1604 | 39.29   |
| 70      | 3.52  | 1892 | 95.27   | 77.55       | - | 78.55 |  | 412   | 10.09 | 2016 | 49.39   |
| 43      | 2.17  | 1935 | 97.43   | 78.55       | - | 79.55 |  | 426   | 10.44 | 2442 | 59.82   |
| 28      | 1.41  | 1963 | 98.84   | 79.55       | - | 80.55 |  | 414   | 10.14 | 2856 | 69.97   |
| 8       | 0.40  | 1971 | 99.24   | 80.55       | - | 81.55 |  | 331   | 8.11  | 3187 | 78.07   |
| 7       | 0.35  | 1978 | 99.60   | 81.55       | - | 82.55 |  | 271   | 6.64  | 3458 | 84.71   |
| 4       | 0.20  | 1982 | 99.80   | 82.55       | - | 83.55 |  | 201   | 4.92  | 3659 | 89.64   |
| 2       | 0.10  | 1984 | 99.90   | 83.55       | - | 84.55 |  | 149   | 3.65  | 3808 | 93.29   |
| 1       | 0.05  | 1985 | 99.95   | 84.55       | - | 85.55 |  | 94    | 2.30  | 3902 | 95.59   |
| 0       | 0.00  | 1985 | 99.95   | 85.55       | - | 86.55 |  | 80    | 1.96  | 3982 | 97.55   |
| 1       | 0.05  | 1986 | 100.00  | 86.55       | - | 87.55 |  | 37    | 0.91  | 4019 | 98.46   |
|         |       |      |         | 87.55       | - | 88.55 |  | 27    | 0.66  | 4046 | 99.12   |
|         |       |      |         | 88.55       | - | 89.55 |  | 14    | 0.34  | 4060 | 99.46   |
|         |       |      |         | 89.55       | - | 90.55 |  | 12    | 0.29  | 4072 | 99.76   |
|         |       |      |         | 90.55       | - | 91.55 |  | 5     | 0.12  | 4077 | 99.88   |
|         |       |      |         | 91.55       | - | 92.55 |  | 2     | 0.05  | 4079 | 99.93   |
|         |       |      |         | 92.55       | - | 93.55 |  | 2     | 0.05  | 4081 | 99.98   |
|         |       |      |         | 93.55       | - | 94.55 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 94.55       | - | 95.55 |  | 0     | 0.00  | 4081 | 99.98   |
|         |       |      |         | 95.55       | - | 96.55 |  | 1     | 0.02  | 4082 | 100.00  |

## (D5) AXILLA-WAIST LENGTH (OMPHALION)

The vertical distance between the anterior-scye-on-the-torso landmark and the anterior omphalion landmark is calculated as follows: AXILLA HEIGHT minus WAIST HEIGHT (OMPHALION).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 21.10       | 8.31  | 1ST  | 22.10 | 8.70  |
| 21.70       | 8.54  | 2ND  | 22.80 | 8.98  |
| 21.90       | 8.62  | 3RD  | 23.10 | 9.09  |
| 22.40       | 8.82  | 5TH  | 23.50 | 9.25  |
| 23.20       | 9.13  | 10TH | 24.30 | 9.57  |
| 23.70       | 9.33  | 15TH | 24.90 | 9.80  |
| 24.10       | 9.49  | 20TH | 25.30 | 9.96  |
| 24.40       | 9.61  | 25TH | 25.70 | 10.12 |
| 24.70       | 9.72  | 30TH | 26.00 | 10.24 |
| 25.10       | 9.88  | 35TH | 26.30 | 10.35 |
| 25.30       | 9.96  | 40TH | 26.60 | 10.47 |
| 25.60       | 10.08 | 45TH | 26.90 | 10.59 |
| 25.90       | 10.20 | 50TH | 27.20 | 10.71 |
| 26.10       | 10.28 | 55TH | 27.50 | 10.83 |
| 26.40       | 10.39 | 60TH | 27.70 | 10.91 |
| 26.70       | 10.51 | 65TH | 28.10 | 11.06 |
| 26.90       | 10.59 | 70TH | 28.40 | 11.18 |
| 27.30       | 10.75 | 75TH | 28.80 | 11.34 |
| 27.60       | 10.87 | 80TH | 29.20 | 11.50 |
| 28.00       | 11.02 | 85TH | 29.70 | 11.69 |
| 28.70       | 11.30 | 90TH | 30.30 | 11.93 |
| 29.60       | 11.65 | 95TH | 31.20 | 12.28 |
| 30.10       | 11.85 | 97TH | 31.80 | 12.52 |
| 30.40       | 11.97 | 98TH | 32.30 | 12.72 |
| 31.00       | 12.20 | 99TH | 32.90 | 12.95 |

## (D5) AXILLA-WAIST LENGTH (OMPHALION)

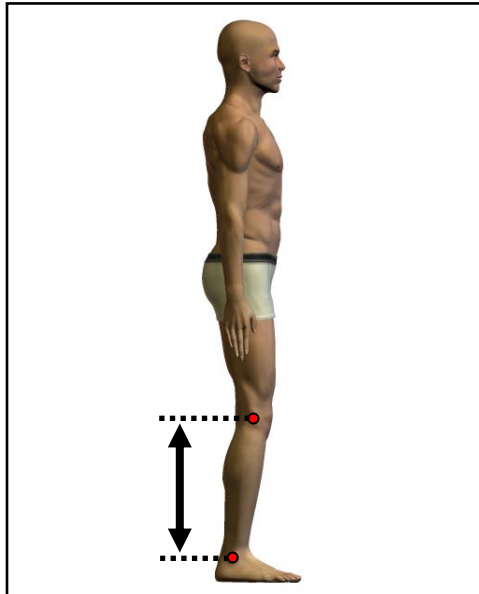
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 25.89                    | MEAN                 | 10.19 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 2.13                     | STANDARD DEVIATION   | 0.84  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 19.30                    | MINIMUM              | 7.60  |
| 33.40                    | MAXIMUM              | 13.15 |
| SKEWNESS                 |                      | 0.13  |
| KURTOSIS                 |                      | 3.01  |
| COEFFICIENT OF VARIATION |                      | 8.2%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 27.26                    | MEAN                 | 10.73 |
| 0.04                     | STD. ERROR (MEAN)    | 0.01  |
| 2.33                     | STANDARD DEVIATION   | 0.92  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 18.90                    | MINIMUM              | 7.44  |
| 38.60                    | MAXIMUM              | 15.20 |
| SKEWNESS                 |                      | 0.17  |
| KURTOSIS                 |                      | 3.23  |
| COEFFICIENT OF VARIATION |                      | 8.5%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 18.75       | - | 19.25 |  | 1     | 0.02 | 1    | 0.02    |
| 2       | 0.10 | 3    | 0.15    | 19.25       | - | 19.75 |  | 1     | 0.02 | 2    | 0.05    |
| 11      | 0.55 | 14   | 0.70    | 19.75       | - | 20.25 |  | 5     | 0.12 | 7    | 0.17    |
| 7       | 0.35 | 21   | 1.06    | 20.25       | - | 20.75 |  | 6     | 0.15 | 13   | 0.32    |
| 22      | 1.11 | 43   | 2.17    | 20.75       | - | 21.25 |  | 4     | 0.10 | 17   | 0.42    |
| 42      | 2.11 | 85   | 4.28    | 21.25       | - | 21.75 |  | 9     | 0.22 | 26   | 0.64    |
| 55      | 2.77 | 140  | 7.05    | 21.75       | - | 22.25 |  | 23    | 0.56 | 49   | 1.20    |
| 65      | 3.27 | 205  | 10.32   | 22.25       | - | 22.75 |  | 28    | 0.69 | 77   | 1.89    |
| 106     | 5.34 | 311  | 15.66   | 22.75       | - | 23.25 |  | 61    | 1.49 | 138  | 3.38    |
| 138     | 6.95 | 449  | 22.61   | 23.25       | - | 23.75 |  | 106   | 2.60 | 244  | 5.98    |
| 148     | 7.45 | 597  | 30.06   | 23.75       | - | 24.25 |  | 143   | 3.50 | 387  | 9.48    |
| 178     | 8.96 | 775  | 39.02   | 24.25       | - | 24.75 |  | 181   | 4.43 | 568  | 13.91   |
| 170     | 8.56 | 945  | 47.58   | 24.75       | - | 25.25 |  | 224   | 5.49 | 792  | 19.40   |
| 188     | 9.47 | 1133 | 57.05   | 25.25       | - | 25.75 |  | 260   | 6.37 | 1052 | 25.77   |
| 181     | 9.11 | 1314 | 66.16   | 25.75       | - | 26.25 |  | 313   | 7.67 | 1365 | 33.44   |
| 175     | 8.81 | 1489 | 74.97   | 26.25       | - | 26.75 |  | 360   | 8.82 | 1725 | 42.26   |
| 144     | 7.25 | 1633 | 82.23   | 26.75       | - | 27.25 |  | 374   | 9.16 | 2099 | 51.42   |
| 97      | 4.88 | 1730 | 87.11   | 27.25       | - | 27.75 |  | 360   | 8.82 | 2459 | 60.24   |
| 72      | 3.63 | 1802 | 90.74   | 27.75       | - | 28.25 |  | 303   | 7.42 | 2762 | 67.66   |
| 51      | 2.57 | 1853 | 93.30   | 28.25       | - | 28.75 |  | 267   | 6.54 | 3029 | 74.20   |
| 55      | 2.77 | 1908 | 96.07   | 28.75       | - | 29.25 |  | 272   | 6.66 | 3301 | 80.87   |
| 26      | 1.31 | 1934 | 97.38   | 29.25       | - | 29.75 |  | 192   | 4.70 | 3493 | 85.57   |
| 26      | 1.31 | 1960 | 98.69   | 29.75       | - | 30.25 |  | 179   | 4.39 | 3672 | 89.96   |
| 10      | 0.50 | 1970 | 99.19   | 30.25       | - | 30.75 |  | 121   | 2.96 | 3793 | 92.92   |
| 7       | 0.35 | 1977 | 99.55   | 30.75       | - | 31.25 |  | 97    | 2.38 | 3890 | 95.30   |
| 4       | 0.20 | 1981 | 99.75   | 31.25       | - | 31.75 |  | 57    | 1.40 | 3947 | 96.69   |
| 3       | 0.15 | 1984 | 99.90   | 31.75       | - | 32.25 |  | 50    | 1.22 | 3997 | 97.92   |
| 1       | 0.05 | 1985 | 99.95   | 32.25       | - | 32.75 |  | 32    | 0.78 | 4029 | 98.70   |
| 1       | 0.05 | 1986 | 100.00  | 32.75       | - | 33.25 |  | 23    | 0.56 | 4052 | 99.27   |
|         |      |      |         | 33.25       | - | 33.75 |  | 11    | 0.27 | 4063 | 99.53   |
|         |      |      |         | 33.75       | - | 34.25 |  | 9     | 0.22 | 4072 | 99.76   |
|         |      |      |         | 34.25       | - | 34.75 |  | 3     | 0.07 | 4075 | 99.83   |
|         |      |      |         | 34.75       | - | 35.25 |  | 4     | 0.10 | 4079 | 99.93   |
|         |      |      |         | 35.25       | - | 35.75 |  | 0     | 0.00 | 4079 | 99.93   |
|         |      |      |         | 35.75       | - | 36.25 |  | 1     | 0.02 | 4080 | 99.95   |
|         |      |      |         | 36.25       | - | 36.75 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 36.75       | - | 37.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 37.25       | - | 37.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 37.75       | - | 38.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 38.25       | - | 38.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (D6) CALF LINK

The vertical distance between the lateral femoral epicondyle landmark and the lateral malleolus landmark is calculated as follows: LATERAL FEMORAL EPICONDYLE HEIGHT minus LATERAL MALLEOLUS HEIGHT.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 34.40       | 13.54 | 1ST  | 36.60 | 14.41 |
| 35.20       | 13.86 | 2ND  | 37.20 | 14.65 |
| 35.60       | 14.02 | 3RD  | 37.50 | 14.76 |
| 36.10       | 14.21 | 5TH  | 37.90 | 14.92 |
| 37.20       | 14.65 | 10TH | 38.70 | 15.24 |
| 37.80       | 14.88 | 15TH | 39.40 | 15.51 |
| 38.20       | 15.04 | 20TH | 39.80 | 15.67 |
| 38.60       | 15.20 | 25TH | 40.20 | 15.83 |
| 38.90       | 15.31 | 30TH | 40.60 | 15.98 |
| 39.30       | 15.47 | 35TH | 40.90 | 16.10 |
| 39.60       | 15.59 | 40TH | 41.20 | 16.22 |
| 39.90       | 15.71 | 45TH | 41.50 | 16.34 |
| 40.20       | 15.83 | 50TH | 41.80 | 16.46 |
| 40.50       | 15.94 | 55TH | 42.10 | 16.57 |
| 40.90       | 16.10 | 60TH | 42.40 | 16.69 |
| 41.20       | 16.22 | 65TH | 42.70 | 16.81 |
| 41.60       | 16.38 | 70TH | 43.10 | 16.97 |
| 42.00       | 16.54 | 75TH | 43.50 | 17.13 |
| 42.50       | 16.73 | 80TH | 43.90 | 17.28 |
| 43.00       | 16.93 | 85TH | 44.30 | 17.44 |
| 43.70       | 17.20 | 90TH | 45.00 | 17.72 |
| 44.60       | 17.56 | 95TH | 46.00 | 18.11 |
| 45.30       | 17.83 | 97TH | 46.70 | 18.39 |
| 45.80       | 18.03 | 98TH | 47.20 | 18.58 |
| 46.90       | 18.46 | 99TH | 47.90 | 18.86 |

(D6) CALF LINK

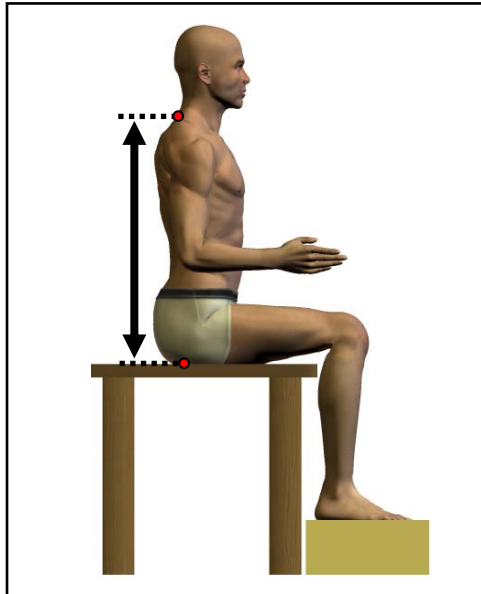
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 40.32                    | MEAN                 | 15.87 |
| 0.06                     | STD. ERROR (MEAN)    | 0.02  |
| 2.59                     | STANDARD DEVIATION   | 1.02  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 29.40                    | MINIMUM              | 11.57 |
| 50.60                    | MAXIMUM              | 19.92 |
| SKEWNESS                 |                      | 0.10  |
| KURTOSIS                 |                      | 3.40  |
| COEFFICIENT OF VARIATION |                      | 6.4%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 41.88                    | MEAN                 | 16.49 |
| 0.04                     | STD. ERROR (MEAN)    | 0.02  |
| 2.46                     | STANDARD DEVIATION   | 0.97  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 34.40                    | MINIMUM              | 13.54 |
| 51.90                    | MAXIMUM              | 20.43 |
| SKEWNESS                 |                      | 0.20  |
| KURTOSIS                 |                      | 3.16  |
| COEFFICIENT OF VARIATION |                      | 5.9%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 29.25       | - | 29.75 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 29.75       | - | 30.25 |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 30.25       | - | 30.75 |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 30.75       | - | 31.25 |  |       |      |      |         |
| 0       | 0.00 | 3    | 0.15    | 31.25       | - | 31.75 |  |       |      |      |         |
| 2       | 0.10 | 5    | 0.25    | 31.75       | - | 32.25 |  |       |      |      |         |
| 1       | 0.05 | 6    | 0.30    | 32.25       | - | 32.75 |  |       |      |      |         |
| 0       | 0.00 | 6    | 0.30    | 32.75       | - | 33.25 |  |       |      |      |         |
| 4       | 0.20 | 10   | 0.50    | 33.25       | - | 33.75 |  |       |      |      |         |
| 5       | 0.25 | 15   | 0.76    | 33.75       | - | 34.25 |  |       |      |      |         |
| 12      | 0.60 | 27   | 1.36    | 34.25       | - | 34.75 |  |       |      |      |         |
| 14      | 0.70 | 41   | 2.06    | 34.75       | - | 35.25 |  | 8     | 0.20 | 8    | 0.20    |
| 26      | 1.31 | 67   | 3.37    | 35.25       | - | 35.75 |  | 2     | 0.05 | 10   | 0.24    |
| 40      | 2.01 | 107  | 5.39    | 35.75       | - | 36.25 |  | 5     | 0.12 | 15   | 0.37    |
| 43      | 2.17 | 150  | 7.55    | 36.25       | - | 36.75 |  | 14    | 0.34 | 29   | 0.71    |
| 56      | 2.82 | 206  | 10.37   | 36.75       | - | 37.25 |  | 20    | 0.49 | 49   | 1.20    |
| 90      | 4.53 | 296  | 14.90   | 37.25       | - | 37.75 |  | 40    | 0.98 | 89   | 2.18    |
| 130     | 6.55 | 426  | 21.45   | 37.75       | - | 38.25 |  | 81    | 1.98 | 170  | 4.16    |
| 108     | 5.44 | 534  | 26.89   | 38.25       | - | 38.75 |  | 100   | 2.45 | 270  | 6.61    |
| 149     | 7.50 | 683  | 34.39   | 38.75       | - | 39.25 |  | 146   | 3.58 | 416  | 10.19   |
| 142     | 7.15 | 825  | 41.54   | 39.25       | - | 39.75 |  | 158   | 3.87 | 574  | 14.06   |
| 173     | 8.71 | 998  | 50.25   | 39.75       | - | 40.25 |  | 207   | 5.07 | 781  | 19.13   |
| 147     | 7.40 | 1145 | 57.65   | 40.25       | - | 40.75 |  | 273   | 6.69 | 1054 | 25.82   |
| 157     | 7.91 | 1302 | 65.56   | 40.75       | - | 41.25 |  | 303   | 7.42 | 1357 | 33.24   |
| 131     | 6.60 | 1433 | 72.16   | 41.25       | - | 41.75 |  | 303   | 7.42 | 1660 | 40.67   |
| 120     | 6.04 | 1553 | 78.20   | 41.75       | - | 42.25 |  | 332   | 8.13 | 1992 | 48.80   |
| 93      | 4.68 | 1646 | 82.88   | 42.25       | - | 42.75 |  | 338   | 8.28 | 2330 | 57.08   |
| 80      | 4.03 | 1726 | 86.91   | 42.75       | - | 43.25 |  | 327   | 8.01 | 2657 | 65.09   |
| 67      | 3.37 | 1793 | 90.28   | 43.25       | - | 43.75 |  | 276   | 6.76 | 2933 | 71.85   |
| 69      | 3.47 | 1862 | 93.76   | 43.75       | - | 44.25 |  | 256   | 6.27 | 3189 | 78.12   |
| 32      | 1.61 | 1894 | 95.37   | 44.25       | - | 44.75 |  | 233   | 5.71 | 3422 | 83.83   |
| 29      | 1.46 | 1923 | 96.83   | 44.75       | - | 45.25 |  | 180   | 4.41 | 3602 | 88.24   |
| 21      | 1.06 | 1944 | 97.89   | 45.25       | - | 45.75 |  | 137   | 3.36 | 3739 | 91.60   |
| 14      | 0.70 | 1958 | 98.59   | 45.75       | - | 46.25 |  | 84    | 2.06 | 3823 | 93.66   |
| 6       | 0.30 | 1964 | 98.89   | 46.25       | - | 46.75 |  | 85    | 2.08 | 3908 | 95.74   |
| 10      | 0.50 | 1974 | 99.40   | 46.75       | - | 47.25 |  | 54    | 1.32 | 3962 | 97.06   |
| 5       | 0.25 | 1979 | 99.65   | 47.25       | - | 47.75 |  | 43    | 1.05 | 4005 | 98.11   |
| 3       | 0.15 | 1982 | 99.80   | 47.75       | - | 48.25 |  | 27    | 0.66 | 4032 | 98.78   |
| 1       | 0.05 | 1983 | 99.85   | 48.25       | - | 48.75 |  | 20    | 0.49 | 4052 | 99.27   |
| 1       | 0.05 | 1984 | 99.90   | 48.75       | - | 49.25 |  | 7     | 0.17 | 4059 | 99.44   |
| 0       | 0.00 | 1984 | 99.90   | 49.25       | - | 49.75 |  | 8     | 0.20 | 4067 | 99.63   |
| 1       | 0.05 | 1985 | 99.95   | 49.75       | - | 50.25 |  | 6     | 0.15 | 4073 | 99.78   |
| 1       | 0.05 | 1986 | 100.00  | 50.25       | - | 50.75 |  | 4     | 0.10 | 4077 | 99.88   |
|         |      |      |         | 50.75       | - | 51.25 |  | 1     | 0.02 | 4078 | 99.90   |
|         |      |      |         | 51.25       | - | 51.75 |  | 3     | 0.07 | 4081 | 99.98   |
|         |      |      |         | 51.75       | - | 52.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         |             |   |       |  | 1     | 0.02 | 4082 | 100.00  |

## (D7) CERVICALE HEIGHT, SITTING\*

The vertical distance between a sitting surface and the cervicale landmark is calculated as follows: SITTING HEIGHT minus (STATURE minus CERVICALE HEIGHT).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 56.10       | 22.09 | 1ST  | 60.60 | 23.86 |
| 56.80       | 22.36 | 2ND  | 61.80 | 24.33 |
| 57.20       | 22.52 | 3RD  | 62.20 | 24.49 |
| 57.80       | 22.76 | 5TH  | 63.00 | 24.80 |
| 58.90       | 23.19 | 10TH | 64.10 | 25.24 |
| 59.40       | 23.39 | 15TH | 64.90 | 25.55 |
| 59.90       | 23.58 | 20TH | 65.50 | 25.79 |
| 60.40       | 23.78 | 25TH | 66.00 | 25.98 |
| 60.90       | 23.98 | 30TH | 66.40 | 26.14 |
| 61.30       | 24.13 | 35TH | 66.80 | 26.30 |
| 61.70       | 24.29 | 40TH | 67.20 | 26.46 |
| 62.10       | 24.45 | 45TH | 67.50 | 26.57 |
| 62.40       | 24.57 | 50TH | 67.90 | 26.73 |
| 62.80       | 24.72 | 55TH | 68.30 | 26.89 |
| 63.20       | 24.88 | 60TH | 68.70 | 27.05 |
| 63.50       | 25.00 | 65TH | 69.10 | 27.20 |
| 63.80       | 25.12 | 70TH | 69.50 | 27.36 |
| 64.20       | 25.28 | 75TH | 69.90 | 27.52 |
| 64.80       | 25.51 | 80TH | 70.40 | 27.72 |
| 65.30       | 25.71 | 85TH | 71.00 | 27.95 |
| 66.00       | 25.98 | 90TH | 71.70 | 28.23 |
| 66.90       | 26.34 | 95TH | 72.80 | 28.66 |
| 67.60       | 26.61 | 97TH | 73.50 | 28.94 |
| 68.10       | 26.81 | 98TH | 74.00 | 29.13 |
| 68.90       | 27.13 | 99TH | 74.80 | 29.45 |

\* In ANSUR cervicale was defined as the highest point on the seventh cervical vertebra. For consistency with international standards, it is now the most prominent point on the seventh cervical vertebra.

## (D7) CERVICALE HEIGHT, SITTING

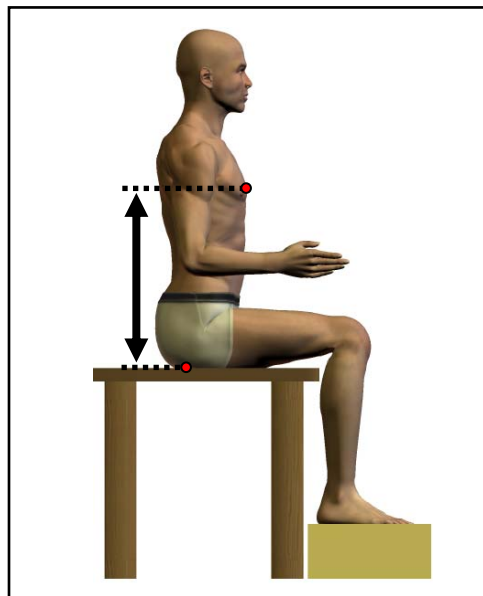
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 62.38                    | MEAN                 | 24.56 |
| 0.06                     | STD. ERROR (MEAN)    | 0.02  |
| 2.78                     | STANDARD DEVIATION   | 1.09  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 53.00                    | MINIMUM              | 20.87 |
| 70.50                    | MAXIMUM              | 27.76 |
| SKEWNESS                 |                      | 0.00  |
| KURTOSIS                 |                      | 2.74  |
| COEFFICIENT OF VARIATION |                      | 4.5%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 67.94                    | MEAN                 | 26.75 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 2.99                     | STANDARD DEVIATION   | 1.18  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 58.00                    | MINIMUM              | 22.83 |
| 79.20                    | MAXIMUM              | 31.18 |
| SKEWNESS                 |                      | -0.05 |
| KURTOSIS                 |                      | 3.08  |
| COEFFICIENT OF VARIATION |                      | 4.4%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 52.75       | - | 53.25 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 53.25       | - | 53.75 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 53.75       | - | 54.25 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 54.25       | - | 54.75 |  |       |      |      |         |
| 5       | 0.25 | 6    | 0.30    | 54.75       | - | 55.25 |  |       |      |      |         |
| 5       | 0.25 | 11   | 0.55    | 55.25       | - | 55.75 |  |       |      |      |         |
| 12      | 0.60 | 23   | 1.16    | 55.75       | - | 56.25 |  |       |      |      |         |
| 15      | 0.76 | 38   | 1.91    | 56.25       | - | 56.75 |  |       |      |      |         |
| 24      | 1.21 | 62   | 3.12    | 56.75       | - | 57.25 |  |       |      |      |         |
| 33      | 1.66 | 95   | 4.78    | 57.25       | - | 57.75 |  |       |      |      |         |
| 44      | 2.22 | 139  | 7.00    | 57.75       | - | 58.25 |  | 1     | 0.02 | 1    | 0.02    |
| 54      | 2.72 | 193  | 9.72    | 58.25       | - | 58.75 |  | 3     | 0.07 | 4    | 0.10    |
| 76      | 3.83 | 269  | 13.54   | 58.75       | - | 59.25 |  | 10    | 0.24 | 14   | 0.34    |
| 102     | 5.14 | 371  | 18.68   | 59.25       | - | 59.75 |  | 9     | 0.22 | 23   | 0.56    |
| 97      | 4.88 | 468  | 23.56   | 59.75       | - | 60.25 |  | 4     | 0.10 | 27   | 0.66    |
| 92      | 4.63 | 560  | 28.20   | 60.25       | - | 60.75 |  | 17    | 0.42 | 44   | 1.08    |
| 112     | 5.64 | 672  | 33.84   | 60.75       | - | 61.25 |  | 16    | 0.39 | 60   | 1.47    |
| 129     | 6.50 | 801  | 40.33   | 61.25       | - | 61.75 |  | 21    | 0.51 | 81   | 1.98    |
| 149     | 7.50 | 950  | 47.83   | 61.75       | - | 62.25 |  | 44    | 1.08 | 125  | 3.06    |
| 132     | 6.65 | 1082 | 54.48   | 62.25       | - | 62.75 |  | 58    | 1.42 | 183  | 4.48    |
| 144     | 7.25 | 1226 | 61.73   | 62.75       | - | 63.25 |  | 68    | 1.67 | 251  | 6.15    |
| 152     | 7.65 | 1378 | 69.39   | 63.25       | - | 63.75 |  | 87    | 2.13 | 338  | 8.28    |
| 112     | 5.64 | 1490 | 75.03   | 63.75       | - | 64.25 |  | 96    | 2.35 | 434  | 10.63   |
| 84      | 4.23 | 1574 | 79.25   | 64.25       | - | 64.75 |  | 136   | 3.33 | 570  | 13.96   |
| 103     | 5.19 | 1677 | 84.44   | 64.75       | - | 65.25 |  | 158   | 3.87 | 728  | 17.83   |
| 78      | 3.93 | 1755 | 88.37   | 65.25       | - | 65.75 |  | 200   | 4.90 | 928  | 22.73   |
| 70      | 3.52 | 1825 | 91.89   | 65.75       | - | 66.25 |  | 236   | 5.78 | 1164 | 28.52   |
| 49      | 2.47 | 1874 | 94.36   | 66.25       | - | 66.75 |  | 228   | 5.59 | 1392 | 34.10   |
| 32      | 1.61 | 1906 | 95.97   | 66.75       | - | 67.25 |  | 264   | 6.47 | 1656 | 40.57   |
| 28      | 1.41 | 1934 | 97.38   | 67.25       | - | 67.75 |  | 293   | 7.18 | 1949 | 47.75   |
| 21      | 1.06 | 1955 | 98.44   | 67.75       | - | 68.25 |  | 252   | 6.17 | 2201 | 53.92   |
| 11      | 0.55 | 1966 | 98.99   | 68.25       | - | 68.75 |  | 267   | 6.54 | 2468 | 60.46   |
| 7       | 0.35 | 1973 | 99.35   | 68.75       | - | 69.25 |  | 242   | 5.93 | 2710 | 66.39   |
| 9       | 0.45 | 1982 | 99.80   | 69.25       | - | 69.75 |  | 243   | 5.95 | 2953 | 72.34   |
| 3       | 0.15 | 1985 | 99.95   | 69.75       | - | 70.25 |  | 243   | 5.95 | 3196 | 78.29   |
| 1       | 0.05 | 1986 | 100.00  | 70.25       | - | 70.75 |  | 175   | 4.29 | 3371 | 82.58   |
|         |      |      |         | 70.75       | - | 71.25 |  | 170   | 4.16 | 3541 | 86.75   |
|         |      |      |         | 71.25       | - | 71.75 |  | 139   | 3.41 | 3680 | 90.15   |
|         |      |      |         | 71.75       | - | 72.25 |  | 110   | 2.69 | 3790 | 92.85   |
|         |      |      |         | 72.25       | - | 72.75 |  | 75    | 1.84 | 3865 | 94.68   |
|         |      |      |         | 72.75       | - | 73.25 |  | 63    | 1.54 | 3928 | 96.23   |
|         |      |      |         | 73.25       | - | 73.75 |  | 58    | 1.42 | 3986 | 97.65   |
|         |      |      |         | 73.75       | - | 74.25 |  | 29    | 0.71 | 4015 | 98.36   |
|         |      |      |         | 74.25       | - | 74.75 |  | 22    | 0.54 | 4037 | 98.90   |
|         |      |      |         | 74.75       | - | 75.25 |  | 16    | 0.39 | 4053 | 99.29   |
|         |      |      |         | 75.25       | - | 75.75 |  | 12    | 0.29 | 4065 | 99.58   |
|         |      |      |         | 75.75       | - | 76.25 |  | 8     | 0.20 | 4073 | 99.78   |
|         |      |      |         | 76.25       | - | 76.75 |  | 4     | 0.10 | 4077 | 99.88   |
|         |      |      |         | 76.75       | - | 77.25 |  | 2     | 0.05 | 4079 | 99.93   |
|         |      |      |         | 77.25       | - | 77.75 |  | 1     | 0.02 | 4080 | 99.95   |
|         |      |      |         | 77.75       | - | 78.25 |  | 0     | 0.00 | 4080 | 99.95   |
|         |      |      |         | 78.25       | - | 78.75 |  | 0     | 0.00 | 4080 | 99.95   |
|         |      |      |         | 78.75       | - | 79.25 |  | 2     | 0.05 | 4082 | 100.00  |

## (D8) CHEST HEIGHT, SITTING\*

The vertical distance between a sitting surface and the chest point, anterior landmark is calculated as follows: SITTING HEIGHT minus (STATURE minus CHEST HEIGHT).



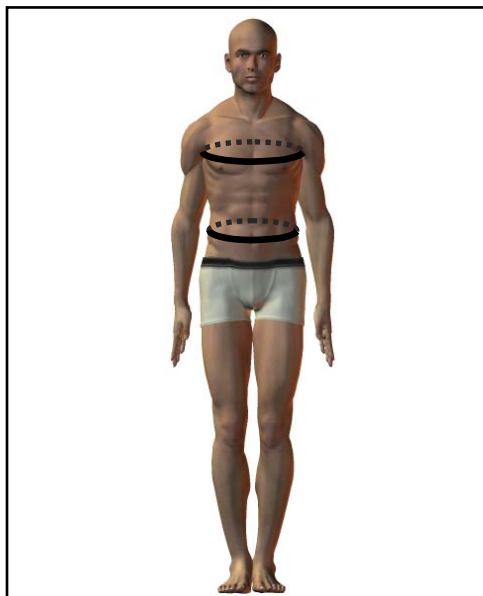
| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 33.00       | 12.99 | 1ST  | 39.00 | 15.35 |
| 34.00       | 13.39 | 2ND  | 39.90 | 15.71 |
| 34.30       | 13.50 | 3RD  | 40.30 | 15.87 |
| 35.00       | 13.78 | 5TH  | 41.00 | 16.14 |
| 36.40       | 14.33 | 10TH | 41.90 | 16.50 |
| 37.10       | 14.61 | 15TH | 42.60 | 16.77 |
| 37.70       | 14.84 | 20TH | 43.10 | 16.97 |
| 38.10       | 15.00 | 25TH | 43.60 | 17.17 |
| 38.50       | 15.16 | 30TH | 43.90 | 17.28 |
| 39.00       | 15.35 | 35TH | 44.30 | 17.44 |
| 39.30       | 15.47 | 40TH | 44.60 | 17.56 |
| 39.70       | 15.63 | 45TH | 45.00 | 17.72 |
| 40.10       | 15.79 | 50TH | 45.30 | 17.83 |
| 40.40       | 15.91 | 55TH | 45.60 | 17.95 |
| 40.70       | 16.02 | 60TH | 46.00 | 18.11 |
| 41.00       | 16.14 | 65TH | 46.30 | 18.23 |
| 41.40       | 16.30 | 70TH | 46.70 | 18.39 |
| 41.80       | 16.46 | 75TH | 47.10 | 18.54 |
| 42.40       | 16.69 | 80TH | 47.50 | 18.70 |
| 42.90       | 16.89 | 85TH | 48.00 | 18.90 |
| 43.70       | 17.20 | 90TH | 48.70 | 19.17 |
| 44.50       | 17.52 | 95TH | 49.80 | 19.61 |
| 45.20       | 17.80 | 97TH | 50.40 | 19.84 |
| 45.70       | 17.99 | 98TH | 50.80 | 20.00 |
| 46.70       | 18.39 | 99TH | 51.40 | 20.24 |

\*In ANSUR this measurement was taken (in males) at the level of the navel (nipple). This change was made in order to capture the breadth of the chest at its maximum. The landmark is unchanged for females.



## (D9) CHEST-WAIST DROP (OMPHALION)\*

The difference between the circumference of the chest and the circumference of the waist at omphalion is calculated as follows: CHEST CIRCUMFERENCE minus WAIST CIRCUMFERENCE (OMPHALION).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| -4.90       | -1.93 | 1ST  | -1.70 | -0.67 |
| -3.20       | -1.26 | 2ND  | 0.10  | 0.04  |
| -2.00       | -0.79 | 3RD  | 1.40  | 0.55  |
| -0.50       | -0.20 | 5TH  | 2.80  | 1.10  |
| 1.50        | 0.59  | 10TH | 5.10  | 2.01  |
| 3.00        | 1.18  | 15TH | 6.50  | 2.56  |
| 4.30        | 1.69  | 20TH | 7.50  | 2.95  |
| 5.20        | 2.05  | 25TH | 8.30  | 3.27  |
| 6.00        | 2.36  | 30TH | 9.10  | 3.58  |
| 6.80        | 2.68  | 35TH | 9.90  | 3.90  |
| 7.50        | 2.95  | 40TH | 10.50 | 4.13  |
| 8.10        | 3.19  | 45TH | 11.30 | 4.45  |
| 8.70        | 3.43  | 50TH | 11.90 | 4.69  |
| 9.30        | 3.66  | 55TH | 12.60 | 4.96  |
| 10.10       | 3.98  | 60TH | 13.30 | 5.24  |
| 10.80       | 4.25  | 65TH | 14.00 | 5.51  |
| 11.60       | 4.57  | 70TH | 14.70 | 5.79  |
| 12.30       | 4.84  | 75TH | 15.50 | 6.10  |
| 13.10       | 5.16  | 80TH | 16.30 | 6.42  |
| 14.10       | 5.55  | 85TH | 17.20 | 6.77  |
| 15.40       | 6.06  | 90TH | 18.40 | 7.24  |
| 17.00       | 6.69  | 95TH | 20.10 | 7.91  |
| 18.10       | 7.13  | 97TH | 21.40 | 8.43  |
| 19.00       | 7.48  | 98TH | 22.10 | 8.70  |
| 20.40       | 8.03  | 99TH | 23.30 | 9.17  |

\* In ANSUR this measurement was taken (in males) at the level of thelion (nipple). This change was made in order to capture the breadth of the chest at its maximum. The landmark is unchanged for females. This measurement also differs from ANSUR because the tissue is now compressed and the measurement is taken at maximum inspiration.

## (D9) CHEST-WAIST DROP (OMPHALION)

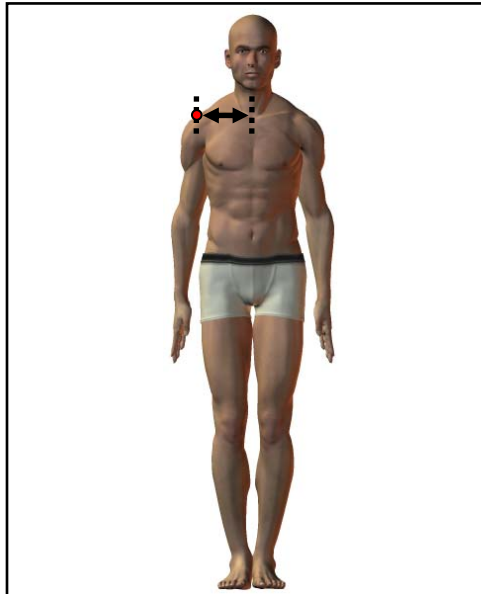
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 8.60                     | MEAN                 | 3.38  |
| 0.12                     | STD. ERROR (MEAN)    | 0.05  |
| 5.36                     | STANDARD DEVIATION   | 2.11  |
| 0.09                     | STD. ERROR (STD.DEV) | 0.03  |
| -17.30                   | MINIMUM              | -6.81 |
| 26.30                    | MAXIMUM              | 10.35 |
| SKEWNESS                 |                      | -0.25 |
| KURTOSIS                 |                      | 3.34  |
| COEFFICIENT OF VARIATION |                      | 62.4% |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 11.81                    | MEAN                 | 4.65  |
| 0.08                     | STD. ERROR (MEAN)    | 0.03  |
| 5.31                     | STANDARD DEVIATION   | 2.09  |
| 0.06                     | STD. ERROR (STD.DEV) | 0.02  |
| -11.20                   | MINIMUM              | -4.41 |
| 32.00                    | MAXIMUM              | 12.60 |
| SKEWNESS                 |                      | -0.16 |
| KURTOSIS                 |                      | 3.26  |
| COEFFICIENT OF VARIATION |                      | 44.9% |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   | CM     |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | -17.55      | - | -16.55 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | -16.55      | - | -15.55 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | -15.55      | - | -14.55 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | -14.55      | - | -13.55 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | -13.55      | - | -12.55 |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | -12.55      | - | -11.55 |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | -11.55      | - | -10.55 |  | 1     | 0.02 | 1    | 0.02    |
| 1       | 0.05 | 3    | 0.15    | -10.55      | - | -9.55  |  | 0     | 0.00 | 1    | 0.02    |
| 0       | 0.00 | 3    | 0.15    | -9.55       | - | -8.55  |  | 0     | 0.00 | 1    | 0.02    |
| 4       | 0.20 | 7    | 0.35    | -8.55       | - | -7.55  |  | 1     | 0.02 | 2    | 0.05    |
| 4       | 0.20 | 11   | 0.55    | -7.55       | - | -6.55  |  | 2     | 0.05 | 4    | 0.10    |
| 5       | 0.25 | 16   | 0.81    | -6.55       | - | -5.55  |  | 2     | 0.05 | 6    | 0.15    |
| 7       | 0.35 | 23   | 1.16    | -5.55       | - | -4.55  |  | 4     | 0.10 | 10   | 0.24    |
| 8       | 0.40 | 31   | 1.56    | -4.55       | - | -3.55  |  | 5     | 0.12 | 15   | 0.37    |
| 19      | 0.96 | 50   | 2.52    | -3.55       | - | -2.55  |  | 9     | 0.22 | 24   | 0.59    |
| 19      | 0.96 | 69   | 3.47    | -2.55       | - | -1.55  |  | 18    | 0.44 | 42   | 1.03    |
| 28      | 1.41 | 97   | 4.88    | -1.55       | - | -0.55  |  | 19    | 0.47 | 61   | 1.49    |
| 31      | 1.56 | 128  | 6.45    | -0.55       | - | 0.45   |  | 29    | 0.71 | 90   | 2.20    |
| 67      | 3.37 | 195  | 9.82    | 0.45        | - | 1.45   |  | 36    | 0.88 | 126  | 3.09    |
| 60      | 3.02 | 255  | 12.84   | 1.45        | - | 2.45   |  | 50    | 1.22 | 176  | 4.31    |
| 73      | 3.68 | 328  | 16.52   | 2.45        | - | 3.45   |  | 75    | 1.84 | 251  | 6.15    |
| 84      | 4.23 | 412  | 20.75   | 3.45        | - | 4.45   |  | 92    | 2.25 | 343  | 8.40    |
| 102     | 5.14 | 514  | 25.88   | 4.45        | - | 5.45   |  | 104   | 2.55 | 447  | 10.95   |
| 142     | 7.15 | 656  | 33.03   | 5.45        | - | 6.45   |  | 151   | 3.70 | 598  | 14.65   |
| 122     | 6.14 | 778  | 39.17   | 6.45        | - | 7.45   |  | 204   | 5.00 | 802  | 19.65   |
| 165     | 8.31 | 943  | 47.48   | 7.45        | - | 8.45   |  | 248   | 6.08 | 1050 | 25.72   |
| 166     | 8.36 | 1109 | 55.84   | 8.45        | - | 9.45   |  | 264   | 6.47 | 1314 | 32.19   |
| 141     | 7.10 | 1250 | 62.94   | 9.45        | - | 10.45  |  | 288   | 7.06 | 1602 | 39.25   |
| 129     | 6.50 | 1379 | 69.44   | 10.45       | - | 11.45  |  | 287   | 7.03 | 1889 | 46.28   |
| 128     | 6.45 | 1507 | 75.88   | 11.45       | - | 12.45  |  | 303   | 7.42 | 2192 | 53.70   |
| 124     | 6.24 | 1631 | 82.12   | 12.45       | - | 13.45  |  | 304   | 7.45 | 2496 | 61.15   |
| 90      | 4.53 | 1721 | 86.66   | 13.45       | - | 14.45  |  | 301   | 7.37 | 2797 | 68.52   |
| 72      | 3.63 | 1793 | 90.28   | 14.45       | - | 15.45  |  | 255   | 6.25 | 3052 | 74.77   |
| 61      | 3.07 | 1854 | 93.35   | 15.45       | - | 16.45  |  | 251   | 6.15 | 3303 | 80.92   |
| 51      | 2.57 | 1905 | 95.92   | 16.45       | - | 17.45  |  | 205   | 5.02 | 3508 | 85.94   |
| 34      | 1.71 | 1939 | 97.63   | 17.45       | - | 18.45  |  | 168   | 4.12 | 3676 | 90.05   |
| 16      | 0.81 | 1955 | 98.44   | 18.45       | - | 19.45  |  | 126   | 3.09 | 3802 | 93.14   |
| 12      | 0.60 | 1967 | 99.04   | 19.45       | - | 20.45  |  | 105   | 2.57 | 3907 | 95.71   |
| 9       | 0.45 | 1976 | 99.50   | 20.45       | - | 21.45  |  | 56    | 1.37 | 3963 | 97.08   |
| 5       | 0.25 | 1981 | 99.75   | 21.45       | - | 22.45  |  | 55    | 1.35 | 4018 | 98.43   |
| 2       | 0.10 | 1983 | 99.85   | 22.45       | - | 23.45  |  | 25    | 0.61 | 4043 | 99.04   |
| 1       | 0.05 | 1984 | 99.90   | 23.45       | - | 24.45  |  | 10    | 0.24 | 4053 | 99.29   |
| 1       | 0.05 | 1985 | 99.95   | 24.45       | - | 25.45  |  | 10    | 0.24 | 4063 | 99.53   |
| 1       | 0.05 | 1986 | 100.00  | 25.45       | - | 26.45  |  | 9     | 0.22 | 4072 | 99.76   |
|         |      |      |         | 26.45       | - | 27.45  |  | 3     | 0.07 | 4075 | 99.83   |
|         |      |      |         | 27.45       | - | 28.45  |  | 1     | 0.02 | 4076 | 99.85   |
|         |      |      |         | 28.45       | - | 29.45  |  | 2     | 0.05 | 4078 | 99.90   |
|         |      |      |         | 29.45       | - | 30.45  |  | 1     | 0.02 | 4079 | 99.93   |
|         |      |      |         | 30.45       | - | 31.45  |  | 2     | 0.05 | 4081 | 99.98   |
|         |      |      |         | 31.45       | - | 32.45  |  | 1     | 0.02 | 4082 | 100.00  |

## (D10) CLAVICLE LINK

The distance between the midline of the body and the acromion right landmark is calculated as one-half of BIACROMIAL BREADTH.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 16.10       | 6.34 | 1ST  | 18.60 | 7.32 |
| 16.50       | 6.50 | 2ND  | 18.90 | 7.44 |
| 16.60       | 6.54 | 3RD  | 19.00 | 7.48 |
| 16.80       | 6.61 | 5TH  | 19.20 | 7.56 |
| 17.10       | 6.73 | 10TH | 19.60 | 7.72 |
| 17.40       | 6.85 | 15TH | 19.80 | 7.80 |
| 17.50       | 6.89 | 20TH | 20.00 | 7.87 |
| 17.70       | 6.97 | 25TH | 20.20 | 7.95 |
| 17.80       | 7.01 | 30TH | 20.30 | 7.99 |
| 18.00       | 7.09 | 35TH | 20.40 | 8.03 |
| 18.10       | 7.13 | 40TH | 20.60 | 8.11 |
| 18.20       | 7.17 | 45TH | 20.70 | 8.15 |
| 18.30       | 7.20 | 50TH | 20.80 | 8.19 |
| 18.40       | 7.24 | 55TH | 20.90 | 8.23 |
| 18.50       | 7.28 | 60TH | 21.00 | 8.27 |
| 18.60       | 7.32 | 65TH | 21.10 | 8.31 |
| 18.80       | 7.40 | 70TH | 21.30 | 8.39 |
| 18.90       | 7.44 | 75TH | 21.40 | 8.43 |
| 19.00       | 7.48 | 80TH | 21.60 | 8.50 |
| 19.20       | 7.56 | 85TH | 21.80 | 8.58 |
| 19.50       | 7.68 | 90TH | 22.10 | 8.70 |
| 19.80       | 7.80 | 95TH | 22.40 | 8.82 |
| 20.00       | 7.87 | 97TH | 22.70 | 8.94 |
| 20.20       | 7.95 | 98TH | 22.90 | 9.02 |
| 20.30       | 7.99 | 99TH | 23.20 | 9.13 |

## (D10) CLAVICLE LINK

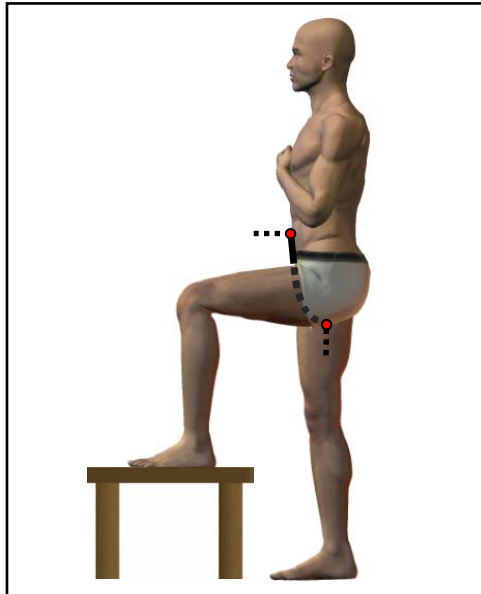
| FEMALES                  |                      |           |
|--------------------------|----------------------|-----------|
| <u>CM</u>                |                      | <u>IN</u> |
| 18.29                    | MEAN                 | 7.20      |
| 0.02                     | STD. ERROR (MEAN)    | 0.01      |
| 0.91                     | STANDARD DEVIATION   | 0.36      |
| 0.01                     | STD. ERROR (STD.DEV) | 0.01      |
| 14.20                    | MINIMUM              | 5.59      |
| 21.10                    | MAXIMUM              | 8.31      |
| SKEWNESS                 |                      | -0.05     |
| KURTOSIS                 |                      | 3.14      |
| COEFFICIENT OF VARIATION |                      | 5.0%      |
| NUMBER OF PARTICIPANTS   |                      | 1986      |

| MALES                    |                      |           |
|--------------------------|----------------------|-----------|
| <u>CM</u>                |                      | <u>IN</u> |
| 20.81                    | MEAN                 | 8.19      |
| 0.02                     | STD. ERROR (MEAN)    | 0.01      |
| 0.96                     | STANDARD DEVIATION   | 0.38      |
| 0.01                     | STD. ERROR (STD.DEV) | 0.00      |
| 16.90                    | MINIMUM              | 6.65      |
| 24.50                    | MAXIMUM              | 9.65      |
| SKEWNESS                 |                      | 0.08      |
| KURTOSIS                 |                      | 3.29      |
| COEFFICIENT OF VARIATION |                      | 4.6%      |
| NUMBER OF PARTICIPANTS   |                      | 4082      |

| FEMALES |      |      |         | FREQUENCIES |    |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|----|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct |             | CM |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 14.15       | -  | 14.35 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 14.35       | -  | 14.55 |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 14.55       | -  | 14.75 |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 14.75       | -  | 14.95 |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 14.95       | -  | 15.15 |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 15.15       | -  | 15.35 |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 15.35       | -  | 15.55 |  |       |      |      |         |
| 4       | 0.20 | 6    | 0.30    | 15.55       | -  | 15.75 |  |       |      |      |         |
| 7       | 0.35 | 13   | 0.65    | 15.75       | -  | 15.95 |  |       |      |      |         |
| 10      | 0.50 | 23   | 1.16    | 15.95       | -  | 16.15 |  |       |      |      |         |
| 7       | 0.35 | 30   | 1.51    | 16.15       | -  | 16.35 |  |       |      |      |         |
| 24      | 1.21 | 54   | 2.72    | 16.35       | -  | 16.55 |  |       |      |      |         |
| 39      | 1.96 | 93   | 4.68    | 16.55       | -  | 16.75 |  |       |      |      |         |
| 52      | 2.62 | 145  | 7.30    | 16.75       | -  | 16.95 |  | 1     | 0.02 | 1    | 0.02    |
| 63      | 3.17 | 208  | 10.47   | 16.95       | -  | 17.15 |  | 0     | 0.00 | 1    | 0.02    |
| 88      | 4.43 | 296  | 14.90   | 17.15       | -  | 17.35 |  | 1     | 0.02 | 2    | 0.05    |
| 104     | 5.24 | 400  | 20.14   | 17.35       | -  | 17.55 |  | 1     | 0.02 | 3    | 0.07    |
| 150     | 7.55 | 550  | 27.69   | 17.55       | -  | 17.75 |  | 2     | 0.05 | 5    | 0.12    |
| 145     | 7.30 | 695  | 34.99   | 17.75       | -  | 17.95 |  | 4     | 0.10 | 9    | 0.22    |
| 178     | 8.96 | 873  | 43.96   | 17.95       | -  | 18.15 |  | 3     | 0.07 | 12   | 0.29    |
| 181     | 9.11 | 1054 | 53.07   | 18.15       | -  | 18.35 |  | 11    | 0.27 | 23   | 0.56    |
| 168     | 8.46 | 1222 | 61.53   | 18.35       | -  | 18.55 |  | 16    | 0.39 | 39   | 0.96    |
| 142     | 7.15 | 1364 | 68.68   | 18.55       | -  | 18.75 |  | 25    | 0.61 | 64   | 1.57    |
| 169     | 8.51 | 1533 | 77.19   | 18.75       | -  | 18.95 |  | 38    | 0.93 | 102  | 2.50    |
| 104     | 5.24 | 1637 | 82.43   | 18.95       | -  | 19.15 |  | 73    | 1.79 | 175  | 4.29    |
| 97      | 4.88 | 1734 | 87.31   | 19.15       | -  | 19.35 |  | 78    | 1.91 | 253  | 6.20    |
| 84      | 4.23 | 1818 | 91.54   | 19.35       | -  | 19.55 |  | 99    | 2.43 | 352  | 8.62    |
| 56      | 2.82 | 1874 | 94.36   | 19.55       | -  | 19.75 |  | 162   | 3.97 | 514  | 12.59   |
| 41      | 2.06 | 1915 | 96.42   | 19.75       | -  | 19.95 |  | 207   | 5.07 | 721  | 17.66   |
| 28      | 1.41 | 1943 | 97.83   | 19.95       | -  | 20.15 |  | 257   | 6.30 | 978  | 23.96   |
| 24      | 1.21 | 1967 | 99.04   | 20.15       | -  | 20.35 |  | 288   | 7.06 | 1266 | 31.01   |
| 5       | 0.25 | 1972 | 99.30   | 20.35       | -  | 20.55 |  | 332   | 8.13 | 1598 | 39.15   |
| 7       | 0.35 | 1979 | 99.65   | 20.55       | -  | 20.75 |  | 369   | 9.04 | 1967 | 48.19   |
| 3       | 0.15 | 1982 | 99.80   | 20.75       | -  | 20.95 |  | 377   | 9.24 | 2344 | 57.42   |
| 4       | 0.20 | 1986 | 100.00  | 20.95       | -  | 21.15 |  | 317   | 7.77 | 2661 | 65.19   |
|         |      |      |         | 21.15       | -  | 21.35 |  | 303   | 7.42 | 2964 | 72.61   |
|         |      |      |         | 21.35       | -  | 21.55 |  | 283   | 6.93 | 3247 | 79.54   |
|         |      |      |         | 21.55       | -  | 21.75 |  | 182   | 4.46 | 3429 | 84.00   |
|         |      |      |         | 21.75       | -  | 21.95 |  | 167   | 4.09 | 3596 | 88.09   |
|         |      |      |         | 21.95       | -  | 22.15 |  | 135   | 3.31 | 3731 | 91.40   |
|         |      |      |         | 22.15       | -  | 22.35 |  | 122   | 2.99 | 3853 | 94.39   |
|         |      |      |         | 22.35       | -  | 22.55 |  | 85    | 2.08 | 3938 | 96.47   |
|         |      |      |         | 22.55       | -  | 22.75 |  | 50    | 1.22 | 3988 | 97.70   |
|         |      |      |         | 22.75       | -  | 22.95 |  | 25    | 0.61 | 4013 | 98.31   |
|         |      |      |         | 22.95       | -  | 23.15 |  | 27    | 0.66 | 4040 | 98.97   |
|         |      |      |         | 23.15       | -  | 23.35 |  | 16    | 0.39 | 4056 | 99.36   |
|         |      |      |         | 23.35       | -  | 23.55 |  | 10    | 0.24 | 4066 | 99.61   |
|         |      |      |         | 23.55       | -  | 23.75 |  | 6     | 0.15 | 4072 | 99.76   |
|         |      |      |         | 23.75       | -  | 23.95 |  | 6     | 0.15 | 4078 | 99.90   |
|         |      |      |         | 23.95       | -  | 24.15 |  | 1     | 0.02 | 4079 | 99.93   |
|         |      |      |         | 24.15       | -  | 24.35 |  | 2     | 0.05 | 4081 | 99.98   |
|         |      |      |         | 24.35       | -  | 24.55 |  | 1     | 0.02 | 4082 | 100.00  |

## (D11) CROTCH LENGTH, ANTERIOR (OMPHALION)

The surface distance between the inner thigh landmark and the abdomen at the level of the waist at the navel (omphalion) of a participant standing with one leg on a step is calculated as follows: CROTCH LENGTH (OMPHALION) minus CROTCH LENGTH, POSTERIOR (OMPHALION).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 21.00       | 8.27  | 1ST  | 19.20 | 7.56  |
| 21.90       | 8.62  | 2ND  | 20.00 | 7.87  |
| 22.40       | 8.82  | 3RD  | 20.40 | 8.03  |
| 23.10       | 9.09  | 5TH  | 21.10 | 8.31  |
| 24.10       | 9.49  | 10TH | 22.30 | 8.78  |
| 25.00       | 9.84  | 15TH | 23.00 | 9.06  |
| 25.40       | 10.00 | 20TH | 23.60 | 9.29  |
| 25.90       | 10.20 | 25TH | 24.20 | 9.53  |
| 26.30       | 10.35 | 30TH | 24.70 | 9.72  |
| 26.80       | 10.55 | 35TH | 25.20 | 9.92  |
| 27.10       | 10.67 | 40TH | 25.60 | 10.08 |
| 27.50       | 10.83 | 45TH | 26.00 | 10.24 |
| 27.90       | 10.98 | 50TH | 26.50 | 10.43 |
| 28.30       | 11.14 | 55TH | 27.00 | 10.63 |
| 28.60       | 11.26 | 60TH | 27.40 | 10.79 |
| 29.00       | 11.42 | 65TH | 27.80 | 10.94 |
| 29.50       | 11.61 | 70TH | 28.40 | 11.18 |
| 29.90       | 11.77 | 75TH | 29.00 | 11.42 |
| 30.40       | 11.97 | 80TH | 29.60 | 11.65 |
| 31.00       | 12.20 | 85TH | 30.30 | 11.93 |
| 31.70       | 12.48 | 90TH | 31.20 | 12.28 |
| 32.80       | 12.91 | 95TH | 32.70 | 12.87 |
| 33.40       | 13.15 | 97TH | 33.50 | 13.19 |
| 33.80       | 13.31 | 98TH | 34.10 | 13.43 |
| 34.80       | 13.70 | 99TH | 35.20 | 13.86 |

## (D11) CROTCH LENGTH, ANTERIOR (OMPHALION)

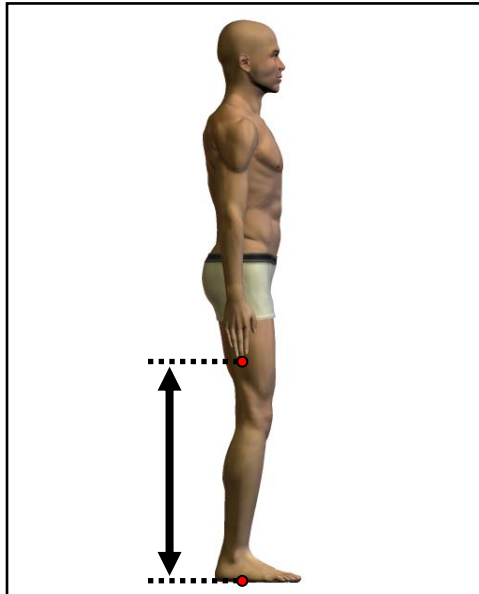
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 27.90                    | MEAN                 | 10.98 |
| 0.07                     | STD. ERROR (MEAN)    | 0.03  |
| 2.95                     | STANDARD DEVIATION   | 1.16  |
| 0.05                     | STD. ERROR (STD.DEV) | 0.02  |
| 16.50                    | MINIMUM              | 6.50  |
| 39.20                    | MAXIMUM              | 15.43 |
| SKEWNESS                 |                      | 0.01  |
| KURTOSIS                 |                      | 3.07  |
| COEFFICIENT OF VARIATION |                      | 10.6% |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 26.64                    | MEAN                 | 10.49 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 3.50                     | STANDARD DEVIATION   | 1.38  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 14.20                    | MINIMUM              | 5.59  |
| 40.00                    | MAXIMUM              | 15.75 |
| SKEWNESS                 |                      | 0.20  |
| KURTOSIS                 |                      | 2.94  |
| COEFFICIENT OF VARIATION |                      | 13.1% |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
|         |      |      |         | 13.75       | - | 14.25 |  | 1     | 0.02 | 1    | 0.02    |
|         |      |      |         | 14.25       | - | 14.75 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 14.75       | - | 15.25 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 15.25       | - | 15.75 |  | 0     | 0.00 | 1    | 0.02    |
|         |      |      |         | 15.75       | - | 16.25 |  | 1     | 0.02 | 2    | 0.05    |
|         |      |      |         | 16.25       | - | 16.75 |  | 1     | 0.02 | 3    | 0.07    |
|         |      |      |         | 16.75       | - | 17.25 |  | 4     | 0.10 | 7    | 0.17    |
|         |      |      |         | 17.25       | - | 17.75 |  | 2     | 0.05 | 9    | 0.22    |
|         |      |      |         | 17.75       | - | 18.25 |  | 8     | 0.20 | 17   | 0.42    |
|         |      |      |         | 18.25       | - | 18.75 |  | 13    | 0.32 | 30   | 0.73    |
|         |      |      |         | 18.75       | - | 19.25 |  | 12    | 0.29 | 42   | 1.03    |
|         |      |      |         | 19.25       | - | 19.75 |  | 24    | 0.59 | 66   | 1.62    |
|         |      |      |         | 19.75       | - | 20.25 |  | 42    | 1.03 | 108  | 2.65    |
|         |      |      |         | 20.25       | - | 20.75 |  | 55    | 1.35 | 163  | 3.99    |
|         |      |      |         | 20.75       | - | 21.25 |  | 63    | 1.54 | 226  | 5.54    |
|         |      |      |         | 21.25       | - | 21.75 |  | 76    | 1.86 | 302  | 7.40    |
|         |      |      |         | 21.75       | - | 22.25 |  | 102   | 2.50 | 404  | 9.90    |
|         |      |      |         | 22.25       | - | 22.75 |  | 141   | 3.45 | 545  | 13.35   |
|         |      |      |         | 22.75       | - | 23.25 |  | 144   | 3.53 | 689  | 16.88   |
|         |      |      |         | 23.25       | - | 23.75 |  | 172   | 4.21 | 861  | 21.09   |
|         |      |      |         | 23.75       | - | 24.25 |  | 170   | 4.16 | 1031 | 25.26   |
|         |      |      |         | 24.25       | - | 24.75 |  | 207   | 5.07 | 1238 | 30.33   |
|         |      |      |         | 24.75       | - | 25.25 |  | 213   | 5.22 | 1451 | 35.55   |
|         |      |      |         | 25.25       | - | 25.75 |  | 241   | 5.90 | 1692 | 41.45   |
|         |      |      |         | 25.75       | - | 26.25 |  | 236   | 5.78 | 1928 | 47.23   |
|         |      |      |         | 26.25       | - | 26.75 |  | 218   | 5.34 | 2146 | 52.57   |
|         |      |      |         | 26.75       | - | 27.25 |  | 253   | 6.20 | 2399 | 58.77   |
|         |      |      |         | 27.25       | - | 27.75 |  | 222   | 5.44 | 2621 | 64.21   |
|         |      |      |         | 27.75       | - | 28.25 |  | 170   | 4.16 | 2791 | 68.37   |
|         |      |      |         | 28.25       | - | 28.75 |  | 188   | 4.61 | 2979 | 72.98   |
|         |      |      |         | 28.75       | - | 29.25 |  | 179   | 4.39 | 3158 | 77.36   |
|         |      |      |         | 29.25       | - | 29.75 |  | 159   | 3.90 | 3317 | 81.26   |
|         |      |      |         | 29.75       | - | 30.25 |  | 143   | 3.50 | 3460 | 84.76   |
|         |      |      |         | 30.25       | - | 30.75 |  | 120   | 2.94 | 3580 | 87.70   |
|         |      |      |         | 30.75       | - | 31.25 |  | 105   | 2.57 | 3685 | 90.27   |
|         |      |      |         | 31.25       | - | 31.75 |  | 69    | 1.69 | 3754 | 91.96   |
|         |      |      |         | 31.75       | - | 32.25 |  | 62    | 1.52 | 3816 | 93.48   |
|         |      |      |         | 32.25       | - | 32.75 |  | 69    | 1.69 | 3885 | 95.17   |
|         |      |      |         | 32.75       | - | 33.25 |  | 49    | 1.20 | 3934 | 96.37   |
|         |      |      |         | 33.25       | - | 33.75 |  | 42    | 1.03 | 3976 | 97.40   |
|         |      |      |         | 33.75       | - | 34.25 |  | 34    | 0.83 | 4010 | 98.24   |
|         |      |      |         | 34.25       | - | 34.75 |  | 14    | 0.34 | 4024 | 98.58   |
|         |      |      |         | 34.75       | - | 35.25 |  | 18    | 0.44 | 4042 | 99.02   |
|         |      |      |         | 35.25       | - | 35.75 |  | 14    | 0.34 | 4056 | 99.36   |
|         |      |      |         | 35.75       | - | 36.25 |  | 10    | 0.24 | 4066 | 99.61   |
|         |      |      |         | 36.25       | - | 36.75 |  | 5     | 0.12 | 4071 | 99.73   |
|         |      |      |         | 36.75       | - | 37.25 |  | 3     | 0.07 | 4074 | 99.80   |
|         |      |      |         | 37.25       | - | 37.75 |  | 3     | 0.07 | 4077 | 99.88   |
|         |      |      |         | 37.75       | - | 38.25 |  | 2     | 0.05 | 4079 | 99.93   |
|         |      |      |         | 38.25       | - | 38.75 |  | 0     | 0.00 | 4079 | 99.93   |
|         |      |      |         | 38.75       | - | 39.25 |  | 2     | 0.05 | 4081 | 99.98   |
|         |      |      |         | 39.25       | - | 39.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 39.75       | - | 40.25 |  | 1     | 0.02 | 4082 | 100.00  |

## (D12) DACTYLION HEIGHT

The vertical distance between a standing surface and the dactylon III landmark of a participant standing erect with the arms and hands straight at the sides is calculated as follows: WRIST HEIGHT minus HAND LENGTH.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 53.40       | 21.02 | 1ST  | 57.10 | 22.48 |
| 54.40       | 21.42 | 2ND  | 58.00 | 22.83 |
| 54.90       | 21.61 | 3RD  | 58.30 | 22.95 |
| 55.60       | 21.89 | 5TH  | 59.30 | 23.35 |
| 56.80       | 22.36 | 10TH | 60.70 | 23.90 |
| 57.70       | 22.72 | 15TH | 61.60 | 24.25 |
| 58.40       | 22.99 | 20TH | 62.30 | 24.53 |
| 59.00       | 23.23 | 25TH | 62.90 | 24.76 |
| 59.50       | 23.43 | 30TH | 63.40 | 24.96 |
| 60.00       | 23.62 | 35TH | 64.00 | 25.20 |
| 60.50       | 23.82 | 40TH | 64.40 | 25.35 |
| 60.90       | 23.98 | 45TH | 64.90 | 25.55 |
| 61.30       | 24.13 | 50TH | 65.40 | 25.75 |
| 61.70       | 24.29 | 55TH | 65.90 | 25.94 |
| 62.10       | 24.45 | 60TH | 66.30 | 26.10 |
| 62.60       | 24.65 | 65TH | 66.80 | 26.30 |
| 63.10       | 24.84 | 70TH | 67.40 | 26.54 |
| 63.60       | 25.04 | 75TH | 67.90 | 26.73 |
| 64.10       | 25.24 | 80TH | 68.60 | 27.01 |
| 64.80       | 25.51 | 85TH | 69.30 | 27.28 |
| 65.60       | 25.83 | 90TH | 70.30 | 27.68 |
| 67.20       | 26.46 | 95TH | 71.70 | 28.23 |
| 67.90       | 26.73 | 97TH | 72.50 | 28.54 |
| 68.60       | 27.01 | 98TH | 73.10 | 28.78 |
| 70.30       | 27.68 | 99TH | 74.20 | 29.21 |

## (D12) DACTYLION HEIGHT

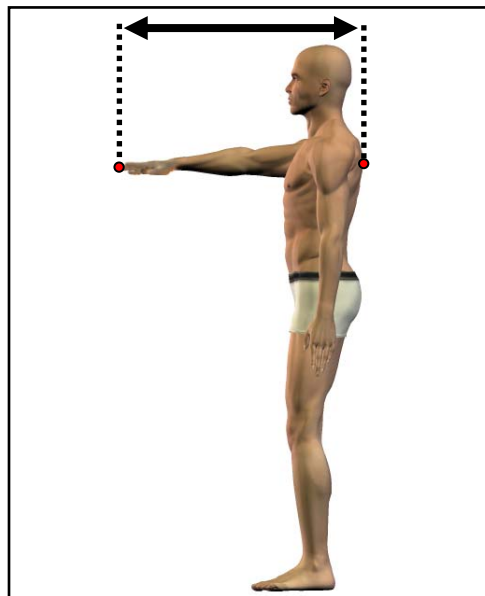
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 61.31                    | MEAN                 | 24.14 |
| 0.08                     | STD. ERROR (MEAN)    | 0.03  |
| 3.48                     | STANDARD DEVIATION   | 1.37  |
| 0.06                     | STD. ERROR (STD.DEV) | 0.02  |
| 50.00                    | MINIMUM              | 19.69 |
| 75.30                    | MAXIMUM              | 29.65 |
| SKEWNESS                 |                      | 0.12  |
| KURTOSIS                 |                      | 3.19  |
| COEFFICIENT OF VARIATION |                      | 5.7%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 65.42                    | MEAN                 | 25.76 |
| 0.06                     | STD. ERROR (MEAN)    | 0.02  |
| 3.74                     | STANDARD DEVIATION   | 1.47  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 53.00                    | MINIMUM              | 20.87 |
| 79.60                    | MAXIMUM              | 31.34 |
| SKEWNESS                 |                      | 0.10  |
| KURTOSIS                 |                      | 3.01  |
| COEFFICIENT OF VARIATION |                      | 5.7%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10 | 2    | 0.10    | 49.75       | - | 50.50 |  |       |      |      |         |
| 0       | 0.00 | 2    | 0.10    | 50.50       | - | 51.25 |  |       |      |      |         |
| 2       | 0.10 | 4    | 0.20    | 51.25       | - | 52.00 |  |       |      |      |         |
| 8       | 0.40 | 12   | 0.60    | 52.00       | - | 52.75 |  |       |      |      |         |
| 8       | 0.40 | 20   | 1.01    | 52.75       | - | 53.50 |  | 1     | 0.02 | 1    | 0.02    |
| 17      | 0.86 | 37   | 1.86    | 53.50       | - | 54.25 |  | 2     | 0.05 | 3    | 0.07    |
| 24      | 1.21 | 61   | 3.07    | 54.25       | - | 55.00 |  | 2     | 0.05 | 5    | 0.12    |
| 48      | 2.42 | 109  | 5.49    | 55.00       | - | 55.75 |  | 9     | 0.22 | 14   | 0.34    |
| 59      | 2.97 | 168  | 8.46    | 55.75       | - | 56.50 |  | 13    | 0.32 | 27   | 0.66    |
| 81      | 4.08 | 249  | 12.54   | 56.50       | - | 57.25 |  | 17    | 0.42 | 44   | 1.08    |
| 85      | 4.28 | 334  | 16.82   | 57.25       | - | 58.00 |  | 35    | 0.86 | 79   | 1.94    |
| 121     | 6.09 | 455  | 22.91   | 58.00       | - | 58.75 |  | 81    | 1.98 | 160  | 3.92    |
| 134     | 6.75 | 589  | 29.66   | 58.75       | - | 59.50 |  | 64    | 1.57 | 224  | 5.49    |
| 162     | 8.16 | 751  | 37.81   | 59.50       | - | 60.25 |  | 114   | 2.79 | 338  | 8.28    |
| 150     | 7.55 | 901  | 45.37   | 60.25       | - | 61.00 |  | 131   | 3.21 | 469  | 11.49   |
| 193     | 9.72 | 1094 | 55.09   | 61.00       | - | 61.75 |  | 189   | 4.63 | 658  | 16.12   |
| 175     | 8.81 | 1269 | 63.90   | 61.75       | - | 62.50 |  | 229   | 5.61 | 887  | 21.73   |
| 150     | 7.55 | 1419 | 71.45   | 62.50       | - | 63.25 |  | 266   | 6.52 | 1153 | 28.25   |
| 142     | 7.15 | 1561 | 78.60   | 63.25       | - | 64.00 |  | 268   | 6.57 | 1421 | 34.81   |
| 121     | 6.09 | 1682 | 84.69   | 64.00       | - | 64.75 |  | 343   | 8.40 | 1764 | 43.21   |
| 90      | 4.53 | 1772 | 89.22   | 64.75       | - | 65.50 |  | 317   | 7.77 | 2081 | 50.98   |
| 62      | 3.12 | 1834 | 92.35   | 65.50       | - | 66.25 |  | 354   | 8.67 | 2435 | 59.65   |
| 37      | 1.86 | 1871 | 94.21   | 66.25       | - | 67.00 |  | 257   | 6.30 | 2692 | 65.95   |
| 45      | 2.27 | 1916 | 96.48   | 67.00       | - | 67.75 |  | 317   | 7.77 | 3009 | 73.71   |
| 28      | 1.41 | 1944 | 97.89   | 67.75       | - | 68.50 |  | 226   | 5.54 | 3235 | 79.25   |
| 15      | 0.76 | 1959 | 98.64   | 68.50       | - | 69.25 |  | 222   | 5.44 | 3457 | 84.69   |
| 4       | 0.20 | 1963 | 98.84   | 69.25       | - | 70.00 |  | 169   | 4.14 | 3626 | 88.83   |
| 9       | 0.45 | 1972 | 99.30   | 70.00       | - | 70.75 |  | 123   | 3.01 | 3749 | 91.84   |
| 6       | 0.30 | 1978 | 99.60   | 70.75       | - | 71.50 |  | 91    | 2.23 | 3840 | 94.07   |
| 4       | 0.20 | 1982 | 99.80   | 71.50       | - | 72.25 |  | 96    | 2.35 | 3936 | 96.42   |
| 2       | 0.10 | 1984 | 99.90   | 72.25       | - | 73.00 |  | 55    | 1.35 | 3991 | 97.77   |
| 1       | 0.05 | 1985 | 99.95   | 73.00       | - | 73.75 |  | 37    | 0.91 | 4028 | 98.68   |
| 0       | 0.00 | 1985 | 99.95   | 73.75       | - | 74.50 |  | 18    | 0.44 | 4046 | 99.12   |
| 0       | 0.00 | 1985 | 99.95   | 74.50       | - | 75.25 |  | 14    | 0.34 | 4060 | 99.46   |
| 1       | 0.05 | 1986 | 100.00  | 75.25       | - | 76.00 |  | 8     | 0.20 | 4068 | 99.66   |
|         |      |      |         | 76.00       | - | 76.75 |  | 6     | 0.15 | 4074 | 99.80   |
|         |      |      |         | 76.75       | - | 77.50 |  | 1     | 0.02 | 4075 | 99.83   |
|         |      |      |         | 77.50       | - | 78.25 |  | 1     | 0.02 | 4076 | 99.85   |
|         |      |      |         | 78.25       | - | 79.00 |  | 4     | 0.10 | 4080 | 99.95   |
|         |      |      |         | 79.00       | - | 79.75 |  | 2     | 0.05 | 4082 | 100.00  |

### (D13) DACTYLION REACH FROM WALL

The horizontal distance between the plane of the back and the dactylon III landmark of a participant standing erect with the back against a wall and the arm, hand, and fingers extended forward horizontally is calculated as follows: THUMB TIP REACH plus (ANSUR mean of HAND LENGTH minus ANSUR mean of WRIST-THUMB TIP LENGTH).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 71.40       | 28.11 | 1ST  | 78.50 | 30.91 |
| 72.40       | 28.50 | 2ND  | 79.50 | 31.30 |
| 73.00       | 28.74 | 3RD  | 80.10 | 31.54 |
| 73.70       | 29.02 | 5TH  | 81.10 | 31.93 |
| 75.40       | 29.69 | 10TH | 82.60 | 32.52 |
| 76.50       | 30.12 | 15TH | 83.60 | 32.91 |
| 77.20       | 30.39 | 20TH | 84.50 | 33.27 |
| 77.80       | 30.63 | 25TH | 85.10 | 33.50 |
| 78.40       | 30.87 | 30TH | 85.80 | 33.78 |
| 78.90       | 31.06 | 35TH | 86.40 | 34.02 |
| 79.40       | 31.26 | 40TH | 86.90 | 34.21 |
| 79.90       | 31.46 | 45TH | 87.50 | 34.45 |
| 80.50       | 31.69 | 50TH | 88.00 | 34.65 |
| 81.10       | 31.93 | 55TH | 88.60 | 34.88 |
| 81.60       | 32.13 | 60TH | 89.10 | 35.08 |
| 82.20       | 32.36 | 65TH | 89.60 | 35.28 |
| 82.90       | 32.64 | 70TH | 90.20 | 35.51 |
| 83.50       | 32.87 | 75TH | 90.70 | 35.71 |
| 84.30       | 33.19 | 80TH | 91.50 | 36.02 |
| 85.30       | 33.58 | 85TH | 92.50 | 36.42 |
| 86.40       | 34.02 | 90TH | 93.70 | 36.89 |
| 87.90       | 34.61 | 95TH | 95.50 | 37.60 |
| 89.00       | 35.04 | 97TH | 96.60 | 38.03 |
| 89.90       | 35.39 | 98TH | 97.90 | 38.54 |
| 91.50       | 36.02 | 99TH | 99.20 | 39.06 |

# (D13) DACTYLION REACH FROM WALL

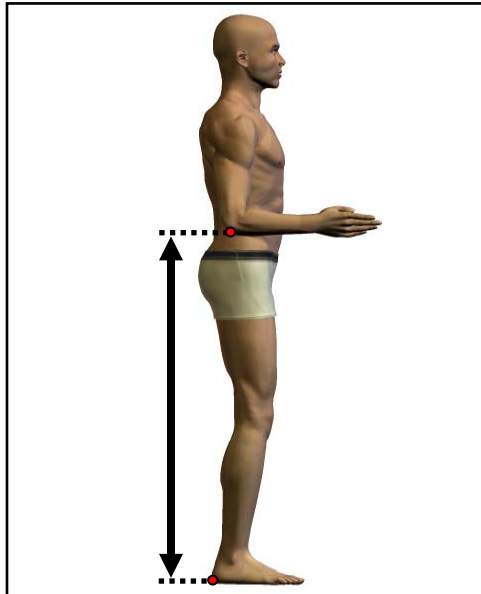
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 80.70                    | MEAN                 | 31.77 |
| 0.10                     | STD. ERROR (MEAN)    | 0.04  |
| 4.28                     | STANDARD DEVIATION   | 1.68  |
| 0.07                     | STD. ERROR (STD.DEV) | 0.03  |
| 66.50                    | MINIMUM              | 26.18 |
| 95.70                    | MAXIMUM              | 37.68 |
| SKEWNESS                 |                      | 0.17  |
| KURTOSIS                 |                      | 3.00  |
| COEFFICIENT OF VARIATION |                      | 5.3%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 88.09                    | MEAN                 | 34.68 |
| 0.07                     | STD. ERROR (MEAN)    | 0.03  |
| 4.37                     | STANDARD DEVIATION   | 1.72  |
| 0.05                     | STD. ERROR (STD.DEV) | 0.02  |
| 71.90                    | MINIMUM              | 28.31 |
| 106.70                   | MAXIMUM              | 42.01 |
| SKEWNESS                 |                      | 0.21  |
| KURTOSIS                 |                      | 3.26  |
| COEFFICIENT OF VARIATION |                      | 5.0%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   | CM     |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 65.55       | - | 66.55  |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 66.55       | - | 67.55  |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 67.55       | - | 68.55  |  |       |      |      |         |
| 2       | 0.10 | 5    | 0.25    | 68.55       | - | 69.55  |  |       |      |      |         |
| 7       | 0.35 | 12   | 0.60    | 69.55       | - | 70.55  |  |       |      |      |         |
| 14      | 0.70 | 26   | 1.31    | 70.55       | - | 71.55  |  |       |      |      |         |
| 16      | 0.81 | 42   | 2.11    | 71.55       | - | 72.55  |  | 1     | 0.02 | 1    | 0.02    |
| 48      | 2.42 | 90   | 4.53    | 72.55       | - | 73.55  |  | 0     | 0.00 | 1    | 0.02    |
| 55      | 2.77 | 145  | 7.30    | 73.55       | - | 74.55  |  | 2     | 0.05 | 3    | 0.07    |
| 64      | 3.22 | 209  | 10.52   | 74.55       | - | 75.55  |  | 4     | 0.10 | 7    | 0.17    |
| 97      | 4.88 | 306  | 15.41   | 75.55       | - | 76.55  |  | 4     | 0.10 | 11   | 0.27    |
| 147     | 7.40 | 453  | 22.81   | 76.55       | - | 77.55  |  | 8     | 0.20 | 19   | 0.47    |
| 181     | 9.11 | 634  | 31.92   | 77.55       | - | 78.55  |  | 25    | 0.61 | 44   | 1.08    |
| 187     | 9.42 | 821  | 41.34   | 78.55       | - | 79.55  |  | 38    | 0.93 | 82   | 2.01    |
| 196     | 9.87 | 1017 | 51.21   | 79.55       | - | 80.55  |  | 71    | 1.74 | 153  | 3.75    |
| 162     | 8.16 | 1179 | 59.37   | 80.55       | - | 81.55  |  | 106   | 2.60 | 259  | 6.34    |
| 169     | 8.51 | 1348 | 67.88   | 81.55       | - | 82.55  |  | 144   | 3.53 | 403  | 9.87    |
| 144     | 7.25 | 1492 | 75.13   | 82.55       | - | 83.55  |  | 201   | 4.92 | 604  | 14.80   |
| 118     | 5.94 | 1610 | 81.07   | 83.55       | - | 84.55  |  | 246   | 6.03 | 850  | 20.82   |
| 99      | 4.98 | 1709 | 86.05   | 84.55       | - | 85.55  |  | 303   | 7.42 | 1153 | 28.25   |
| 94      | 4.73 | 1803 | 90.79   | 85.55       | - | 86.55  |  | 340   | 8.33 | 1493 | 36.58   |
| 61      | 3.07 | 1864 | 93.86   | 86.55       | - | 87.55  |  | 381   | 9.33 | 1874 | 45.91   |
| 52      | 2.62 | 1916 | 96.48   | 87.55       | - | 88.55  |  | 364   | 8.92 | 2238 | 54.83   |
| 24      | 1.21 | 1940 | 97.68   | 88.55       | - | 89.55  |  | 393   | 9.63 | 2631 | 64.45   |
| 16      | 0.81 | 1956 | 98.49   | 89.55       | - | 90.55  |  | 347   | 8.50 | 2978 | 72.95   |
| 13      | 0.65 | 1969 | 99.14   | 90.55       | - | 91.55  |  | 291   | 7.13 | 3269 | 80.08   |
| 9       | 0.45 | 1978 | 99.60   | 91.55       | - | 92.55  |  | 211   | 5.17 | 3480 | 85.25   |
| 4       | 0.20 | 1982 | 99.80   | 92.55       | - | 93.55  |  | 172   | 4.21 | 3652 | 89.47   |
| 3       | 0.15 | 1985 | 99.95   | 93.55       | - | 94.55  |  | 127   | 3.11 | 3779 | 92.58   |
| 0       | 0.00 | 1985 | 99.95   | 94.55       | - | 95.55  |  | 99    | 2.43 | 3878 | 95.00   |
| 1       | 0.05 | 1986 | 100.00  | 95.55       | - | 96.55  |  | 76    | 1.86 | 3954 | 96.86   |
|         |      |      |         | 96.55       | - | 97.55  |  | 40    | 0.98 | 3994 | 97.84   |
|         |      |      |         | 97.55       | - | 98.55  |  | 36    | 0.88 | 4030 | 98.73   |
|         |      |      |         | 98.55       | - | 99.55  |  | 18    | 0.44 | 4048 | 99.17   |
|         |      |      |         | 99.55       | - | 100.55 |  | 14    | 0.34 | 4062 | 99.51   |
|         |      |      |         | 100.55      | - | 101.55 |  | 8     | 0.20 | 4070 | 99.71   |
|         |      |      |         | 101.55      | - | 102.55 |  | 4     | 0.10 | 4074 | 99.80   |
|         |      |      |         | 102.55      | - | 103.55 |  | 4     | 0.10 | 4078 | 99.90   |
|         |      |      |         | 103.55      | - | 104.55 |  | 1     | 0.02 | 4079 | 99.93   |
|         |      |      |         | 104.55      | - | 105.55 |  | 2     | 0.05 | 4081 | 99.98   |
|         |      |      |         | 105.55      | - | 106.55 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 106.55      | - | 107.55 |  | 1     | 0.02 | 4082 | 100.00  |

## (D14) ELBOW REST HEIGHT, STANDING

The vertical distance between a standing surface and the olecranon bottom landmark of a participant standing erect with the forearm and hand held horizontally is calculated as follows: ELBOW REST HEIGHT plus STATURE minus SITTING HEIGHT.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 90.30       | 35.55 | 1ST  | 97.20  | 38.27 |
| 91.20       | 35.91 | 2ND  | 98.40  | 38.74 |
| 92.20       | 36.30 | 3RD  | 99.10  | 39.02 |
| 93.20       | 36.69 | 5TH  | 100.40 | 39.53 |
| 94.80       | 37.32 | 10TH | 101.90 | 40.12 |
| 95.80       | 37.72 | 15TH | 103.10 | 40.59 |
| 96.60       | 38.03 | 20TH | 104.00 | 40.94 |
| 97.30       | 38.31 | 25TH | 104.80 | 41.26 |
| 98.00       | 38.58 | 30TH | 105.60 | 41.57 |
| 98.50       | 38.78 | 35TH | 106.30 | 41.85 |
| 99.10       | 39.02 | 40TH | 107.00 | 42.13 |
| 99.70       | 39.25 | 45TH | 107.60 | 42.36 |
| 100.20      | 39.45 | 50TH | 108.30 | 42.64 |
| 100.80      | 39.69 | 55TH | 108.90 | 42.87 |
| 101.30      | 39.88 | 60TH | 109.40 | 43.07 |
| 101.90      | 40.12 | 65TH | 110.10 | 43.35 |
| 102.60      | 40.39 | 70TH | 110.80 | 43.62 |
| 103.40      | 40.71 | 75TH | 111.60 | 43.94 |
| 104.30      | 41.06 | 80TH | 112.40 | 44.25 |
| 105.10      | 41.38 | 85TH | 113.40 | 44.65 |
| 106.20      | 41.81 | 90TH | 114.70 | 45.16 |
| 108.40      | 42.68 | 95TH | 116.70 | 45.94 |
| 109.10      | 42.95 | 97TH | 117.90 | 46.42 |
| 110.50      | 43.50 | 98TH | 119.10 | 46.89 |
| 111.60      | 43.94 | 99TH | 120.80 | 47.56 |

## (D14) ELBOW REST HEIGHT, STANDING

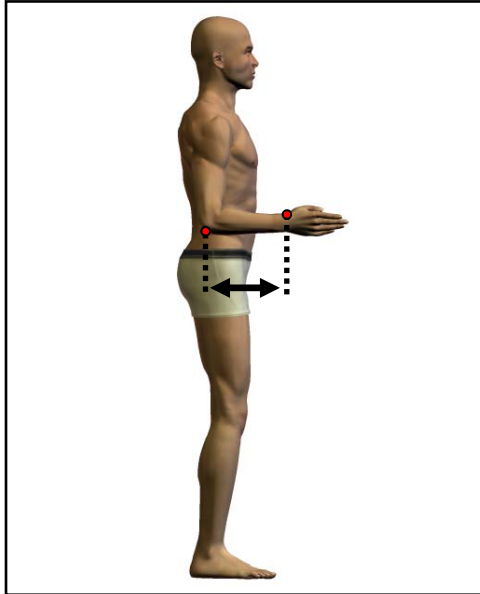
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 100.43                   | MEAN                 | 39.54 |
| 0.10                     | STD. ERROR (MEAN)    | 0.04  |
| 4.54                     | STANDARD DEVIATION   | 1.79  |
| 0.07                     | STD. ERROR (STD.DEV) | 0.03  |
| 85.30                    | MINIMUM              | 33.58 |
| 116.20                   | MAXIMUM              | 45.75 |
| SKEWNESS                 |                      | 0.17  |
| KURTOSIS                 |                      | 3.04  |
| COEFFICIENT OF VARIATION |                      | 4.5%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 108.30                   | MEAN                 | 42.64 |
| 0.08                     | STD. ERROR (MEAN)    | 0.03  |
| 5.01                     | STANDARD DEVIATION   | 1.97  |
| 0.06                     | STD. ERROR (STD.DEV) | 0.02  |
| 89.60                    | MINIMUM              | 35.28 |
| 127.60                   | MAXIMUM              | 50.24 |
| SKEWNESS                 |                      | 0.13  |
| KURTOSIS                 |                      | 3.08  |
| COEFFICIENT OF VARIATION |                      | 4.6%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   | CM     |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 84.55       | - | 85.55  |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 85.55       | - | 86.55  |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 86.55       | - | 87.55  |  |       |      |      |         |
| 3       | 0.15 | 6    | 0.30    | 87.55       | - | 88.55  |  |       |      |      |         |
| 4       | 0.20 | 10   | 0.50    | 88.55       | - | 89.55  |  |       |      |      |         |
| 14      | 0.70 | 24   | 1.21    | 89.55       | - | 90.55  |  | 1     | 0.02 | 1    | 0.02    |
| 18      | 0.91 | 42   | 2.11    | 90.55       | - | 91.55  |  | 0     | 0.00 | 1    | 0.02    |
| 29      | 1.46 | 71   | 3.58    | 91.55       | - | 92.55  |  | 1     | 0.02 | 2    | 0.05    |
| 44      | 2.22 | 115  | 5.79    | 92.55       | - | 93.55  |  | 1     | 0.02 | 3    | 0.07    |
| 65      | 3.27 | 180  | 9.06    | 93.55       | - | 94.55  |  | 5     | 0.12 | 8    | 0.20    |
| 85      | 4.28 | 265  | 13.34   | 94.55       | - | 95.55  |  | 7     | 0.17 | 15   | 0.37    |
| 122     | 6.14 | 387  | 19.49   | 95.55       | - | 96.55  |  | 15    | 0.37 | 30   | 0.73    |
| 133     | 6.70 | 520  | 26.18   | 96.55       | - | 97.55  |  | 23    | 0.56 | 53   | 1.30    |
| 176     | 8.86 | 696  | 35.05   | 97.55       | - | 98.55  |  | 37    | 0.91 | 90   | 2.20    |
| 173     | 8.71 | 869  | 43.76   | 98.55       | - | 99.55  |  | 54    | 1.32 | 144  | 3.53    |
| 177     | 8.91 | 1046 | 52.67   | 99.55       | - | 100.55 |  | 80    | 1.96 | 224  | 5.49    |
| 182     | 9.16 | 1228 | 61.83   | 100.55      | - | 101.55 |  | 124   | 3.04 | 348  | 8.53    |
| 156     | 7.85 | 1384 | 69.69   | 101.55      | - | 102.55 |  | 168   | 4.12 | 516  | 12.64   |
| 123     | 6.19 | 1507 | 75.88   | 102.55      | - | 103.55 |  | 190   | 4.65 | 706  | 17.30   |
| 115     | 5.79 | 1622 | 81.67   | 103.55      | - | 104.55 |  | 244   | 5.98 | 950  | 23.27   |
| 97      | 4.88 | 1719 | 86.56   | 104.55      | - | 105.55 |  | 261   | 6.39 | 1211 | 29.67   |
| 81      | 4.08 | 1800 | 90.63   | 105.55      | - | 106.55 |  | 297   | 7.28 | 1508 | 36.94   |
| 55      | 2.77 | 1855 | 93.40   | 106.55      | - | 107.55 |  | 299   | 7.32 | 1807 | 44.27   |
| 38      | 1.91 | 1893 | 95.32   | 107.55      | - | 108.55 |  | 321   | 7.86 | 2128 | 52.13   |
| 42      | 2.11 | 1935 | 97.43   | 108.55      | - | 109.55 |  | 359   | 8.79 | 2487 | 60.93   |
| 15      | 0.76 | 1950 | 98.19   | 109.55      | - | 110.55 |  | 283   | 6.93 | 2770 | 67.86   |
| 16      | 0.81 | 1966 | 98.99   | 110.55      | - | 111.55 |  | 282   | 6.91 | 3052 | 74.77   |
| 10      | 0.50 | 1976 | 99.50   | 111.55      | - | 112.55 |  | 237   | 5.81 | 3289 | 80.57   |
| 4       | 0.20 | 1980 | 99.70   | 112.55      | - | 113.55 |  | 203   | 4.97 | 3492 | 85.55   |
| 4       | 0.20 | 1984 | 99.90   | 113.55      | - | 114.55 |  | 158   | 3.87 | 3650 | 89.42   |
| 0       | 0.00 | 1984 | 99.90   | 114.55      | - | 115.55 |  | 129   | 3.16 | 3779 | 92.58   |
| 2       | 0.10 | 1986 | 100.00  | 115.55      | - | 116.55 |  | 81    | 1.98 | 3860 | 94.56   |
|         |      |      |         | 116.55      | - | 117.55 |  | 76    | 1.86 | 3936 | 96.42   |
|         |      |      |         | 117.55      | - | 118.55 |  | 46    | 1.13 | 3982 | 97.55   |
|         |      |      |         | 118.55      | - | 119.55 |  | 33    | 0.81 | 4015 | 98.36   |
|         |      |      |         | 119.55      | - | 120.55 |  | 21    | 0.51 | 4036 | 98.87   |
|         |      |      |         | 120.55      | - | 121.55 |  | 18    | 0.44 | 4054 | 99.31   |
|         |      |      |         | 121.55      | - | 122.55 |  | 13    | 0.32 | 4067 | 99.63   |
|         |      |      |         | 122.55      | - | 123.55 |  | 7     | 0.17 | 4074 | 99.80   |
|         |      |      |         | 123.55      | - | 124.55 |  | 3     | 0.07 | 4077 | 99.88   |
|         |      |      |         | 124.55      | - | 125.55 |  | 3     | 0.07 | 4080 | 99.95   |
|         |      |      |         | 125.55      | - | 126.55 |  | 0     | 0.00 | 4080 | 99.95   |
|         |      |      |         | 126.55      | - | 127.55 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 127.55      | - | 128.55 |  | 1     | 0.02 | 4082 | 100.00  |

## (D15) ELBOW-WRIST LENGTH

The horizontal distance between the olecranon rear landmark and the stylium landmark of a participant standing with the forearm and hand held horizontally is calculated as follows: FOREARM-HAND LENGTH minus HAND LENGTH.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 22.50       | 8.86  | 1ST  | 25.20 | 9.92  |
| 22.90       | 9.02  | 2ND  | 25.70 | 10.12 |
| 23.20       | 9.13  | 3RD  | 25.90 | 10.20 |
| 23.50       | 9.25  | 5TH  | 26.30 | 10.35 |
| 24.10       | 9.49  | 10TH | 26.70 | 10.51 |
| 24.40       | 9.61  | 15TH | 27.10 | 10.67 |
| 24.60       | 9.69  | 20TH | 27.40 | 10.79 |
| 24.80       | 9.76  | 25TH | 27.60 | 10.87 |
| 25.00       | 9.84  | 30TH | 27.90 | 10.98 |
| 25.20       | 9.92  | 35TH | 28.10 | 11.06 |
| 25.40       | 10.00 | 40TH | 28.30 | 11.14 |
| 25.50       | 10.04 | 45TH | 28.40 | 11.18 |
| 25.80       | 10.16 | 50TH | 28.70 | 11.30 |
| 26.00       | 10.24 | 55TH | 28.90 | 11.38 |
| 26.20       | 10.31 | 60TH | 29.10 | 11.46 |
| 26.40       | 10.39 | 65TH | 29.30 | 11.54 |
| 26.60       | 10.47 | 70TH | 29.50 | 11.61 |
| 26.90       | 10.59 | 75TH | 29.70 | 11.69 |
| 27.20       | 10.71 | 80TH | 29.90 | 11.77 |
| 27.50       | 10.83 | 85TH | 30.30 | 11.93 |
| 27.90       | 10.98 | 90TH | 30.70 | 12.09 |
| 28.50       | 11.22 | 95TH | 31.40 | 12.36 |
| 29.00       | 11.42 | 97TH | 31.70 | 12.48 |
| 29.30       | 11.54 | 98TH | 32.00 | 12.60 |
| 29.80       | 11.73 | 99TH | 32.70 | 12.87 |

## (D15) ELBOW-WRIST LENGTH

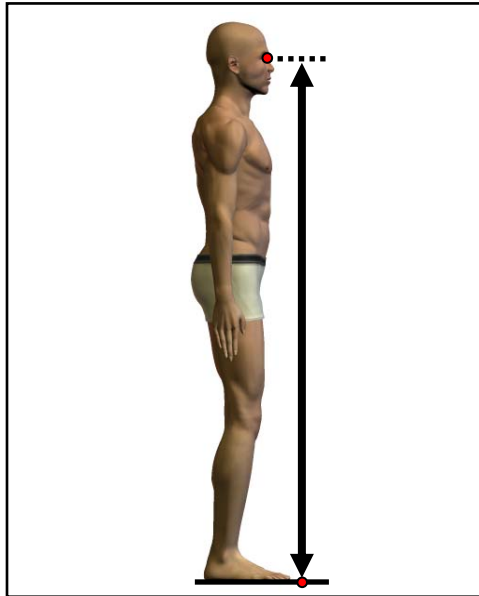
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 25.88                    | MEAN                 | 10.19 |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 1.54                     | STANDARD DEVIATION   | 0.61  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 18.70                    | MINIMUM              | 7.36  |
| 31.00                    | MAXIMUM              | 12.20 |
| SKEWNESS                 |                      | 0.22  |
| KURTOSIS                 |                      | 3.28  |
| COEFFICIENT OF VARIATION |                      | 6.0%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 28.69                    | MEAN                 | 11.30 |
| 0.02                     | STD. ERROR (MEAN)    | 0.01  |
| 1.56                     | STANDARD DEVIATION   | 0.61  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 23.50                    | MINIMUM              | 9.25  |
| 35.50                    | MAXIMUM              | 13.98 |
| SKEWNESS                 |                      | 0.20  |
| KURTOSIS                 |                      | 3.17  |
| COEFFICIENT OF VARIATION |                      | 5.4%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |    |       |     | MALES |      |        |         |
|---------|-------|------|---------|-------------|----|-------|-----|-------|------|--------|---------|
| F       | FPct  | CumF | CumFPct |             | CM |       |     | F     | FPct | CumF   | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 18.55       | -  | 18.90 |     |       |      |        |         |
| 0       | 0.00  | 1    | 0.05    | 18.90       | -  | 19.25 |     |       |      |        |         |
| 0       | 0.00  | 1    | 0.05    | 19.25       | -  | 19.60 |     |       |      |        |         |
| 0       | 0.00  | 1    | 0.05    | 19.60       | -  | 19.95 |     |       |      |        |         |
| 0       | 0.00  | 1    | 0.05    | 19.95       | -  | 20.30 |     |       |      |        |         |
| 0       | 0.00  | 1    | 0.05    | 20.30       | -  | 20.65 |     |       |      |        |         |
| 0       | 0.00  | 1    | 0.05    | 20.65       | -  | 21.00 |     |       |      |        |         |
| 1       | 0.05  | 2    | 0.10    | 21.00       | -  | 21.35 |     |       |      |        |         |
| 2       | 0.10  | 4    | 0.20    | 21.35       | -  | 21.70 |     |       |      |        |         |
| 7       | 0.35  | 11   | 0.55    | 21.70       | -  | 22.05 |     |       |      |        |         |
| 6       | 0.30  | 17   | 0.86    | 22.05       | -  | 22.40 |     |       |      |        |         |
| 18      | 0.91  | 35   | 1.76    | 22.40       | -  | 22.75 |     |       |      |        |         |
| 13      | 0.65  | 48   | 2.42    | 22.75       | -  | 23.10 |     |       |      |        |         |
| 41      | 2.06  | 89   | 4.48    | 23.10       | -  | 23.45 |     |       |      |        |         |
| 49      | 2.47  | 138  | 6.95    | 23.45       | -  | 23.80 | 1   | 0.02  | 1    | 0.02   |         |
| 91      | 4.58  | 229  | 11.53   | 23.80       | -  | 24.15 | 3   | 0.07  | 4    | 0.10   |         |
| 100     | 5.04  | 329  | 16.57   | 24.15       | -  | 24.50 | 2   | 0.05  | 6    | 0.15   |         |
| 174     | 8.76  | 503  | 25.33   | 24.50       | -  | 24.85 | 11  | 0.27  | 17   | 0.42   |         |
| 166     | 8.36  | 669  | 33.69   | 24.85       | -  | 25.20 | 18  | 0.44  | 35   | 0.86   |         |
| 225     | 11.33 | 894  | 45.02   | 25.20       | -  | 25.55 | 36  | 0.88  | 71   | 1.74   |         |
| 144     | 7.25  | 1038 | 52.27   | 25.55       | -  | 25.90 | 38  | 0.93  | 109  | 2.67   |         |
| 180     | 9.06  | 1218 | 61.33   | 25.90       | -  | 26.25 | 93  | 2.28  | 202  | 4.95   |         |
| 139     | 7.00  | 1357 | 68.33   | 26.25       | -  | 26.60 | 108 | 2.65  | 310  | 7.59   |         |
| 171     | 8.61  | 1528 | 76.94   | 26.60       | -  | 26.95 | 226 | 5.54  | 536  | 13.13  |         |
| 94      | 4.73  | 1622 | 81.67   | 26.95       | -  | 27.30 | 203 | 4.97  | 739  | 18.10  |         |
| 107     | 5.39  | 1729 | 87.06   | 27.30       | -  | 27.65 | 296 | 7.25  | 1035 | 25.36  |         |
| 59      | 2.97  | 1788 | 90.03   | 27.65       | -  | 28.00 | 281 | 6.88  | 1316 | 32.24  |         |
| 68      | 3.42  | 1856 | 93.45   | 28.00       | -  | 28.35 | 412 | 10.09 | 1728 | 42.33  |         |
| 43      | 2.17  | 1899 | 95.62   | 28.35       | -  | 28.70 | 293 | 7.18  | 2021 | 49.51  |         |
| 36      | 1.81  | 1935 | 97.43   | 28.70       | -  | 29.05 | 420 | 10.29 | 2441 | 59.80  |         |
| 18      | 0.91  | 1953 | 98.34   | 29.05       | -  | 29.40 | 303 | 7.42  | 2744 | 67.22  |         |
| 12      | 0.60  | 1965 | 98.94   | 29.40       | -  | 29.75 | 375 | 9.19  | 3119 | 76.41  |         |
| 7       | 0.35  | 1972 | 99.30   | 29.75       | -  | 30.10 | 227 | 5.56  | 3346 | 81.97  |         |
| 7       | 0.35  | 1979 | 99.65   | 30.10       | -  | 30.45 | 218 | 5.34  | 3564 | 87.31  |         |
| 3       | 0.15  | 1982 | 99.80   | 30.45       | -  | 30.80 | 132 | 3.23  | 3696 | 90.54  |         |
| 4       | 0.20  | 1986 | 100.00  | 30.80       | -  | 31.15 | 128 | 3.14  | 3824 | 93.68  |         |
|         |       |      |         | 31.15       | -  | 31.50 | 73  | 1.79  | 3897 | 95.47  |         |
|         |       |      |         | 31.50       | -  | 31.85 | 83  | 2.03  | 3980 | 97.50  |         |
|         |       |      |         | 31.85       | -  | 32.20 | 31  | 0.76  | 4011 | 98.26  |         |
|         |       |      |         | 32.20       | -  | 32.55 | 23  | 0.56  | 4034 | 98.82  |         |
|         |       |      |         | 32.55       | -  | 32.90 | 17  | 0.42  | 4051 | 99.24  |         |
|         |       |      |         | 32.90       | -  | 33.25 | 17  | 0.42  | 4068 | 99.66  |         |
|         |       |      |         | 33.25       | -  | 33.60 | 5   | 0.12  | 4073 | 99.78  |         |
|         |       |      |         | 33.60       | -  | 33.95 | 4   | 0.10  | 4077 | 99.88  |         |
|         |       |      |         | 33.95       | -  | 34.30 | 1   | 0.02  | 4078 | 99.90  |         |
|         |       |      |         | 34.30       | -  | 34.65 | 3   | 0.07  | 4081 | 99.98  |         |
|         |       |      |         | 34.65       | -  | 35.00 | 0   | 0.00  | 4081 | 99.98  |         |
|         |       |      |         | 35.00       | -  | 35.35 | 0   | 0.00  | 4081 | 99.98  |         |
|         |       |      |         | 35.35       | -  | 35.70 | 1   | 0.02  | 4082 | 100.00 |         |

## (D16) EYE HEIGHT

The vertical distance between a standing surface and the ectocanthus landmark of a participant standing erect with the head in the Frankfurt plane is calculated as follows:  
 EYE HEIGHT SITTING plus STATURE minus SITTING HEIGHT.

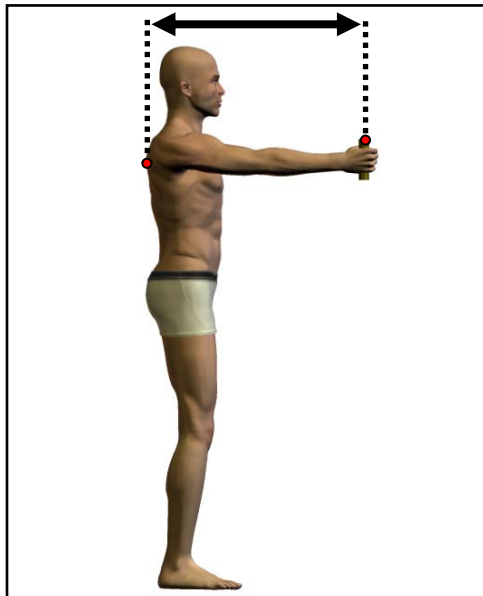


| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 137.80      | 54.25 | 1ST  | 149.20 | 58.74 |
| 139.20      | 54.80 | 2ND  | 151.10 | 59.49 |
| 140.40      | 55.28 | 3RD  | 152.20 | 59.92 |
| 142.10      | 55.94 | 5TH  | 153.60 | 60.47 |
| 144.20      | 56.77 | 10TH | 155.70 | 61.30 |
| 145.60      | 57.32 | 15TH | 157.30 | 61.93 |
| 147.00      | 57.87 | 20TH | 158.70 | 62.48 |
| 147.90      | 58.23 | 25TH | 159.90 | 62.95 |
| 148.80      | 58.58 | 30TH | 160.70 | 63.27 |
| 149.50      | 58.86 | 35TH | 161.60 | 63.62 |
| 150.10      | 59.09 | 40TH | 162.40 | 63.94 |
| 151.00      | 59.45 | 45TH | 163.20 | 64.25 |
| 151.70      | 59.72 | 50TH | 164.00 | 64.57 |
| 152.60      | 60.08 | 55TH | 164.90 | 64.92 |
| 153.40      | 60.39 | 60TH | 165.90 | 65.31 |
| 154.20      | 60.71 | 65TH | 166.80 | 65.67 |
| 155.10      | 61.06 | 70TH | 167.70 | 66.02 |
| 156.10      | 61.46 | 75TH | 168.60 | 66.38 |
| 157.10      | 61.85 | 80TH | 169.60 | 66.77 |
| 158.30      | 62.32 | 85TH | 171.10 | 67.36 |
| 160.10      | 63.03 | 90TH | 172.70 | 67.99 |
| 162.60      | 64.02 | 95TH | 175.30 | 69.02 |
| 164.10      | 64.61 | 97TH | 177.10 | 69.72 |
| 165.20      | 65.04 | 98TH | 178.70 | 70.35 |
| 166.00      | 65.35 | 99TH | 180.90 | 71.22 |



## (D17) FUNCTIONAL GRIP REACH

The horizontal distance between the vertical plane of the back and the center of a 1-1/4-in diameter dowel gripped in the right hand of a participant standing erect with the back against a wall and the arm and hand extended forward horizontally is calculated as follows: THUMB TIP REACH minus ANSUR mean of WRIST-THUMB TIP LENGTH plus ANSUR mean of WRIST-CENTER OF GRIP LENGTH.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 60.00       | 23.62 | 1ST  | 66.10 | 26.02 |
| 61.00       | 24.02 | 2ND  | 67.10 | 26.42 |
| 61.60       | 24.25 | 3RD  | 67.70 | 26.65 |
| 62.30       | 24.53 | 5TH  | 68.70 | 27.05 |
| 64.00       | 25.20 | 10TH | 70.20 | 27.64 |
| 65.10       | 25.63 | 15TH | 71.20 | 28.03 |
| 65.80       | 25.91 | 20TH | 72.10 | 28.39 |
| 66.40       | 26.14 | 25TH | 72.70 | 28.62 |
| 67.00       | 26.38 | 30TH | 73.40 | 28.90 |
| 67.50       | 26.57 | 35TH | 74.00 | 29.13 |
| 68.00       | 26.77 | 40TH | 74.50 | 29.33 |
| 68.50       | 26.97 | 45TH | 75.10 | 29.57 |
| 69.10       | 27.20 | 50TH | 75.60 | 29.76 |
| 69.70       | 27.44 | 55TH | 76.20 | 30.00 |
| 70.20       | 27.64 | 60TH | 76.70 | 30.20 |
| 70.80       | 27.87 | 65TH | 77.20 | 30.39 |
| 71.50       | 28.15 | 70TH | 77.80 | 30.63 |
| 72.10       | 28.39 | 75TH | 78.30 | 30.83 |
| 72.90       | 28.70 | 80TH | 79.10 | 31.14 |
| 73.90       | 29.09 | 85TH | 80.10 | 31.54 |
| 75.00       | 29.53 | 90TH | 81.30 | 32.01 |
| 76.50       | 30.12 | 95TH | 83.10 | 32.72 |
| 77.60       | 30.55 | 97TH | 84.20 | 33.15 |
| 78.50       | 30.91 | 98TH | 85.50 | 33.66 |
| 80.10       | 31.54 | 99TH | 86.80 | 34.17 |

## (D17) FUNCTIONAL GRIP REACH

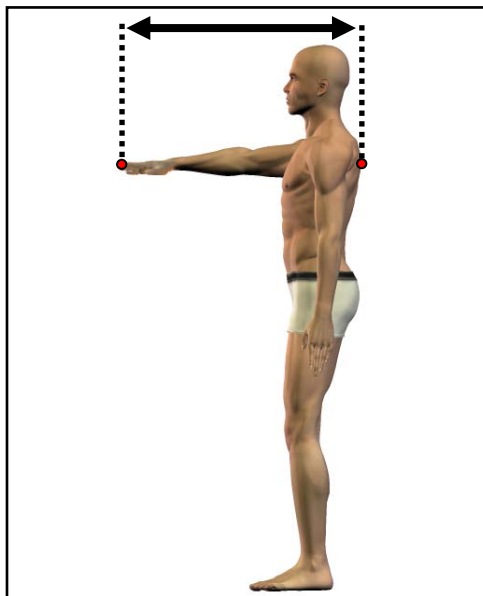
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 69.30                    | MEAN                 | 27.28 |
| 0.10                     | STD. ERROR (MEAN)    | 0.04  |
| 4.28                     | STANDARD DEVIATION   | 1.68  |
| 0.07                     | STD. ERROR (STD.DEV) | 0.03  |
| 55.10                    | MINIMUM              | 21.69 |
| 84.30                    | MAXIMUM              | 33.19 |
| SKEWNESS                 |                      | 0.17  |
| KURTOSIS                 |                      | 3.00  |
| COEFFICIENT OF VARIATION |                      | 6.2%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 75.69                    | MEAN                 | 29.80 |
| 0.07                     | STD. ERROR (MEAN)    | 0.03  |
| 4.37                     | STANDARD DEVIATION   | 1.72  |
| 0.05                     | STD. ERROR (STD.DEV) | 0.02  |
| 59.50                    | MINIMUM              | 23.43 |
| 94.30                    | MAXIMUM              | 37.13 |
| SKEWNESS                 |                      | 0.21  |
| KURTOSIS                 |                      | 3.26  |
| COEFFICIENT OF VARIATION |                      | 5.8%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   | CM    |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 54.75       | - | 55.50 |  |       |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 55.50       | - | 56.25 |  |       |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 56.25       | - | 57.00 |  |       |      |      |         |
| 1       | 0.05 | 4    | 0.20    | 57.00       | - | 57.75 |  |       |      |      |         |
| 1       | 0.05 | 5    | 0.25    | 57.75       | - | 58.50 |  |       |      |      |         |
| 7       | 0.35 | 12   | 0.60    | 58.50       | - | 59.25 |  |       |      |      |         |
| 5       | 0.25 | 17   | 0.86    | 59.25       | - | 60.00 |  | 1     | 0.02 | 1    | 0.02    |
| 17      | 0.86 | 34   | 1.71    | 60.00       | - | 60.75 |  | 0     | 0.00 | 1    | 0.02    |
| 23      | 1.16 | 57   | 2.87    | 60.75       | - | 61.50 |  | 0     | 0.00 | 1    | 0.02    |
| 40      | 2.01 | 97   | 4.88    | 61.50       | - | 62.25 |  | 2     | 0.05 | 3    | 0.07    |
| 33      | 1.66 | 130  | 6.55    | 62.25       | - | 63.00 |  | 1     | 0.02 | 4    | 0.10    |
| 50      | 2.52 | 180  | 9.06    | 63.00       | - | 63.75 |  | 3     | 0.07 | 7    | 0.17    |
| 64      | 3.22 | 244  | 12.29   | 63.75       | - | 64.50 |  | 5     | 0.12 | 12   | 0.29    |
| 75      | 3.78 | 319  | 16.06   | 64.50       | - | 65.25 |  | 9     | 0.22 | 21   | 0.51    |
| 99      | 4.98 | 418  | 21.05   | 65.25       | - | 66.00 |  | 16    | 0.39 | 37   | 0.91    |
| 139     | 7.00 | 557  | 28.05   | 66.00       | - | 66.75 |  | 26    | 0.64 | 63   | 1.54    |
| 125     | 6.29 | 682  | 34.34   | 66.75       | - | 67.50 |  | 42    | 1.03 | 105  | 2.57    |
| 160     | 8.06 | 842  | 42.40   | 67.50       | - | 68.25 |  | 56    | 1.37 | 161  | 3.94    |
| 131     | 6.60 | 973  | 48.99   | 68.25       | - | 69.00 |  | 74    | 1.81 | 235  | 5.76    |
| 139     | 7.00 | 1112 | 55.99   | 69.00       | - | 69.75 |  | 93    | 2.28 | 328  | 8.04    |
| 126     | 6.34 | 1238 | 62.34   | 69.75       | - | 70.50 |  | 129   | 3.16 | 457  | 11.20   |
| 125     | 6.29 | 1363 | 68.63   | 70.50       | - | 71.25 |  | 165   | 4.04 | 622  | 15.24   |
| 102     | 5.14 | 1465 | 73.77   | 71.25       | - | 72.00 |  | 174   | 4.26 | 796  | 19.50   |
| 108     | 5.44 | 1573 | 79.20   | 72.00       | - | 72.75 |  | 226   | 5.54 | 1022 | 25.04   |
| 72      | 3.63 | 1645 | 82.83   | 72.75       | - | 73.50 |  | 227   | 5.56 | 1249 | 30.60   |
| 78      | 3.93 | 1723 | 86.76   | 73.50       | - | 74.25 |  | 283   | 6.93 | 1532 | 37.53   |
| 63      | 3.17 | 1786 | 89.93   | 74.25       | - | 75.00 |  | 270   | 6.61 | 1802 | 44.15   |
| 63      | 3.17 | 1849 | 93.10   | 75.00       | - | 75.75 |  | 284   | 6.96 | 2086 | 51.10   |
| 32      | 1.61 | 1881 | 94.71   | 75.75       | - | 76.50 |  | 286   | 7.01 | 2372 | 58.11   |
| 38      | 1.91 | 1919 | 96.63   | 76.50       | - | 77.25 |  | 291   | 7.13 | 2663 | 65.24   |
| 16      | 0.81 | 1935 | 97.43   | 77.25       | - | 78.00 |  | 261   | 6.39 | 2924 | 71.63   |
| 18      | 0.91 | 1953 | 98.34   | 78.00       | - | 78.75 |  | 243   | 5.95 | 3167 | 77.58   |
| 6       | 0.30 | 1959 | 98.64   | 78.75       | - | 79.50 |  | 168   | 4.12 | 3335 | 81.70   |
| 12      | 0.60 | 1971 | 99.24   | 79.50       | - | 80.25 |  | 157   | 3.85 | 3492 | 85.55   |
| 4       | 0.20 | 1975 | 99.45   | 80.25       | - | 81.00 |  | 128   | 3.14 | 3620 | 88.68   |
| 6       | 0.30 | 1981 | 99.75   | 81.00       | - | 81.75 |  | 114   | 2.79 | 3734 | 91.47   |
| 4       | 0.20 | 1985 | 99.95   | 81.75       | - | 82.50 |  | 68    | 1.67 | 3802 | 93.14   |
| 0       | 0.00 | 1985 | 99.95   | 82.50       | - | 83.25 |  | 89    | 2.18 | 3891 | 95.32   |
| 0       | 0.00 | 1985 | 99.95   | 83.25       | - | 84.00 |  | 48    | 1.18 | 3939 | 96.50   |
| 1       | 0.05 | 1986 | 100.00  | 84.00       | - | 84.75 |  | 43    | 1.05 | 3982 | 97.55   |
|         |      |      |         | 84.75       | - | 85.50 |  | 18    | 0.44 | 4000 | 97.99   |
|         |      |      |         | 85.50       | - | 86.25 |  | 31    | 0.76 | 4031 | 98.75   |
|         |      |      |         | 86.25       | - | 87.00 |  | 12    | 0.29 | 4043 | 99.04   |
|         |      |      |         | 87.00       | - | 87.75 |  | 16    | 0.39 | 4059 | 99.44   |
|         |      |      |         | 87.75       | - | 88.50 |  | 6     | 0.15 | 4065 | 99.58   |
|         |      |      |         | 88.50       | - | 89.25 |  | 5     | 0.12 | 4070 | 99.71   |
|         |      |      |         | 89.25       | - | 90.00 |  | 3     | 0.07 | 4073 | 99.78   |
|         |      |      |         | 90.00       | - | 90.75 |  | 3     | 0.07 | 4076 | 99.85   |
|         |      |      |         | 90.75       | - | 91.50 |  | 3     | 0.07 | 4079 | 99.93   |
|         |      |      |         | 91.50       | - | 92.25 |  | 1     | 0.02 | 4080 | 99.95   |
|         |      |      |         | 92.25       | - | 93.00 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 93.00       | - | 93.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 93.75       | - | 94.50 |  | 1     | 0.02 | 4082 | 100.00  |

## (D18) INDEX FINGER REACH

The horizontal distance between the vertical plane of the back and the tip of the right index finger of a participant standing erect with the back against a wall and the arm, hand, and fingers extended forward horizontally is calculated as follows: THUMB TIP REACH minus ANSUR mean of WRIST-THUMB TIP LENGTH plus ANSUR mean of WRIST-INDEX FINGER LENGTH.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 70.30       | 27.68 | 1ST  | 77.20 | 30.39 |
| 71.30       | 28.07 | 2ND  | 78.20 | 30.79 |
| 71.90       | 28.31 | 3RD  | 78.80 | 31.02 |
| 72.60       | 28.58 | 5TH  | 79.80 | 31.42 |
| 74.30       | 29.25 | 10TH | 81.30 | 32.01 |
| 75.40       | 29.69 | 15TH | 82.30 | 32.40 |
| 76.10       | 29.96 | 20TH | 83.20 | 32.76 |
| 76.70       | 30.20 | 25TH | 83.80 | 32.99 |
| 77.30       | 30.43 | 30TH | 84.50 | 33.27 |
| 77.80       | 30.63 | 35TH | 85.10 | 33.50 |
| 78.30       | 30.83 | 40TH | 85.60 | 33.70 |
| 78.80       | 31.02 | 45TH | 86.20 | 33.94 |
| 79.40       | 31.26 | 50TH | 86.70 | 34.13 |
| 80.00       | 31.50 | 55TH | 87.30 | 34.37 |
| 80.50       | 31.69 | 60TH | 87.80 | 34.57 |
| 81.10       | 31.93 | 65TH | 88.30 | 34.76 |
| 81.80       | 32.20 | 70TH | 88.90 | 35.00 |
| 82.40       | 32.44 | 75TH | 89.40 | 35.20 |
| 83.20       | 32.76 | 80TH | 90.20 | 35.51 |
| 84.20       | 33.15 | 85TH | 91.20 | 35.91 |
| 85.30       | 33.58 | 90TH | 92.40 | 36.38 |
| 86.80       | 34.17 | 95TH | 94.20 | 37.09 |
| 87.90       | 34.61 | 97TH | 95.30 | 37.52 |
| 88.80       | 34.96 | 98TH | 96.60 | 38.03 |
| 90.40       | 35.59 | 99TH | 97.90 | 38.54 |

## (D18) INDEX FINGER REACH

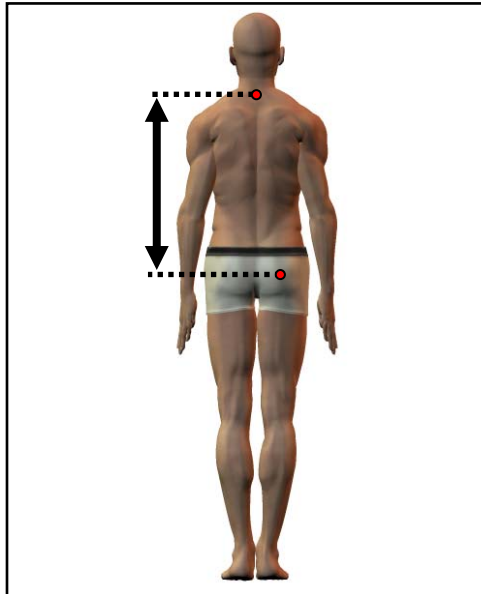
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 79.60                    | MEAN                 | 31.34 |
| 0.10                     | STD. ERROR (MEAN)    | 0.04  |
| 4.28                     | STANDARD DEVIATION   | 1.68  |
| 0.07                     | STD. ERROR (STD.DEV) | 0.03  |
| 65.40                    | MINIMUM              | 25.75 |
| 94.60                    | MAXIMUM              | 37.24 |
| SKEWNESS                 |                      | 0.17  |
| KURTOSIS                 |                      | 3.00  |
| COEFFICIENT OF VARIATION |                      | 5.4%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 86.79                    | MEAN                 | 34.17 |
| 0.07                     | STD. ERROR (MEAN)    | 0.03  |
| 4.37                     | STANDARD DEVIATION   | 1.72  |
| 0.05                     | STD. ERROR (STD.DEV) | 0.02  |
| 70.60                    | MINIMUM              | 27.80 |
| 105.40                   | MAXIMUM              | 41.50 |
| SKEWNESS                 |                      | 0.21  |
| KURTOSIS                 |                      | 3.26  |
| COEFFICIENT OF VARIATION |                      | 5.0%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   | MALES  |      |      |         |
|---------|------|------|---------|-------------|---|--------|------|------|---------|
| E       | FPct | CumF | CumFPct | CM          |   | E      | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 64.55       | - | 65.55  |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 65.55       | - | 66.55  |      |      |         |
| 1       | 0.05 | 3    | 0.15    | 66.55       | - | 67.55  |      |      |         |
| 2       | 0.10 | 5    | 0.25    | 67.55       | - | 68.55  |      |      |         |
| 7       | 0.35 | 12   | 0.60    | 68.55       | - | 69.55  |      |      |         |
| 14      | 0.70 | 26   | 1.31    | 69.55       | - | 70.55  |      |      |         |
| 19      | 0.96 | 45   | 2.27    | 70.55       | - | 71.55  | 1    | 0.02 | 0.02    |
| 52      | 2.62 | 97   | 4.88    | 71.55       | - | 72.55  | 0    | 0.00 | 0.02    |
| 55      | 2.77 | 152  | 7.65    | 72.55       | - | 73.55  | 3    | 0.07 | 0.10    |
| 70      | 3.52 | 222  | 11.18   | 73.55       | - | 74.55  | 3    | 0.07 | 0.17    |
| 97      | 4.88 | 319  | 16.06   | 74.55       | - | 75.55  | 5    | 0.12 | 0.29    |
| 158     | 7.96 | 477  | 24.02   | 75.55       | - | 76.55  | 10   | 0.24 | 0.54    |
| 175     | 8.81 | 652  | 32.83   | 76.55       | - | 77.55  | 33   | 0.81 | 1.35    |
| 190     | 9.57 | 842  | 42.40   | 77.55       | - | 78.55  | 50   | 1.22 | 2.57    |
| 195     | 9.82 | 1037 | 52.22   | 78.55       | - | 79.55  | 71   | 1.74 | 4.31    |
| 162     | 8.16 | 1199 | 60.37   | 79.55       | - | 80.55  | 114  | 2.79 | 7.10    |
| 164     | 8.26 | 1363 | 68.63   | 80.55       | - | 81.55  | 167  | 4.09 | 11.20   |
| 143     | 7.20 | 1506 | 75.83   | 81.55       | - | 82.55  | 202  | 4.95 | 16.14   |
| 117     | 5.89 | 1623 | 81.72   | 82.55       | - | 83.55  | 267  | 6.54 | 22.68   |
| 100     | 5.04 | 1723 | 86.76   | 83.55       | - | 84.55  | 323  | 7.91 | 30.60   |
| 89      | 4.48 | 1812 | 91.24   | 84.55       | - | 85.55  | 365  | 8.94 | 39.54   |
| 57      | 2.87 | 1869 | 94.11   | 85.55       | - | 86.55  | 362  | 8.87 | 48.41   |
| 50      | 2.52 | 1919 | 96.63   | 86.55       | - | 87.55  | 396  | 9.70 | 58.11   |
| 23      | 1.16 | 1942 | 97.78   | 87.55       | - | 88.55  | 381  | 9.33 | 67.44   |
| 16      | 0.81 | 1958 | 98.59   | 88.55       | - | 89.55  | 339  | 8.30 | 75.75   |
| 13      | 0.65 | 1971 | 99.24   | 89.55       | - | 90.55  | 243  | 5.95 | 81.70   |
| 9       | 0.45 | 1980 | 99.70   | 90.55       | - | 91.55  | 191  | 4.68 | 86.38   |
| 2       | 0.10 | 1982 | 99.80   | 91.55       | - | 92.55  | 173  | 4.24 | 90.62   |
| 3       | 0.15 | 1985 | 99.95   | 92.55       | - | 93.55  | 103  | 2.52 | 93.14   |
| 0       | 0.00 | 1985 | 99.95   | 93.55       | - | 94.55  | 104  | 2.55 | 95.69   |
| 1       | 0.05 | 1986 | 100.00  | 94.55       | - | 95.55  | 68   | 1.67 | 97.35   |
|         |      |      |         | 95.55       | - | 96.55  | 26   | 0.64 | 97.99   |
|         |      |      |         | 96.55       | - | 97.55  | 36   | 0.88 | 98.87   |
|         |      |      |         | 97.55       | - | 98.55  | 20   | 0.49 | 99.36   |
|         |      |      |         | 98.55       | - | 99.55  | 9    | 0.22 | 99.58   |
|         |      |      |         | 99.55       | - | 100.55 | 6    | 0.15 | 99.73   |
|         |      |      |         | 100.55      | - | 101.55 | 4    | 0.10 | 99.83   |
|         |      |      |         | 101.55      | - | 102.55 | 4    | 0.10 | 99.93   |
|         |      |      |         | 102.55      | - | 103.55 | 2    | 0.05 | 99.98   |
|         |      |      |         | 103.55      | - | 104.55 | 0    | 0.00 | 99.98   |
|         |      |      |         | 104.55      | - | 105.55 | 1    | 0.02 | 100.00  |

## (D19) NECK-BUTTOCK LENGTH

The vertical distance between the cervicale landmark and the buttock point right landmark is calculated as follows: CERVICALE HEIGHT minus BUTTOCK HEIGHT.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 49.50       | 19.49 | 1ST  | 55.00 | 21.65 |
| 50.10       | 19.72 | 2ND  | 55.80 | 21.97 |
| 50.40       | 19.84 | 3RD  | 56.30 | 22.17 |
| 51.10       | 20.12 | 5TH  | 57.20 | 22.52 |
| 52.20       | 20.55 | 10TH | 58.60 | 23.07 |
| 53.00       | 20.87 | 15TH | 59.50 | 23.43 |
| 53.60       | 21.10 | 20TH | 60.10 | 23.66 |
| 54.10       | 21.30 | 25TH | 60.70 | 23.90 |
| 54.60       | 21.50 | 30TH | 61.20 | 24.09 |
| 55.00       | 21.65 | 35TH | 61.60 | 24.25 |
| 55.40       | 21.81 | 40TH | 62.10 | 24.45 |
| 55.70       | 21.93 | 45TH | 62.60 | 24.65 |
| 56.10       | 22.09 | 50TH | 63.00 | 24.80 |
| 56.50       | 22.24 | 55TH | 63.40 | 24.96 |
| 56.90       | 22.40 | 60TH | 63.90 | 25.16 |
| 57.50       | 22.64 | 65TH | 64.30 | 25.31 |
| 57.90       | 22.80 | 70TH | 64.80 | 25.51 |
| 58.30       | 22.95 | 75TH | 65.30 | 25.71 |
| 58.80       | 23.15 | 80TH | 65.80 | 25.91 |
| 59.40       | 23.39 | 85TH | 66.50 | 26.18 |
| 60.10       | 23.66 | 90TH | 67.30 | 26.50 |
| 61.10       | 24.06 | 95TH | 68.30 | 26.89 |
| 61.80       | 24.33 | 97TH | 69.10 | 27.20 |
| 62.70       | 24.69 | 98TH | 69.70 | 27.44 |
| 63.60       | 25.04 | 99TH | 70.40 | 27.72 |

## (D19) NECK-BUTTOCK LENGTH

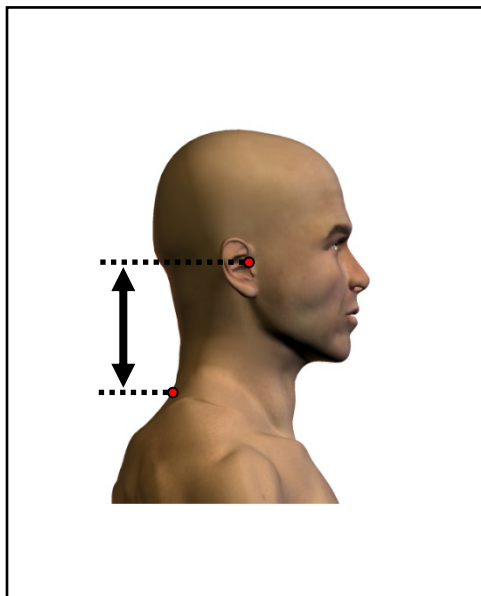
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 56.19                    | MEAN                 | 22.12 |
| 0.07                     | STD. ERROR (MEAN)    | 0.03  |
| 3.06                     | STANDARD DEVIATION   | 1.20  |
| 0.05                     | STD. ERROR (STD.DEV) | 0.02  |
| 47.10                    | MINIMUM              | 18.54 |
| 65.50                    | MAXIMUM              | 25.79 |
| SKEWNESS                 |                      | 0.04  |
| KURTOSIS                 |                      | 2.84  |
| COEFFICIENT OF VARIATION |                      | 5.4%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 62.94                    | MEAN                 | 24.78 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 3.37                     | STANDARD DEVIATION   | 1.33  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.01  |
| 49.00                    | MINIMUM              | 19.29 |
| 75.70                    | MAXIMUM              | 29.80 |
| SKEWNESS                 |                      | -0.11 |
| KURTOSIS                 |                      | 2.95  |
| COEFFICIENT OF VARIATION |                      | 5.4%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   | MALES |      |      |         |
|---------|-------|------|---------|-------------|---|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   | F     | FPct | CumF | CumFPct |
| 2       | 0.10  | 2    | 0.10    | 46.75       | - | 47.50 |      |      |         |
| 6       | 0.30  | 8    | 0.40    | 47.50       | - | 48.25 |      |      |         |
| 8       | 0.40  | 16   | 0.81    | 48.25       | - | 49.00 |      |      |         |
| 10      | 0.50  | 26   | 1.31    | 49.00       | - | 49.75 |      |      |         |
| 36      | 1.81  | 62   | 3.12    | 49.75       | - | 50.50 | 1    | 0.02 | 0.02    |
| 44      | 2.22  | 106  | 5.34    | 50.50       | - | 51.25 | 0    | 0.00 | 0.02    |
| 55      | 2.77  | 161  | 8.11    | 51.25       | - | 52.00 | 0    | 0.00 | 0.02    |
| 108     | 5.44  | 269  | 13.54   | 52.00       | - | 52.75 | 4    | 0.10 | 0.12    |
| 104     | 5.24  | 373  | 18.78   | 52.75       | - | 53.50 | 8    | 0.20 | 0.32    |
| 156     | 7.85  | 529  | 26.64   | 53.50       | - | 54.25 | 13   | 0.32 | 0.64    |
| 155     | 7.80  | 684  | 34.44   | 54.25       | - | 55.00 | 11   | 0.27 | 0.91    |
| 217     | 10.93 | 901  | 45.37   | 55.00       | - | 55.75 | 42   | 1.03 | 1.94    |
| 186     | 9.37  | 1087 | 54.73   | 55.75       | - | 56.50 | 52   | 1.27 | 3.21    |
| 169     | 8.51  | 1256 | 63.24   | 56.50       | - | 57.25 | 77   | 1.89 | 5.10    |
| 138     | 6.95  | 1394 | 70.19   | 57.25       | - | 58.00 | 85   | 2.08 | 7.18    |
| 187     | 9.42  | 1581 | 79.61   | 58.00       | - | 58.75 | 145  | 3.55 | 10.73   |
| 116     | 5.84  | 1697 | 85.45   | 58.75       | - | 59.50 | 156  | 3.82 | 14.55   |
| 107     | 5.39  | 1804 | 90.84   | 59.50       | - | 60.25 | 271  | 6.64 | 21.19   |
| 62      | 3.12  | 1866 | 93.96   | 60.25       | - | 61.00 | 260  | 6.37 | 27.56   |
| 58      | 2.92  | 1924 | 96.88   | 61.00       | - | 61.75 | 358  | 8.77 | 36.33   |
| 19      | 0.96  | 1943 | 97.83   | 61.75       | - | 62.50 | 306  | 7.50 | 43.83   |
| 18      | 0.91  | 1961 | 98.74   | 62.50       | - | 63.25 | 385  | 9.43 | 53.26   |
| 14      | 0.70  | 1975 | 99.45   | 63.25       | - | 64.00 | 307  | 7.52 | 60.78   |
| 8       | 0.40  | 1983 | 99.85   | 64.00       | - | 64.75 | 364  | 8.92 | 69.70   |
| 2       | 0.10  | 1985 | 99.95   | 64.75       | - | 65.50 | 281  | 6.88 | 76.58   |
| 1       | 0.05  | 1986 | 100.00  | 65.50       | - | 66.25 | 278  | 6.81 | 83.39   |
|         |       |      |         | 66.25       | - | 67.00 | 196  | 4.80 | 88.19   |
|         |       |      |         | 67.00       | - | 67.75 | 177  | 4.34 | 92.53   |
|         |       |      |         | 67.75       | - | 68.50 | 119  | 2.92 | 95.44   |
|         |       |      |         | 68.50       | - | 69.25 | 80   | 1.96 | 97.40   |
|         |       |      |         | 69.25       | - | 70.00 | 43   | 1.05 | 98.46   |
|         |       |      |         | 70.00       | - | 70.75 | 34   | 0.83 | 99.29   |
|         |       |      |         | 70.75       | - | 71.50 | 14   | 0.34 | 99.63   |
|         |       |      |         | 71.50       | - | 72.25 | 9    | 0.22 | 99.85   |
|         |       |      |         | 72.25       | - | 73.00 | 3    | 0.07 | 99.93   |
|         |       |      |         | 73.00       | - | 73.75 | 2    | 0.05 | 99.98   |
|         |       |      |         | 73.75       | - | 74.50 | 0    | 0.00 | 99.98   |
|         |       |      |         | 74.50       | - | 75.25 | 0    | 0.00 | 99.98   |
|         |       |      |         | 75.25       | - | 76.00 | 1    | 0.02 | 100.00  |

## (D20) NECK LINK

The vertical distance between the cervicale landmark and the tragon landmark is calculated as follows: STATURE minus TRAGION-TOP OF HEAD minus CERVICALE HEIGHT.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 7.90        | 3.11 | 1ST  | 8.00  | 3.15 |
| 8.20        | 3.23 | 2ND  | 8.20  | 3.23 |
| 8.50        | 3.35 | 3RD  | 8.40  | 3.31 |
| 8.70        | 3.43 | 5TH  | 8.70  | 3.43 |
| 9.10        | 3.58 | 10TH | 9.20  | 3.62 |
| 9.40        | 3.70 | 15TH | 9.50  | 3.74 |
| 9.60        | 3.78 | 20TH | 9.70  | 3.82 |
| 9.80        | 3.86 | 25TH | 9.90  | 3.90 |
| 10.00       | 3.94 | 30TH | 10.10 | 3.98 |
| 10.10       | 3.98 | 35TH | 10.30 | 4.06 |
| 10.30       | 4.06 | 40TH | 10.40 | 4.09 |
| 10.40       | 4.09 | 45TH | 10.60 | 4.17 |
| 10.60       | 4.17 | 50TH | 10.80 | 4.25 |
| 10.80       | 4.25 | 55TH | 10.90 | 4.29 |
| 10.90       | 4.29 | 60TH | 11.10 | 4.37 |
| 11.10       | 4.37 | 65TH | 11.30 | 4.45 |
| 11.30       | 4.45 | 70TH | 11.40 | 4.49 |
| 11.40       | 4.49 | 75TH | 11.60 | 4.57 |
| 11.60       | 4.57 | 80TH | 11.80 | 4.65 |
| 11.80       | 4.65 | 85TH | 12.10 | 4.76 |
| 12.20       | 4.80 | 90TH | 12.40 | 4.88 |
| 12.70       | 5.00 | 95TH | 12.90 | 5.08 |
| 12.90       | 5.08 | 97TH | 13.30 | 5.24 |
| 13.10       | 5.16 | 98TH | 13.50 | 5.31 |
| 13.60       | 5.35 | 99TH | 13.80 | 5.43 |

(D20) NECK LINK

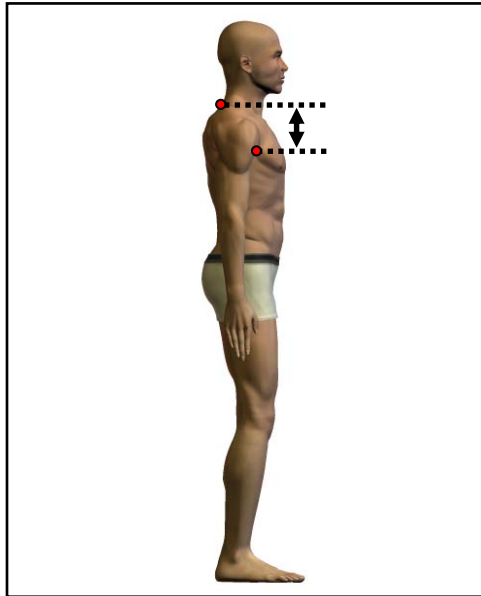
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 10.63                    | MEAN                 | 4.19  |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 1.18                     | STANDARD DEVIATION   | 0.47  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 7.10                     | MINIMUM              | 2.80  |
| 15.00                    | MAXIMUM              | 5.91  |
| SKEWNESS                 |                      | 0.14  |
| KURTOSIS                 |                      | 3.05  |
| COEFFICIENT OF VARIATION |                      | 11.1% |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 10.78                    | MEAN                 | 4.24  |
| 0.02                     | STD. ERROR (MEAN)    | 0.01  |
| 1.27                     | STANDARD DEVIATION   | 0.50  |
| 0.01                     | STD. ERROR (STD.DEV) | 0.01  |
| 6.20                     | MINIMUM              | 2.44  |
| 15.10                    | MAXIMUM              | 5.94  |
| SKEWNESS                 |                      | 0.08  |
| KURTOSIS                 |                      | 2.94  |
| COEFFICIENT OF VARIATION |                      | 11.8% |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |    |       |     | MALES |      |         |  |
|---------|------|------|---------|-------------|----|-------|-----|-------|------|---------|--|
| F       | FPct | CumF | CumFPct |             | CM |       | F   | FPct  | CumF | CumFPct |  |
|         |      |      |         | 6.15        | -  | 6.35  | 1   | 0.02  | 1    | 0.02    |  |
|         |      |      |         | 6.35        | -  | 6.55  | 0   | 0.00  | 1    | 0.02    |  |
|         |      |      |         | 6.55        | -  | 6.75  | 0   | 0.00  | 1    | 0.02    |  |
|         |      |      |         | 6.75        | -  | 6.95  | 1   | 0.02  | 2    | 0.05    |  |
| 1       | 0.05 | 1    | 0.05    | 6.95        | -  | 7.15  | 3   | 0.07  | 5    | 0.12    |  |
| 1       | 0.05 | 2    | 0.10    | 7.15        | -  | 7.35  | 4   | 0.10  | 9    | 0.22    |  |
| 3       | 0.15 | 5    | 0.25    | 7.35        | -  | 7.55  | 8   | 0.20  | 17   | 0.42    |  |
| 2       | 0.10 | 7    | 0.35    | 7.55        | -  | 7.75  | 5   | 0.12  | 22   | 0.54    |  |
| 14      | 0.70 | 21   | 1.06    | 7.75        | -  | 7.95  | 13  | 0.32  | 35   | 0.86    |  |
| 10      | 0.50 | 31   | 1.56    | 7.95        | -  | 8.15  | 33  | 0.81  | 68   | 1.67    |  |
| 15      | 0.76 | 46   | 2.32    | 8.15        | -  | 8.35  | 37  | 0.91  | 105  | 2.57    |  |
| 25      | 1.26 | 71   | 3.58    | 8.35        | -  | 8.55  | 53  | 1.30  | 158  | 3.87    |  |
| 30      | 1.51 | 101  | 5.09    | 8.55        | -  | 8.75  | 65  | 1.59  | 223  | 5.46    |  |
| 46      | 2.32 | 147  | 7.40    | 8.75        | -  | 8.95  | 83  | 2.03  | 306  | 7.50    |  |
| 63      | 3.17 | 210  | 10.57   | 8.95        | -  | 9.15  | 99  | 2.43  | 405  | 9.92    |  |
| 67      | 3.37 | 277  | 13.95   | 9.15        | -  | 9.35  | 124 | 3.04  | 529  | 12.96   |  |
| 82      | 4.13 | 359  | 18.08   | 9.35        | -  | 9.55  | 147 | 3.60  | 676  | 16.56   |  |
| 95      | 4.78 | 454  | 22.86   | 9.55        | -  | 9.75  | 192 | 4.70  | 868  | 21.26   |  |
| 105     | 5.29 | 559  | 28.15   | 9.75        | -  | 9.95  | 193 | 4.73  | 1061 | 25.99   |  |
| 139     | 7.00 | 698  | 35.15   | 9.95        | -  | 10.15 | 213 | 5.22  | 1274 | 31.21   |  |
| 131     | 6.60 | 829  | 41.74   | 10.15       | -  | 10.35 | 210 | 5.14  | 1484 | 36.35   |  |
| 124     | 6.24 | 953  | 47.99   | 10.35       | -  | 10.55 | 297 | 7.28  | 1781 | 43.63   |  |
| 131     | 6.60 | 1084 | 54.58   | 10.55       | -  | 10.75 | 242 | 5.93  | 2023 | 49.56   |  |
| 108     | 5.44 | 1192 | 60.02   | 10.75       | -  | 10.95 | 283 | 6.93  | 2306 | 56.49   |  |
| 133     | 6.70 | 1325 | 66.72   | 10.95       | -  | 11.15 | 224 | 5.49  | 2530 | 61.98   |  |
| 121     | 6.09 | 1446 | 72.81   | 11.15       | -  | 11.35 | 240 | 5.88  | 2770 | 67.86   |  |
| 126     | 6.34 | 1572 | 79.15   | 11.35       | -  | 11.55 | 221 | 5.41  | 2991 | 73.27   |  |
| 85      | 4.28 | 1657 | 83.43   | 11.55       | -  | 11.75 | 175 | 4.29  | 3166 | 77.56   |  |
| 74      | 3.73 | 1731 | 87.16   | 11.75       | -  | 11.95 | 196 | 4.80  | 3362 | 82.36   |  |
| 56      | 2.82 | 1787 | 89.98   | 11.95       | -  | 12.15 | 152 | 3.72  | 3514 | 86.09   |  |
| 47      | 2.37 | 1834 | 92.35   | 12.15       | -  | 12.35 | 121 | 2.96  | 3635 | 89.05   |  |
| 40      | 2.01 | 1874 | 94.36   | 12.35       | -  | 12.55 | 103 | 2.52  | 3738 | 91.57   |  |
| 31      | 1.56 | 1905 | 95.92   | 12.55       | -  | 12.75 | 92  | 2.25  | 3830 | 93.83   |  |
| 26      | 1.31 | 1931 | 97.23   | 12.75       | -  | 12.95 | 64  | 1.57  | 3894 | 95.39   |  |
| 21      | 1.06 | 1952 | 98.29   | 12.95       | -  | 13.15 | 46  | 1.13  | 3940 | 96.52   |  |
| 7       | 0.35 | 1959 | 98.64   | 13.15       | -  | 13.35 | 41  | 1.00  | 3981 | 97.53   |  |
| 6       | 0.30 | 1965 | 98.94   | 13.35       | -  | 13.55 | 32  | 0.78  | 4013 | 98.31   |  |
| 6       | 0.30 | 1971 | 99.24   | 13.55       | -  | 13.75 | 18  | 0.44  | 4031 | 98.75   |  |
| 8       | 0.40 | 1979 | 99.65   | 13.75       | -  | 13.95 | 25  | 0.61  | 4056 | 99.36   |  |
| 1       | 0.05 | 1980 | 99.70   | 13.95       | -  | 14.15 | 8   | 0.20  | 4064 | 99.56   |  |
| 1       | 0.05 | 1981 | 99.75   | 14.15       | -  | 14.35 | 8   | 0.20  | 4072 | 99.76   |  |
| 1       | 0.05 | 1982 | 99.80   | 14.35       | -  | 14.55 | 3   | 0.07  | 4075 | 99.83   |  |
| 3       | 0.15 | 1985 | 99.95   | 14.55       | -  | 14.75 | 4   | 0.10  | 4079 | 99.93   |  |
| 0       | 0.00 | 1985 | 99.95   | 14.75       | -  | 14.95 | 0   | 0.00  | 4079 | 99.93   |  |
| 1       | 0.05 | 1986 | 100.00  | 14.95       | -  | 15.15 | 3   | 0.07  | 4082 | 100.00  |  |

## (D21) NECK-SCYE LENGTH

The vertical distance between the cervicale landmark and the anterior scye landmark is calculated as follows: CERVICALE HEIGHT minus AXILLA HEIGHT.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 12.20       | 4.80 | 1ST  | 15.50 | 6.10 |
| 12.60       | 4.96 | 2ND  | 15.80 | 6.22 |
| 12.90       | 5.08 | 3RD  | 16.10 | 6.34 |
| 13.30       | 5.24 | 5TH  | 16.50 | 6.50 |
| 13.90       | 5.47 | 10TH | 17.00 | 6.69 |
| 14.20       | 5.59 | 15TH | 17.30 | 6.81 |
| 14.50       | 5.71 | 20TH | 17.60 | 6.93 |
| 14.70       | 5.79 | 25TH | 17.90 | 7.05 |
| 14.90       | 5.87 | 30TH | 18.10 | 7.13 |
| 15.10       | 5.94 | 35TH | 18.30 | 7.20 |
| 15.30       | 6.02 | 40TH | 18.50 | 7.28 |
| 15.40       | 6.06 | 45TH | 18.70 | 7.36 |
| 15.60       | 6.14 | 50TH | 18.80 | 7.40 |
| 15.80       | 6.22 | 55TH | 19.00 | 7.48 |
| 16.00       | 6.30 | 60TH | 19.20 | 7.56 |
| 16.20       | 6.38 | 65TH | 19.40 | 7.64 |
| 16.40       | 6.46 | 70TH | 19.60 | 7.72 |
| 16.60       | 6.54 | 75TH | 19.80 | 7.80 |
| 16.80       | 6.61 | 80TH | 20.00 | 7.87 |
| 17.10       | 6.73 | 85TH | 20.30 | 7.99 |
| 17.50       | 6.89 | 90TH | 20.70 | 8.15 |
| 18.00       | 7.09 | 95TH | 21.20 | 8.35 |
| 18.40       | 7.24 | 97TH | 21.50 | 8.46 |
| 18.60       | 7.32 | 98TH | 21.80 | 8.58 |
| 18.90       | 7.44 | 99TH | 22.20 | 8.74 |

## (D21) NECK-SCYE LENGTH

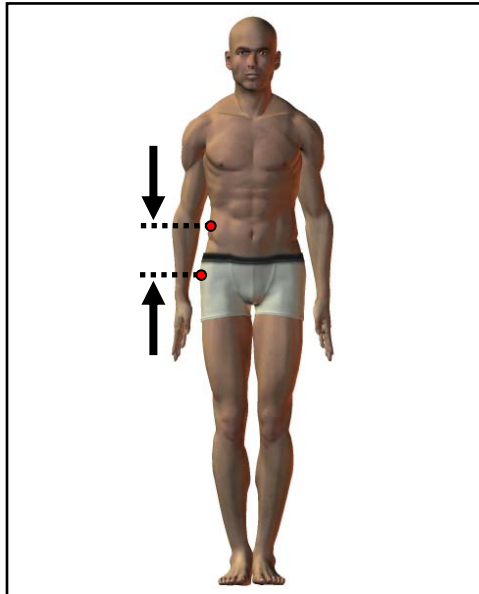
| FEMALES                  |                      |      |
|--------------------------|----------------------|------|
| CM                       |                      | IN   |
| 15.66                    | MEAN                 | 6.17 |
| 0.03                     | STD. ERROR (MEAN)    | 0.01 |
| 1.45                     | STANDARD DEVIATION   | 0.57 |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01 |
| 11.30                    | MINIMUM              | 4.45 |
| 21.20                    | MAXIMUM              | 8.35 |
| SKEWNESS                 |                      | 0.09 |
| KURTOSIS                 |                      | 3.25 |
| COEFFICIENT OF VARIATION |                      | 9.2% |
| NUMBER OF PARTICIPANTS   |                      | 1986 |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 18.82                    | MEAN                 | 7.41  |
| 0.02                     | STD. ERROR (MEAN)    | 0.01  |
| 1.45                     | STANDARD DEVIATION   | 0.57  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 13.60                    | MINIMUM              | 5.35  |
| 25.50                    | MAXIMUM              | 10.04 |
| SKEWNESS                 |                      | -0.01 |
| KURTOSIS                 |                      | 3.15  |
| COEFFICIENT OF VARIATION |                      | 7.7%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |    | MALES |     |       |      |         |
|---------|-------|------|---------|-------------|----|-------|-----|-------|------|---------|
| F       | FPct  | CumF | CumFPct |             | CM |       | F   | FPct  | CumF | CumFPct |
| 3       | 0.15  | 3    | 0.15    | 11.25       | -  | 11.60 |     |       |      |         |
| 8       | 0.40  | 11   | 0.55    | 11.60       | -  | 11.95 |     |       |      |         |
| 9       | 0.45  | 20   | 1.01    | 11.95       | -  | 12.30 |     |       |      |         |
| 23      | 1.16  | 43   | 2.17    | 12.30       | -  | 12.65 |     |       |      |         |
| 20      | 1.01  | 63   | 3.17    | 12.65       | -  | 13.00 |     |       |      |         |
| 43      | 2.17  | 106  | 5.34    | 13.00       | -  | 13.35 |     |       |      |         |
| 48      | 2.42  | 154  | 7.75    | 13.35       | -  | 13.70 | 1   | 0.02  | 1    | 0.02    |
| 96      | 4.83  | 250  | 12.59   | 13.70       | -  | 14.05 | 3   | 0.07  | 4    | 0.10    |
| 87      | 4.38  | 337  | 16.97   | 14.05       | -  | 14.40 | 3   | 0.07  | 7    | 0.17    |
| 176     | 8.86  | 513  | 25.83   | 14.40       | -  | 14.75 | 6   | 0.15  | 13   | 0.32    |
| 163     | 8.21  | 676  | 34.04   | 14.75       | -  | 15.10 | 8   | 0.20  | 21   | 0.51    |
| 228     | 11.48 | 904  | 45.52   | 15.10       | -  | 15.45 | 19  | 0.47  | 40   | 0.98    |
| 152     | 7.65  | 1056 | 53.17   | 15.45       | -  | 15.80 | 34  | 0.83  | 74   | 1.81    |
| 209     | 10.52 | 1265 | 63.70   | 15.80       | -  | 16.15 | 62  | 1.52  | 136  | 3.33    |
| 148     | 7.45  | 1413 | 71.15   | 16.15       | -  | 16.50 | 68  | 1.67  | 204  | 5.00    |
| 176     | 8.86  | 1589 | 80.01   | 16.50       | -  | 16.85 | 156 | 3.82  | 360  | 8.82    |
| 104     | 5.24  | 1693 | 85.25   | 16.85       | -  | 17.20 | 164 | 4.02  | 524  | 12.84   |
| 103     | 5.19  | 1796 | 90.43   | 17.20       | -  | 17.55 | 231 | 5.66  | 755  | 18.50   |
| 55      | 2.77  | 1851 | 93.20   | 17.55       | -  | 17.90 | 237 | 5.81  | 992  | 24.30   |
| 58      | 2.92  | 1909 | 96.12   | 17.90       | -  | 18.25 | 426 | 10.44 | 1418 | 34.74   |
| 32      | 1.61  | 1941 | 97.73   | 18.25       | -  | 18.60 | 300 | 7.35  | 1718 | 42.09   |
| 27      | 1.36  | 1968 | 99.09   | 18.60       | -  | 18.95 | 435 | 10.66 | 2153 | 52.74   |
| 1       | 0.05  | 1969 | 99.14   | 18.95       | -  | 19.30 | 346 | 8.48  | 2499 | 61.22   |
| 8       | 0.40  | 1977 | 99.55   | 19.30       | -  | 19.65 | 437 | 10.71 | 2936 | 71.93   |
| 2       | 0.10  | 1979 | 99.65   | 19.65       | -  | 20.00 | 272 | 6.66  | 3208 | 78.59   |
| 2       | 0.10  | 1981 | 99.75   | 20.00       | -  | 20.35 | 290 | 7.10  | 3498 | 85.69   |
| 0       | 0.00  | 1981 | 99.75   | 20.35       | -  | 20.70 | 159 | 3.90  | 3657 | 89.59   |
| 2       | 0.10  | 1983 | 99.85   | 20.70       | -  | 21.05 | 167 | 4.09  | 3824 | 93.68   |
| 3       | 0.15  | 1986 | 100.00  | 21.05       | -  | 21.40 | 96  | 2.35  | 3920 | 96.03   |
|         |       |      |         | 21.40       | -  | 21.75 | 71  | 1.74  | 3991 | 97.77   |
|         |       |      |         | 21.75       | -  | 22.10 | 39  | 0.96  | 4030 | 98.73   |
|         |       |      |         | 22.10       | -  | 22.45 | 26  | 0.64  | 4056 | 99.36   |
|         |       |      |         | 22.45       | -  | 22.80 | 9   | 0.22  | 4065 | 99.58   |
|         |       |      |         | 22.80       | -  | 23.15 | 9   | 0.22  | 4074 | 99.80   |
|         |       |      |         | 23.15       | -  | 23.50 | 5   | 0.12  | 4079 | 99.93   |
|         |       |      |         | 23.50       | -  | 23.85 | 2   | 0.05  | 4081 | 99.98   |
|         |       |      |         | 23.85       | -  | 24.20 | 0   | 0.00  | 4081 | 99.98   |
|         |       |      |         | 24.20       | -  | 24.55 | 0   | 0.00  | 4081 | 99.98   |
|         |       |      |         | 24.55       | -  | 24.90 | 0   | 0.00  | 4081 | 99.98   |
|         |       |      |         | 24.90       | -  | 25.25 | 0   | 0.00  | 4081 | 99.98   |
|         |       |      |         | 25.25       | -  | 25.60 | 1   | 0.02  | 4082 | 100.00  |

## (D22) PELVIC LINK

The vertical distance between the iliocristale right landmark and the level of the trochanterion landmark is calculated as follows: ILIOCRISTALE HEIGHT minus TROCHANTERION HEIGHT.



| PERCENTILES |      |      |       |      |
|-------------|------|------|-------|------|
| FEMALES     |      |      | MALES |      |
| CM          | IN   |      | CM    | IN   |
| 10.60       | 4.17 | 1ST  | 10.80 | 4.25 |
| 11.40       | 4.49 | 2ND  | 11.40 | 4.49 |
| 11.70       | 4.61 | 3RD  | 11.70 | 4.61 |
| 12.10       | 4.76 | 5TH  | 12.20 | 4.80 |
| 12.60       | 4.96 | 10TH | 13.10 | 5.16 |
| 13.10       | 5.16 | 15TH | 13.70 | 5.39 |
| 13.50       | 5.31 | 20TH | 14.20 | 5.59 |
| 13.80       | 5.43 | 25TH | 14.60 | 5.75 |
| 14.00       | 5.51 | 30TH | 14.90 | 5.87 |
| 14.30       | 5.63 | 35TH | 15.30 | 6.02 |
| 14.50       | 5.71 | 40TH | 15.60 | 6.14 |
| 14.80       | 5.83 | 45TH | 15.90 | 6.26 |
| 15.00       | 5.91 | 50TH | 16.20 | 6.38 |
| 15.30       | 6.02 | 55TH | 16.40 | 6.46 |
| 15.50       | 6.10 | 60TH | 16.70 | 6.57 |
| 15.80       | 6.22 | 65TH | 17.00 | 6.69 |
| 16.00       | 6.30 | 70TH | 17.30 | 6.81 |
| 16.30       | 6.42 | 75TH | 17.60 | 6.93 |
| 16.60       | 6.54 | 80TH | 18.00 | 7.09 |
| 17.00       | 6.69 | 85TH | 18.40 | 7.24 |
| 17.50       | 6.89 | 90TH | 18.90 | 7.44 |
| 18.20       | 7.17 | 95TH | 19.60 | 7.72 |
| 18.60       | 7.32 | 97TH | 20.00 | 7.87 |
| 18.90       | 7.44 | 98TH | 20.40 | 8.03 |
| 19.40       | 7.64 | 99TH | 21.00 | 8.27 |

(D22) PELVIC LINK

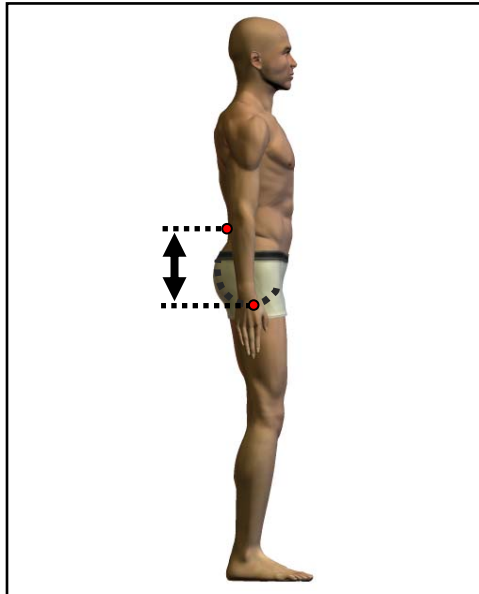
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 15.04                    | MEAN                 | 5.92  |
| 0.04                     | STD. ERROR (MEAN)    | 0.02  |
| 1.87                     | STANDARD DEVIATION   | 0.74  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 8.60                     | MINIMUM              | 3.39  |
| 21.20                    | MAXIMUM              | 8.35  |
| SKEWNESS                 |                      | 0.03  |
| KURTOSIS                 |                      | 2.91  |
| COEFFICIENT OF VARIATION |                      | 12.4% |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 16.07                    | MEAN                 | 6.33  |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 2.23                     | STANDARD DEVIATION   | 0.88  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 6.90                     | MINIMUM              | 2.72  |
| 23.60                    | MAXIMUM              | 9.29  |
| SKEWNESS                 |                      | -0.16 |
| KURTOSIS                 |                      | 3.00  |
| COEFFICIENT OF VARIATION |                      | 13.9% |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|------|------|---------|
| E       | FPct | CumF | CumFPct | CM          |   | E     | FPct | CumF | CumFPct |
|         |      |      |         | 6.60        | - | 6.95  | 1    | 0.02 | 0.02    |
|         |      |      |         | 6.95        | - | 7.30  | 0    | 0.00 | 0.02    |
|         |      |      |         | 7.30        | - | 7.65  | 0    | 0.00 | 0.02    |
|         |      |      |         | 7.65        | - | 8.00  | 0    | 0.00 | 0.02    |
|         |      |      |         | 8.00        | - | 8.35  | 1    | 0.02 | 0.05    |
|         |      |      |         | 8.35        | - | 8.70  | 0    | 0.00 | 0.05    |
|         |      |      |         | 8.70        | - | 9.05  | 2    | 0.05 | 0.10    |
|         |      |      |         | 9.05        | - | 9.40  | 4    | 0.10 | 0.20    |
|         |      |      |         | 9.40        | - | 9.75  | 5    | 0.12 | 0.32    |
|         |      |      |         | 9.75        | - | 10.10 | 3    | 0.07 | 0.39    |
|         |      |      |         | 10.10       | - | 10.45 | 12   | 0.29 | 0.69    |
|         |      |      |         | 10.45       | - | 10.80 | 12   | 0.29 | 0.98    |
|         |      |      |         | 10.80       | - | 11.15 | 22   | 0.54 | 1.52    |
|         |      |      |         | 11.15       | - | 11.50 | 26   | 0.64 | 2.16    |
|         |      |      |         | 11.50       | - | 11.85 | 52   | 1.27 | 3.43    |
|         |      |      |         | 11.85       | - | 12.20 | 52   | 1.27 | 4.70    |
|         |      |      |         | 12.20       | - | 12.55 | 78   | 1.91 | 6.61    |
|         |      |      |         | 12.55       | - | 12.90 | 61   | 1.49 | 8.11    |
|         |      |      |         | 12.90       | - | 13.25 | 124  | 3.04 | 11.15   |
|         |      |      |         | 13.25       | - | 13.60 | 98   | 2.40 | 13.55   |
|         |      |      |         | 13.60       | - | 13.95 | 153  | 3.75 | 17.30   |
|         |      |      |         | 13.95       | - | 14.30 | 124  | 3.04 | 20.33   |
|         |      |      |         | 14.30       | - | 14.65 | 227  | 5.56 | 25.89   |
|         |      |      |         | 14.65       | - | 15.00 | 174  | 4.26 | 30.16   |
|         |      |      |         | 15.00       | - | 15.35 | 237  | 5.81 | 35.96   |
|         |      |      |         | 15.35       | - | 15.70 | 189  | 4.63 | 40.59   |
|         |      |      |         | 15.70       | - | 16.05 | 297  | 7.28 | 47.87   |
|         |      |      |         | 16.05       | - | 16.40 | 221  | 5.41 | 53.28   |
|         |      |      |         | 16.40       | - | 16.75 | 311  | 7.62 | 60.90   |
|         |      |      |         | 16.75       | - | 17.10 | 219  | 5.37 | 66.27   |
|         |      |      |         | 17.10       | - | 17.45 | 280  | 6.86 | 73.13   |
|         |      |      |         | 17.45       | - | 17.80 | 167  | 4.09 | 77.22   |
|         |      |      |         | 17.80       | - | 18.15 | 211  | 5.17 | 82.39   |
|         |      |      |         | 18.15       | - | 18.50 | 152  | 3.72 | 86.11   |
|         |      |      |         | 18.50       | - | 18.85 | 149  | 3.65 | 89.76   |
|         |      |      |         | 18.85       | - | 19.20 | 95   | 2.33 | 92.09   |
|         |      |      |         | 19.20       | - | 19.55 | 114  | 2.79 | 94.88   |
|         |      |      |         | 19.55       | - | 19.90 | 58   | 1.42 | 96.30   |
|         |      |      |         | 19.90       | - | 20.25 | 56   | 1.37 | 97.67   |
|         |      |      |         | 20.25       | - | 20.60 | 24   | 0.59 | 98.26   |
|         |      |      |         | 20.60       | - | 20.95 | 28   | 0.69 | 98.95   |
|         |      |      |         | 20.95       | - | 21.30 | 18   | 0.44 | 99.39   |
|         |      |      |         | 21.30       | - | 21.65 | 8    | 0.20 | 99.58   |
|         |      |      |         | 21.65       | - | 22.00 | 6    | 0.15 | 99.73   |
|         |      |      |         | 22.00       | - | 22.35 | 2    | 0.05 | 99.78   |
|         |      |      |         | 22.35       | - | 22.70 | 2    | 0.05 | 99.83   |
|         |      |      |         | 22.70       | - | 23.05 | 3    | 0.07 | 99.90   |
|         |      |      |         | 23.05       | - | 23.40 | 1    | 0.02 | 99.93   |
|         |      |      |         | 23.40       | - | 23.75 | 3    | 0.07 | 100.00  |

## (D23) RISE (OMPHALION)

The vertical distance between the level of the waist at the navel (omphalion) and the crotch of a participant standing erect is calculated as follows: WAIST HEIGHT (OMPHALION) minus CROTCH HEIGHT.



| PERCENTILES |      |      |       |       |
|-------------|------|------|-------|-------|
| FEMALES     |      |      | MALES |       |
| CM          | IN   |      | CM    | IN    |
| 14.90       | 5.87 | 1ST  | 16.10 | 6.34  |
| 15.40       | 6.06 | 2ND  | 16.60 | 6.54  |
| 15.80       | 6.22 | 3RD  | 17.10 | 6.73  |
| 16.40       | 6.46 | 5TH  | 17.60 | 6.93  |
| 17.10       | 6.73 | 10TH | 18.30 | 7.20  |
| 17.70       | 6.97 | 15TH | 18.80 | 7.40  |
| 18.00       | 7.09 | 20TH | 19.30 | 7.60  |
| 18.40       | 7.24 | 25TH | 19.70 | 7.76  |
| 18.60       | 7.32 | 30TH | 20.00 | 7.87  |
| 18.90       | 7.44 | 35TH | 20.20 | 7.95  |
| 19.20       | 7.56 | 40TH | 20.50 | 8.07  |
| 19.50       | 7.68 | 45TH | 20.80 | 8.19  |
| 19.80       | 7.80 | 50TH | 21.10 | 8.31  |
| 20.10       | 7.91 | 55TH | 21.30 | 8.39  |
| 20.30       | 7.99 | 60TH | 21.60 | 8.50  |
| 20.60       | 8.11 | 65TH | 21.90 | 8.62  |
| 20.90       | 8.23 | 70TH | 22.20 | 8.74  |
| 21.20       | 8.35 | 75TH | 22.40 | 8.82  |
| 21.60       | 8.50 | 80TH | 22.80 | 8.98  |
| 22.00       | 8.66 | 85TH | 23.20 | 9.13  |
| 22.40       | 8.82 | 90TH | 23.80 | 9.37  |
| 23.20       | 9.13 | 95TH | 24.60 | 9.69  |
| 23.70       | 9.33 | 97TH | 25.10 | 9.88  |
| 24.20       | 9.53 | 98TH | 25.50 | 10.04 |
| 24.90       | 9.80 | 99TH | 26.00 | 10.24 |

(D23) RISE (OMPHALION)

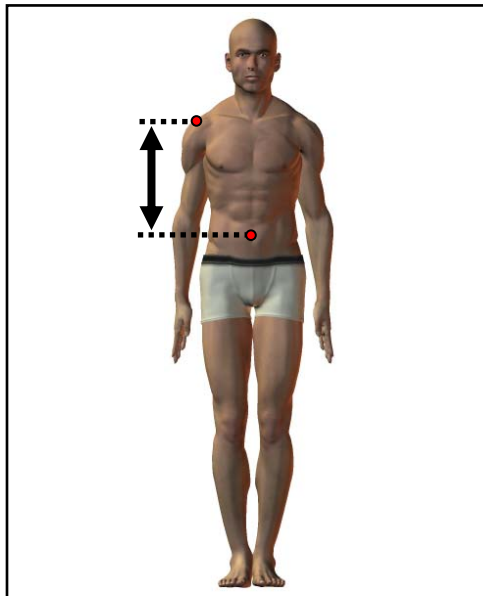
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 19.78                    | MEAN                 | 7.79  |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 2.10                     | STANDARD DEVIATION   | 0.83  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 12.50                    | MINIMUM              | 4.92  |
| 27.60                    | MAXIMUM              | 10.87 |
| SKEWNESS                 |                      | 0.03  |
| KURTOSIS                 |                      | 3.15  |
| COEFFICIENT OF VARIATION |                      | 10.6% |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 21.06                    | MEAN                 | 8.29  |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 2.13                     | STANDARD DEVIATION   | 0.84  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 11.80                    | MINIMUM              | 4.65  |
| 28.30                    | MAXIMUM              | 11.14 |
| SKEWNESS                 |                      | -0.05 |
| KURTOSIS                 |                      | 3.19  |
| COEFFICIENT OF VARIATION |                      | 10.1% |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|------|------|---------|
| E       | FPct | CumF | CumFPct | CM          |   | E     | FPct | CumF | CumFPct |
|         |      |      |         | 11.75       | - | 12.10 | 1    | 0.02 | 0.02    |
|         |      |      |         | 12.10       | - | 12.45 | 0    | 0.00 | 0.02    |
| 2       | 0.10 | 2    | 0.10    | 12.45       | - | 12.80 | 2    | 0.05 | 0.07    |
| 2       | 0.10 | 4    | 0.20    | 12.80       | - | 13.15 | 1    | 0.02 | 0.10    |
| 1       | 0.05 | 5    | 0.25    | 13.15       | - | 13.50 | 1    | 0.02 | 0.12    |
| 1       | 0.05 | 6    | 0.30    | 13.50       | - | 13.85 | 2    | 0.05 | 0.17    |
| 2       | 0.10 | 8    | 0.40    | 13.85       | - | 14.20 | 0    | 0.00 | 0.17    |
| 5       | 0.25 | 13   | 0.65    | 14.20       | - | 14.55 | 2    | 0.05 | 0.22    |
| 6       | 0.30 | 19   | 0.96    | 14.55       | - | 14.90 | 0    | 0.00 | 0.22    |
| 10      | 0.50 | 29   | 1.46    | 14.90       | - | 15.25 | 6    | 0.15 | 0.37    |
| 17      | 0.86 | 46   | 2.32    | 15.25       | - | 15.60 | 12   | 0.29 | 0.66    |
| 20      | 1.01 | 66   | 3.32    | 15.60       | - | 15.95 | 8    | 0.20 | 0.86    |
| 19      | 0.96 | 85   | 4.28    | 15.95       | - | 16.30 | 10   | 0.24 | 1.10    |
| 39      | 1.96 | 124  | 6.24    | 16.30       | - | 16.65 | 39   | 0.96 | 2.06    |
| 47      | 2.37 | 171  | 8.61    | 16.65       | - | 17.00 | 25   | 0.61 | 2.67    |
| 69      | 3.47 | 240  | 12.08   | 17.00       | - | 17.35 | 46   | 1.13 | 3.80    |
| 55      | 2.77 | 295  | 14.85   | 17.35       | - | 17.70 | 66   | 1.62 | 5.41    |
| 109     | 5.49 | 404  | 20.34   | 17.70       | - | 18.05 | 93   | 2.28 | 7.69    |
| 89      | 4.48 | 493  | 24.82   | 18.05       | - | 18.40 | 98   | 2.40 | 10.09   |
| 139     | 7.00 | 632  | 31.82   | 18.40       | - | 18.75 | 153  | 3.75 | 13.84   |
| 115     | 5.79 | 747  | 37.61   | 18.75       | - | 19.10 | 149  | 3.65 | 17.49   |
| 130     | 6.55 | 877  | 44.16   | 19.10       | - | 19.45 | 192  | 4.70 | 22.20   |
| 98      | 4.93 | 975  | 49.09   | 19.45       | - | 19.80 | 172  | 4.21 | 26.41   |
| 135     | 6.80 | 1110 | 55.89   | 19.80       | - | 20.15 | 282  | 6.91 | 33.32   |
| 138     | 6.95 | 1248 | 62.84   | 20.15       | - | 20.50 | 208  | 5.10 | 38.41   |
| 138     | 6.95 | 1386 | 69.79   | 20.50       | - | 20.85 | 311  | 7.62 | 46.03   |
| 95      | 4.78 | 1481 | 74.57   | 20.85       | - | 21.20 | 232  | 5.68 | 51.71   |
| 106     | 5.34 | 1587 | 79.91   | 21.20       | - | 21.55 | 297  | 7.28 | 58.99   |
| 75      | 3.78 | 1662 | 83.69   | 21.55       | - | 21.90 | 217  | 5.32 | 64.31   |
| 93      | 4.68 | 1755 | 88.37   | 21.90       | - | 22.25 | 299  | 7.32 | 71.63   |
| 57      | 2.87 | 1812 | 91.24   | 22.25       | - | 22.60 | 211  | 5.17 | 76.80   |
| 48      | 2.42 | 1860 | 93.66   | 22.60       | - | 22.95 | 223  | 5.46 | 82.26   |
| 29      | 1.46 | 1889 | 95.12   | 22.95       | - | 23.30 | 114  | 2.79 | 85.06   |
| 34      | 1.71 | 1923 | 96.83   | 23.30       | - | 23.65 | 156  | 3.82 | 88.88   |
| 12      | 0.60 | 1935 | 97.43   | 23.65       | - | 24.00 | 101  | 2.47 | 91.35   |
| 16      | 0.81 | 1951 | 98.24   | 24.00       | - | 24.35 | 105  | 2.57 | 93.92   |
| 9       | 0.45 | 1960 | 98.69   | 24.35       | - | 24.70 | 64   | 1.57 | 95.49   |
| 11      | 0.55 | 1971 | 99.24   | 24.70       | - | 25.05 | 53   | 1.30 | 96.79   |
| 6       | 0.30 | 1977 | 99.55   | 25.05       | - | 25.40 | 35   | 0.86 | 97.65   |
| 3       | 0.15 | 1980 | 99.70   | 25.40       | - | 25.75 | 43   | 1.05 | 98.70   |
| 1       | 0.05 | 1981 | 99.75   | 25.75       | - | 26.10 | 17   | 0.42 | 99.12   |
| 1       | 0.05 | 1982 | 99.80   | 26.10       | - | 26.45 | 9    | 0.22 | 99.34   |
| 3       | 0.15 | 1985 | 99.95   | 26.45       | - | 26.80 | 10   | 0.24 | 99.58   |
| 0       | 0.00 | 1985 | 99.95   | 26.80       | - | 27.15 | 11   | 0.27 | 99.85   |
| 0       | 0.00 | 1985 | 99.95   | 27.15       | - | 27.50 | 2    | 0.05 | 99.90   |
| 1       | 0.05 | 1986 | 100.00  | 27.50       | - | 27.85 | 3    | 0.07 | 99.98   |
|         |      |      |         | 27.85       | - | 28.20 | 0    | 0.00 | 99.98   |
|         |      |      |         | 28.20       | - | 28.55 | 1    | 0.02 | 100.00  |

## (D24) SHOULDER-WAIST LENGTH (OMPHALION)

The vertical distance between the acromion right landmark and the level of the waist at the navel (omphalion) of a participant standing erect is calculated as follows: ACROMIAL HEIGHT minus WAIST HEIGHT (OMPHALION).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 29.90       | 11.77 | 1ST  | 32.10 | 12.64 |
| 30.50       | 12.01 | 2ND  | 32.70 | 12.87 |
| 30.80       | 12.13 | 3RD  | 33.30 | 13.11 |
| 31.60       | 12.44 | 5TH  | 33.90 | 13.35 |
| 32.50       | 12.80 | 10TH | 34.90 | 13.74 |
| 33.00       | 12.99 | 15TH | 35.50 | 13.98 |
| 33.50       | 13.19 | 20TH | 36.10 | 14.21 |
| 33.80       | 13.31 | 25TH | 36.50 | 14.37 |
| 34.10       | 13.43 | 30TH | 36.90 | 14.53 |
| 34.50       | 13.58 | 35TH | 37.40 | 14.72 |
| 34.80       | 13.70 | 40TH | 37.70 | 14.84 |
| 35.20       | 13.86 | 45TH | 38.00 | 14.96 |
| 35.40       | 13.94 | 50TH | 38.30 | 15.08 |
| 35.80       | 14.09 | 55TH | 38.70 | 15.24 |
| 36.10       | 14.21 | 60TH | 39.00 | 15.35 |
| 36.40       | 14.33 | 65TH | 39.40 | 15.51 |
| 36.70       | 14.45 | 70TH | 39.80 | 15.67 |
| 37.10       | 14.61 | 75TH | 40.20 | 15.83 |
| 37.50       | 14.76 | 80TH | 40.70 | 16.02 |
| 38.00       | 14.96 | 85TH | 41.30 | 16.26 |
| 38.60       | 15.20 | 90TH | 42.00 | 16.54 |
| 39.70       | 15.63 | 95TH | 43.30 | 17.05 |
| 40.30       | 15.87 | 97TH | 44.20 | 17.40 |
| 40.70       | 16.02 | 98TH | 44.70 | 17.60 |
| 41.70       | 16.42 | 99TH | 45.80 | 18.03 |

## (D24) SHOULDER-WAIST LENGTH (OMPHALION)

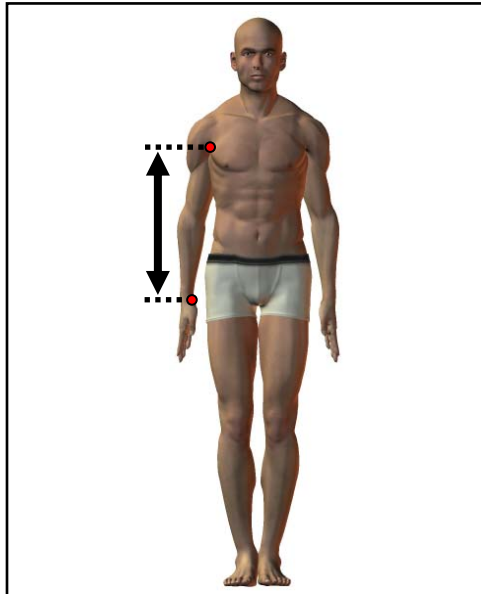
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 35.49                    | MEAN                 | 13.97 |
| 0.06                     | STD. ERROR (MEAN)    | 0.02  |
| 2.45                     | STANDARD DEVIATION   | 0.97  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 28.30                    | MINIMUM              | 11.14 |
| 44.30                    | MAXIMUM              | 17.44 |
| SKEWNESS                 |                      | 0.14  |
| KURTOSIS                 |                      | 3.05  |
| COEFFICIENT OF VARIATION |                      | 6.9%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 38.43                    | MEAN                 | 15.13 |
| 0.04                     | STD. ERROR (MEAN)    | 0.02  |
| 2.85                     | STANDARD DEVIATION   | 1.12  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 29.00                    | MINIMUM              | 11.42 |
| 50.90                    | MAXIMUM              | 20.04 |
| SKEWNESS                 |                      | 0.20  |
| KURTOSIS                 |                      | 3.27  |
| COEFFICIENT OF VARIATION |                      | 7.4%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10 | 2    | 0.10    | 28.25       | - | 28.75 |  | 2     | 0.05 | 2    | 0.05    |
| 4       | 0.20 | 6    | 0.30    | 28.75       | - | 29.25 |  |       |      |      |         |
| 8       | 0.40 | 14   | 0.70    | 29.25       | - | 29.75 |  | 1     | 0.02 | 3    | 0.07    |
| 13      | 0.65 | 27   | 1.36    | 29.75       | - | 30.25 |  | 3     | 0.07 | 6    | 0.15    |
| 30      | 1.51 | 57   | 2.87    | 30.25       | - | 30.75 |  | 4     | 0.10 | 10   | 0.24    |
| 27      | 1.36 | 84   | 4.23    | 30.75       | - | 31.25 |  | 7     | 0.17 | 17   | 0.42    |
| 36      | 1.81 | 120  | 6.04    | 31.25       | - | 31.75 |  | 13    | 0.32 | 30   | 0.73    |
| 57      | 2.87 | 177  | 8.91    | 31.75       | - | 32.25 |  | 18    | 0.44 | 48   | 1.18    |
| 67      | 3.37 | 244  | 12.29   | 32.25       | - | 32.75 |  | 35    | 0.86 | 83   | 2.03    |
| 98      | 4.93 | 342  | 17.22   | 32.75       | - | 33.25 |  | 39    | 0.96 | 122  | 2.99    |
| 126     | 6.34 | 468  | 23.56   | 33.25       | - | 33.75 |  | 63    | 1.54 | 185  | 4.53    |
| 166     | 8.36 | 634  | 31.92   | 33.75       | - | 34.25 |  | 84    | 2.06 | 269  | 6.59    |
| 145     | 7.30 | 779  | 39.22   | 34.25       | - | 34.75 |  | 109   | 2.67 | 378  | 9.26    |
| 144     | 7.25 | 923  | 46.48   | 34.75       | - | 35.25 |  | 150   | 3.67 | 528  | 12.93   |
| 166     | 8.36 | 1089 | 54.83   | 35.25       | - | 35.75 |  | 168   | 4.12 | 696  | 17.05   |
| 166     | 8.36 | 1255 | 63.19   | 35.75       | - | 36.25 |  | 191   | 4.68 | 887  | 21.73   |
| 143     | 7.20 | 1398 | 70.39   | 36.25       | - | 36.75 |  | 251   | 6.15 | 1138 | 27.88   |
| 130     | 6.55 | 1528 | 76.94   | 36.75       | - | 37.25 |  | 225   | 5.51 | 1363 | 33.39   |
| 99      | 4.98 | 1627 | 81.92   | 37.25       | - | 37.75 |  | 321   | 7.86 | 1684 | 41.25   |
| 111     | 5.59 | 1738 | 87.51   | 37.75       | - | 38.25 |  | 298   | 7.30 | 1982 | 48.55   |
| 74      | 3.73 | 1812 | 91.24   | 38.25       | - | 38.75 |  | 308   | 7.55 | 2290 | 56.10   |
| 42      | 2.11 | 1854 | 93.35   | 38.75       | - | 39.25 |  | 286   | 7.01 | 2576 | 63.11   |
| 36      | 1.81 | 1890 | 95.17   | 39.25       | - | 39.75 |  | 254   | 6.22 | 2830 | 69.33   |
| 30      | 1.51 | 1920 | 96.68   | 39.75       | - | 40.25 |  | 259   | 6.34 | 3089 | 75.67   |
| 30      | 1.51 | 1950 | 98.19   | 40.25       | - | 40.75 |  | 187   | 4.58 | 3276 | 80.25   |
| 10      | 0.50 | 1960 | 98.69   | 40.75       | - | 41.25 |  | 173   | 4.24 | 3449 | 84.49   |
| 8       | 0.40 | 1968 | 99.09   | 41.25       | - | 41.75 |  | 151   | 3.70 | 3600 | 88.19   |
| 6       | 0.30 | 1974 | 99.40   | 41.75       | - | 42.25 |  | 121   | 2.96 | 3721 | 91.16   |
| 6       | 0.30 | 1980 | 99.70   | 42.25       | - | 42.75 |  | 83    | 2.03 | 3804 | 93.19   |
| 5       | 0.25 | 1985 | 99.95   | 42.75       | - | 43.25 |  | 65    | 1.59 | 3869 | 94.78   |
| 0       | 0.00 | 1985 | 99.95   | 43.25       | - | 43.75 |  | 58    | 1.42 | 3927 | 96.20   |
| 0       | 0.00 | 1985 | 99.95   | 43.75       | - | 44.25 |  | 43    | 1.05 | 3970 | 97.26   |
| 1       | 0.05 | 1986 | 100.00  | 44.25       | - | 44.75 |  | 34    | 0.83 | 4004 | 98.09   |
|         |      |      |         | 44.75       | - | 45.25 |  | 26    | 0.64 | 4030 | 98.73   |
|         |      |      |         | 45.25       | - | 45.75 |  | 11    | 0.27 | 4041 | 99.00   |
|         |      |      |         | 45.75       | - | 46.25 |  | 14    | 0.34 | 4055 | 99.34   |
|         |      |      |         | 46.25       | - | 46.75 |  | 9     | 0.22 | 4064 | 99.56   |
|         |      |      |         | 46.75       | - | 47.25 |  | 5     | 0.12 | 4069 | 99.68   |
|         |      |      |         | 47.25       | - | 47.75 |  | 6     | 0.15 | 4075 | 99.83   |
|         |      |      |         | 47.75       | - | 48.25 |  | 4     | 0.10 | 4079 | 99.93   |
|         |      |      |         | 48.25       | - | 48.75 |  | 2     | 0.05 | 4081 | 99.98   |
|         |      |      |         | 48.75       | - | 49.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 49.25       | - | 49.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 49.75       | - | 50.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 50.25       | - | 50.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 50.75       | - | 51.25 |  | 1     | 0.02 | 4082 | 100.00  |

## (D25) SLEEVE INSEAM

The vertical distance between the anterior-scye-on-the-torso landmark and the stylium landmark of a participant standing erect with the arms straight at the sides is calculated as follows: AXILLA HEIGHT minus WRIST HEIGHT.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 37.80       | 14.88 | 1ST  | 41.00 | 16.14 |
| 38.50       | 15.16 | 2ND  | 42.00 | 16.54 |
| 39.20       | 15.43 | 3RD  | 42.40 | 16.69 |
| 39.80       | 15.67 | 5TH  | 43.20 | 17.01 |
| 40.70       | 16.02 | 10TH | 44.20 | 17.40 |
| 41.50       | 16.34 | 15TH | 45.00 | 17.72 |
| 42.00       | 16.54 | 20TH | 45.60 | 17.95 |
| 42.50       | 16.73 | 25TH | 46.00 | 18.11 |
| 42.90       | 16.89 | 30TH | 46.50 | 18.31 |
| 43.20       | 17.01 | 35TH | 46.90 | 18.46 |
| 43.60       | 17.17 | 40TH | 47.30 | 18.62 |
| 44.00       | 17.32 | 45TH | 47.70 | 18.78 |
| 44.40       | 17.48 | 50TH | 48.10 | 18.94 |
| 44.80       | 17.64 | 55TH | 48.50 | 19.09 |
| 45.20       | 17.80 | 60TH | 49.00 | 19.29 |
| 45.60       | 17.95 | 65TH | 49.40 | 19.45 |
| 46.00       | 18.11 | 70TH | 49.80 | 19.61 |
| 46.50       | 18.31 | 75TH | 50.20 | 19.76 |
| 47.00       | 18.50 | 80TH | 50.70 | 19.96 |
| 47.70       | 18.78 | 85TH | 51.30 | 20.20 |
| 48.40       | 19.06 | 90TH | 52.10 | 20.51 |
| 49.40       | 19.45 | 95TH | 53.40 | 21.02 |
| 50.30       | 19.80 | 97TH | 54.10 | 21.30 |
| 50.70       | 19.96 | 98TH | 54.90 | 21.61 |
| 51.40       | 20.24 | 99TH | 56.00 | 22.05 |

(D25) SLEEVE INSEAM

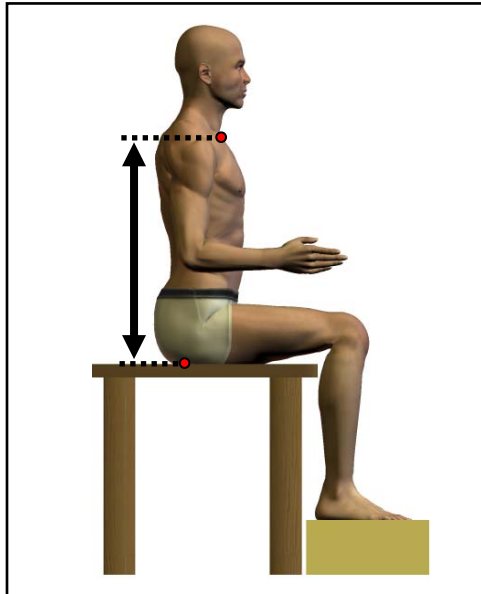
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 44.48                    | MEAN                 | 17.51 |
| 0.07                     | STD. ERROR (MEAN)    | 0.03  |
| 2.98                     | STANDARD DEVIATION   | 1.17  |
| 0.05                     | STD. ERROR (STD.DEV) | 0.02  |
| 32.80                    | MINIMUM              | 12.91 |
| 55.60                    | MAXIMUM              | 21.89 |
| SKEWNESS                 |                      | 0.08  |
| KURTOSIS                 |                      | 3.12  |
| COEFFICIENT OF VARIATION |                      | 6.7%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 48.16                    | MEAN                 | 18.96 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 3.13                     | STANDARD DEVIATION   | 1.23  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 36.00                    | MINIMUM              | 14.17 |
| 61.80                    | MAXIMUM              | 24.33 |
| SKEWNESS                 |                      | 0.11  |
| KURTOSIS                 |                      | 3.23  |
| COEFFICIENT OF VARIATION |                      | 6.5%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | MALES |      |      |         |
|---------|-------|------|---------|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 1     | 0.02 | 1    | 0.02    |
| 1       | 0.05  | 2    | 0.10    | 0     | 0.00 | 1    | 0.02    |
| 1       | 0.05  | 3    | 0.15    | 1     | 0.02 | 2    | 0.05    |
| 1       | 0.05  | 4    | 0.20    | 5     | 0.12 | 7    | 0.17    |
| 3       | 0.15  | 7    | 0.35    | 4     | 0.10 | 11   | 0.27    |
| 6       | 0.30  | 13   | 0.65    | 11    | 0.27 | 22   | 0.54    |
| 8       | 0.40  | 21   | 1.06    | 16    | 0.39 | 38   | 0.93    |
| 27      | 1.36  | 48   | 2.42    | 25    | 0.61 | 63   | 1.54    |
| 27      | 1.36  | 75   | 3.78    | 64    | 1.57 | 127  | 3.11    |
| 76      | 3.83  | 151  | 7.60    | 89    | 2.18 | 216  | 5.29    |
| 70      | 3.52  | 221  | 11.13   | 135   | 3.31 | 351  | 8.60    |
| 129     | 6.50  | 350  | 17.62   | 211   | 5.17 | 562  | 13.77   |
| 131     | 6.60  | 481  | 24.22   | 207   | 5.07 | 769  | 18.84   |
| 225     | 11.33 | 706  | 35.55   | 360   | 8.82 | 1129 | 27.66   |
| 170     | 8.56  | 876  | 44.11   | 328   | 8.04 | 1457 | 35.69   |
| 212     | 10.67 | 1088 | 54.78   | 406   | 9.95 | 1863 | 45.64   |
| 166     | 8.36  | 1254 | 63.14   | 348   | 8.53 | 2211 | 54.16   |
| 184     | 9.26  | 1438 | 72.41   | 378   | 9.26 | 2589 | 63.42   |
| 148     | 7.45  | 1586 | 79.86   | 349   | 8.55 | 2938 | 71.97   |
| 124     | 6.24  | 1710 | 86.10   | 348   | 8.53 | 3286 | 80.50   |
| 83      | 4.18  | 1793 | 90.28   | 222   | 5.44 | 3508 | 85.94   |
| 80      | 4.03  | 1873 | 94.31   | 197   | 4.83 | 3705 | 90.76   |
| 41      | 2.06  | 1914 | 96.37   | 120   | 2.94 | 3825 | 93.70   |
| 33      | 1.66  | 1947 | 98.04   | 98    | 2.40 | 3923 | 96.10   |
| 20      | 1.01  | 1967 | 99.04   | 60    | 1.47 | 3983 | 97.57   |
| 10      | 0.50  | 1977 | 99.55   | 38    | 0.93 | 4021 | 98.51   |
| 4       | 0.20  | 1981 | 99.75   | 20    | 0.49 | 4041 | 99.00   |
| 1       | 0.05  | 1982 | 99.80   | 18    | 0.44 | 4059 | 99.44   |
| 2       | 0.10  | 1984 | 99.90   | 11    | 0.27 | 4070 | 99.71   |
| 1       | 0.05  | 1985 | 99.95   | 7     | 0.17 | 4077 | 99.88   |
| 1       | 0.05  | 1986 | 100.00  | 1     | 0.02 | 4078 | 99.90   |
|         |       |      |         | 1     | 0.02 | 4079 | 99.93   |
|         |       |      |         | 1     | 0.02 | 4080 | 99.95   |
|         |       |      |         | 1     | 0.02 | 4081 | 99.98   |
|         |       |      |         | 1     | 0.02 | 4082 | 100.00  |

## (D26) SUPRASTERNALE HEIGHT, SITTING

The vertical distance between a sitting surface and the suprasternale landmark of a participant sitting erect is calculated as follows: SUPRASTERNALE HEIGHT minus (STATURE minus SITTING HEIGHT).

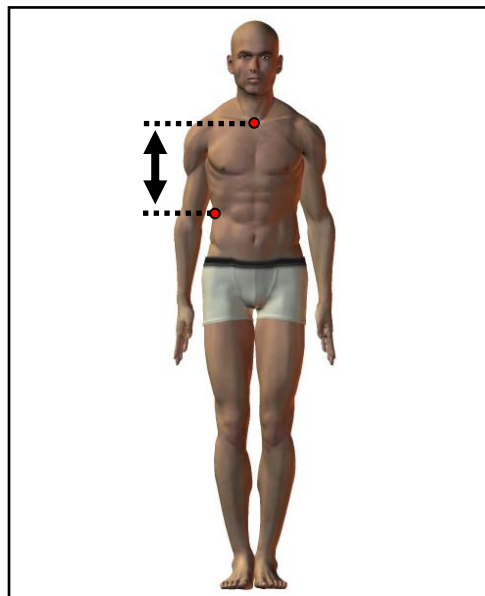


| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 50.10       | 19.72 | 1ST  | 53.30 | 20.98 |
| 50.60       | 19.92 | 2ND  | 54.30 | 21.38 |
| 51.10       | 20.12 | 3RD  | 54.80 | 21.57 |
| 51.60       | 20.31 | 5TH  | 55.50 | 21.85 |
| 52.40       | 20.63 | 10TH | 56.40 | 22.20 |
| 53.10       | 20.91 | 15TH | 57.10 | 22.48 |
| 53.60       | 21.10 | 20TH | 57.70 | 22.72 |
| 54.00       | 21.26 | 25TH | 58.10 | 22.87 |
| 54.50       | 21.46 | 30TH | 58.50 | 23.03 |
| 54.80       | 21.57 | 35TH | 59.00 | 23.23 |
| 55.10       | 21.69 | 40TH | 59.30 | 23.35 |
| 55.50       | 21.85 | 45TH | 59.70 | 23.50 |
| 55.80       | 21.97 | 50TH | 60.10 | 23.66 |
| 56.10       | 22.09 | 55TH | 60.40 | 23.78 |
| 56.40       | 22.20 | 60TH | 60.80 | 23.94 |
| 56.70       | 22.32 | 65TH | 61.10 | 24.06 |
| 57.10       | 22.48 | 70TH | 61.50 | 24.21 |
| 57.50       | 22.64 | 75TH | 62.00 | 24.41 |
| 57.90       | 22.80 | 80TH | 62.50 | 24.61 |
| 58.50       | 23.03 | 85TH | 63.10 | 24.84 |
| 59.10       | 23.27 | 90TH | 63.80 | 25.12 |
| 60.00       | 23.62 | 95TH | 64.80 | 25.51 |
| 60.60       | 23.86 | 97TH | 65.50 | 25.79 |
| 61.00       | 24.02 | 98TH | 66.00 | 25.98 |
| 61.50       | 24.21 | 99TH | 66.70 | 26.26 |



## (D27) SUPRASTERNALE-TENTH RIB LENGTH

The vertical distance between the suprasternale landmark and the tenth rib landmark is calculated as follows: SUPRASTERNALE HEIGHT minus TENTH RIB HEIGHT.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 23.40       | 9.21  | 1ST  | 26.70 | 10.51 |
| 23.90       | 9.41  | 2ND  | 27.20 | 10.71 |
| 24.10       | 9.49  | 3RD  | 27.60 | 10.87 |
| 24.50       | 9.65  | 5TH  | 28.10 | 11.06 |
| 25.20       | 9.92  | 10TH | 28.90 | 11.38 |
| 25.60       | 10.08 | 15TH | 29.50 | 11.61 |
| 25.90       | 10.20 | 20TH | 29.90 | 11.77 |
| 26.20       | 10.31 | 25TH | 30.30 | 11.93 |
| 26.40       | 10.39 | 30TH | 30.70 | 12.09 |
| 26.70       | 10.51 | 35TH | 31.00 | 12.20 |
| 26.90       | 10.59 | 40TH | 31.30 | 12.32 |
| 27.10       | 10.67 | 45TH | 31.60 | 12.44 |
| 27.30       | 10.75 | 50TH | 31.80 | 12.52 |
| 27.60       | 10.87 | 55TH | 32.10 | 12.64 |
| 27.80       | 10.94 | 60TH | 32.40 | 12.76 |
| 28.00       | 11.02 | 65TH | 32.70 | 12.87 |
| 28.20       | 11.10 | 70TH | 33.00 | 12.99 |
| 28.50       | 11.22 | 75TH | 33.30 | 13.11 |
| 28.80       | 11.34 | 80TH | 33.60 | 13.23 |
| 29.10       | 11.46 | 85TH | 34.10 | 13.43 |
| 29.50       | 11.61 | 90TH | 34.50 | 13.58 |
| 30.20       | 11.89 | 95TH | 35.30 | 13.90 |
| 30.60       | 12.05 | 97TH | 35.80 | 14.09 |
| 30.80       | 12.13 | 98TH | 36.20 | 14.25 |
| 31.20       | 12.28 | 99TH | 36.80 | 14.49 |

## (D27) SUPRASTERNAL-TENTH RIB LENGTH

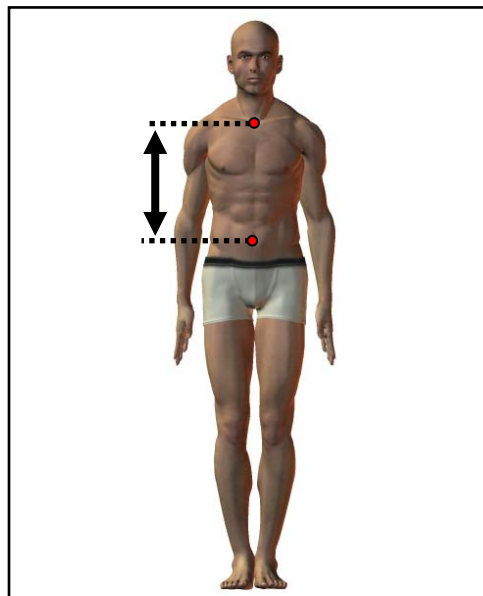
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 27.34                    | MEAN                 | 10.77 |
| 0.04                     | STD. ERROR (MEAN)    | 0.02  |
| 1.71                     | STANDARD DEVIATION   | 0.67  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 20.90                    | MINIMUM              | 8.23  |
| 33.20                    | MAXIMUM              | 13.07 |
| SKEWNESS                 |                      | 0.00  |
| KURTOSIS                 |                      | 3.03  |
| COEFFICIENT OF VARIATION |                      | 6.2%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 31.79                    | MEAN                 | 12.52 |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 2.19                     | STANDARD DEVIATION   | 0.86  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 24.40                    | MINIMUM              | 9.61  |
| 39.00                    | MAXIMUM              | 15.35 |
| SKEWNESS                 |                      | -0.08 |
| KURTOSIS                 |                      | 2.85  |
| COEFFICIENT OF VARIATION |                      | 6.9%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 20.75       | - | 21.25 |  |       |      |      |         |
| 0       | 0.00  | 1    | 0.05    | 21.25       | - | 21.75 |  |       |      |      |         |
| 3       | 0.15  | 4    | 0.20    | 21.75       | - | 22.25 |  |       |      |      |         |
| 3       | 0.15  | 7    | 0.35    | 22.25       | - | 22.75 |  |       |      |      |         |
| 10      | 0.50  | 17   | 0.86    | 22.75       | - | 23.25 |  |       |      |      |         |
| 14      | 0.70  | 31   | 1.56    | 23.25       | - | 23.75 |  |       |      |      |         |
| 43      | 2.17  | 74   | 3.73    | 23.75       | - | 24.25 |  |       |      |      |         |
| 59      | 2.97  | 133  | 6.70    | 24.25       | - | 24.75 |  | 1     | 0.02 | 1    | 0.02    |
| 77      | 3.88  | 210  | 10.57   | 24.75       | - | 25.25 |  | 0     | 0.00 | 1    | 0.02    |
| 135     | 6.80  | 345  | 17.37   | 25.25       | - | 25.75 |  | 7     | 0.17 | 8    | 0.20    |
| 172     | 8.66  | 517  | 26.03   | 25.75       | - | 26.25 |  | 16    | 0.39 | 24   | 0.59    |
| 204     | 10.27 | 721  | 36.30   | 26.25       | - | 26.75 |  | 21    | 0.51 | 45   | 1.10    |
| 217     | 10.93 | 938  | 47.23   | 26.75       | - | 27.25 |  | 40    | 0.98 | 85   | 2.08    |
| 249     | 12.54 | 1187 | 59.77   | 27.25       | - | 27.75 |  | 64    | 1.57 | 149  | 3.65    |
| 214     | 10.78 | 1401 | 70.54   | 27.75       | - | 28.25 |  | 91    | 2.23 | 240  | 5.88    |
| 177     | 8.91  | 1578 | 79.46   | 28.25       | - | 28.75 |  | 121   | 2.96 | 361  | 8.84    |
| 140     | 7.05  | 1718 | 86.51   | 28.75       | - | 29.25 |  | 175   | 4.29 | 536  | 13.13   |
| 115     | 5.79  | 1833 | 92.30   | 29.25       | - | 29.75 |  | 198   | 4.85 | 734  | 17.98   |
| 57      | 2.87  | 1890 | 95.17   | 29.75       | - | 30.25 |  | 243   | 5.95 | 977  | 23.93   |
| 52      | 2.62  | 1942 | 97.78   | 30.25       | - | 30.75 |  | 299   | 7.32 | 1276 | 31.26   |
| 25      | 1.26  | 1967 | 99.04   | 30.75       | - | 31.25 |  | 332   | 8.13 | 1608 | 39.39   |
| 10      | 0.50  | 1977 | 99.55   | 31.25       | - | 31.75 |  | 381   | 9.33 | 1989 | 48.73   |
| 5       | 0.25  | 1982 | 99.80   | 31.75       | - | 32.25 |  | 343   | 8.40 | 2332 | 57.13   |
| 3       | 0.15  | 1985 | 99.95   | 32.25       | - | 32.75 |  | 347   | 8.50 | 2679 | 65.63   |
| 1       | 0.05  | 1986 | 100.00  | 32.75       | - | 33.25 |  | 349   | 8.55 | 3028 | 74.18   |
|         |       |      |         | 33.25       | - | 33.75 |  | 306   | 7.50 | 3334 | 81.68   |
|         |       |      |         | 33.75       | - | 34.25 |  | 228   | 5.59 | 3562 | 87.26   |
|         |       |      |         | 34.25       | - | 34.75 |  | 180   | 4.41 | 3742 | 91.67   |
|         |       |      |         | 34.75       | - | 35.25 |  | 125   | 3.06 | 3867 | 94.73   |
|         |       |      |         | 35.25       | - | 35.75 |  | 69    | 1.69 | 3936 | 96.42   |
|         |       |      |         | 35.75       | - | 36.25 |  | 73    | 1.79 | 4009 | 98.21   |
|         |       |      |         | 36.25       | - | 36.75 |  | 27    | 0.66 | 4036 | 98.87   |
|         |       |      |         | 36.75       | - | 37.25 |  | 25    | 0.61 | 4061 | 99.49   |
|         |       |      |         | 37.25       | - | 37.75 |  | 14    | 0.34 | 4075 | 99.83   |
|         |       |      |         | 37.75       | - | 38.25 |  | 6     | 0.15 | 4081 | 99.98   |
|         |       |      |         | 38.25       | - | 38.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |       |      |         | 38.75       | - | 39.25 |  | 1     | 0.02 | 4082 | 100.00  |

## (D28) SUPRASTERNALE-WAIST LENGTH (OMPHALION)

The vertical distance between the suprasternale landmark and the waist (omphalion) landmark is calculated as follows: SUPRASTERNALE HEIGHT minus WAIST HEIGHT (OMPHALION).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 30.10       | 11.85 | 1ST  | 32.60 | 12.83 |
| 30.50       | 12.01 | 2ND  | 33.30 | 13.11 |
| 30.90       | 12.17 | 3RD  | 33.60 | 13.23 |
| 31.50       | 12.40 | 5TH  | 34.20 | 13.46 |
| 32.10       | 12.64 | 10TH | 35.00 | 13.78 |
| 32.60       | 12.83 | 15TH | 35.50 | 13.98 |
| 33.00       | 12.99 | 20TH | 36.10 | 14.21 |
| 33.50       | 13.19 | 25TH | 36.40 | 14.33 |
| 33.80       | 13.31 | 30TH | 36.80 | 14.49 |
| 34.10       | 13.43 | 35TH | 37.20 | 14.65 |
| 34.30       | 13.50 | 40TH | 37.50 | 14.76 |
| 34.60       | 13.62 | 45TH | 37.80 | 14.88 |
| 34.90       | 13.74 | 50TH | 38.10 | 15.00 |
| 35.20       | 13.86 | 55TH | 38.30 | 15.08 |
| 35.40       | 13.94 | 60TH | 38.70 | 15.24 |
| 35.70       | 14.06 | 65TH | 39.10 | 15.39 |
| 36.00       | 14.17 | 70TH | 39.40 | 15.51 |
| 36.40       | 14.33 | 75TH | 39.90 | 15.71 |
| 36.80       | 14.49 | 80TH | 40.30 | 15.87 |
| 37.30       | 14.69 | 85TH | 40.90 | 16.10 |
| 37.80       | 14.88 | 90TH | 41.60 | 16.38 |
| 38.80       | 15.28 | 95TH | 42.70 | 16.81 |
| 39.40       | 15.51 | 97TH | 43.40 | 17.09 |
| 39.80       | 15.67 | 98TH | 43.90 | 17.28 |
| 40.40       | 15.91 | 99TH | 44.80 | 17.64 |

## (D28) SUPRASTERNALE-WAIST LENGTH (OMPHALION)

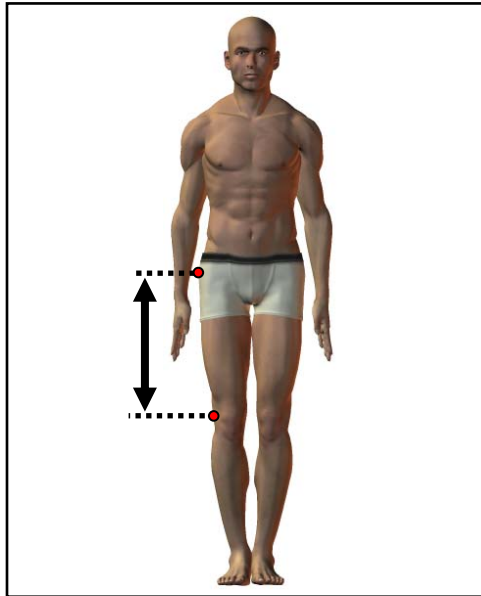
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 34.95                    | MEAN                 | 13.76 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 2.23                     | STANDARD DEVIATION   | 0.88  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.01  |
| 28.40                    | MINIMUM              | 11.18 |
| 43.50                    | MAXIMUM              | 17.13 |
| SKEWNESS                 |                      | 0.20  |
| KURTOSIS                 |                      | 3.05  |
| COEFFICIENT OF VARIATION |                      | 6.4%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 38.21                    | MEAN                 | 15.04 |
| 0.04                     | STD. ERROR (MEAN)    | 0.02  |
| 2.59                     | STANDARD DEVIATION   | 1.02  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 29.30                    | MINIMUM              | 11.54 |
| 48.30                    | MAXIMUM              | 19.02 |
| SKEWNESS                 |                      | 0.25  |
| KURTOSIS                 |                      | 3.13  |
| COEFFICIENT OF VARIATION |                      | 6.8%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   | MALES |      |      |         |
|---------|-------|------|---------|-------------|---|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 28.25       | - | 28.75 |      |      |         |
| 4       | 0.20  | 5    | 0.25    | 28.75       | - | 29.25 |      |      |         |
| 7       | 0.35  | 12   | 0.60    | 29.25       | - | 29.75 | 2    | 0.05 | 0.05    |
| 15      | 0.76  | 27   | 1.36    | 29.75       | - | 30.25 | 1    | 0.02 | 0.07    |
| 26      | 1.31  | 53   | 2.67    | 30.25       | - | 30.75 | 1    | 0.02 | 0.10    |
| 33      | 1.66  | 86   | 4.33    | 30.75       | - | 31.25 | 4    | 0.10 | 0.20    |
| 64      | 3.22  | 150  | 7.55    | 31.25       | - | 31.75 | 4    | 0.10 | 0.29    |
| 67      | 3.37  | 217  | 10.93   | 31.75       | - | 32.25 | 12   | 0.29 | 0.59    |
| 112     | 5.64  | 329  | 16.57   | 32.25       | - | 32.75 | 20   | 0.49 | 1.08    |
| 117     | 5.89  | 446  | 22.46   | 32.75       | - | 33.25 | 36   | 0.88 | 1.96    |
| 134     | 6.75  | 580  | 29.20   | 33.25       | - | 33.75 | 61   | 1.49 | 3.45    |
| 177     | 8.91  | 757  | 38.12   | 33.75       | - | 34.25 | 88   | 2.16 | 5.61    |
| 200     | 10.07 | 957  | 48.19   | 34.25       | - | 34.75 | 107  | 2.62 | 8.23    |
| 160     | 8.06  | 1117 | 56.24   | 34.75       | - | 35.25 | 165  | 4.04 | 12.27   |
| 176     | 8.86  | 1293 | 65.11   | 35.25       | - | 35.75 | 185  | 4.53 | 16.81   |
| 155     | 7.80  | 1448 | 72.91   | 35.75       | - | 36.25 | 241  | 5.90 | 22.71   |
| 133     | 6.70  | 1581 | 79.61   | 36.25       | - | 36.75 | 249  | 6.10 | 28.81   |
| 106     | 5.34  | 1687 | 84.94   | 36.75       | - | 37.25 | 308  | 7.55 | 36.35   |
| 89      | 4.48  | 1776 | 89.43   | 37.25       | - | 37.75 | 341  | 8.35 | 44.71   |
| 57      | 2.87  | 1833 | 92.30   | 37.75       | - | 38.25 | 350  | 8.57 | 53.28   |
| 50      | 2.52  | 1883 | 94.81   | 38.25       | - | 38.75 | 297  | 7.28 | 60.56   |
| 35      | 1.76  | 1918 | 96.58   | 38.75       | - | 39.25 | 274  | 6.71 | 67.27   |
| 26      | 1.31  | 1944 | 97.89   | 39.25       | - | 39.75 | 246  | 6.03 | 73.30   |
| 20      | 1.01  | 1964 | 98.89   | 39.75       | - | 40.25 | 246  | 6.03 | 79.32   |
| 9       | 0.45  | 1973 | 99.35   | 40.25       | - | 40.75 | 173  | 4.24 | 83.56   |
| 6       | 0.30  | 1979 | 99.65   | 40.75       | - | 41.25 | 162  | 3.97 | 87.53   |
| 2       | 0.10  | 1981 | 99.75   | 41.25       | - | 41.75 | 130  | 3.18 | 90.72   |
| 2       | 0.10  | 1983 | 99.85   | 41.75       | - | 42.25 | 99   | 2.43 | 93.14   |
| 1       | 0.05  | 1984 | 99.90   | 42.25       | - | 42.75 | 89   | 2.18 | 95.32   |
| 1       | 0.05  | 1985 | 99.95   | 42.75       | - | 43.25 | 51   | 1.25 | 96.57   |
| 1       | 0.05  | 1986 | 100.00  | 43.25       | - | 43.75 | 46   | 1.13 | 97.70   |
|         |       |      |         | 43.75       | - | 44.25 | 31   | 0.76 | 98.46   |
|         |       |      |         | 44.25       | - | 44.75 | 22   | 0.54 | 99.00   |
|         |       |      |         | 44.75       | - | 45.25 | 18   | 0.44 | 99.44   |
|         |       |      |         | 45.25       | - | 45.75 | 8    | 0.20 | 99.63   |
|         |       |      |         | 45.75       | - | 46.25 | 5    | 0.12 | 99.76   |
|         |       |      |         | 46.25       | - | 46.75 | 5    | 0.12 | 99.88   |
|         |       |      |         | 46.75       | - | 47.25 | 2    | 0.05 | 99.93   |
|         |       |      |         | 47.25       | - | 47.75 | 0    | 0.00 | 99.93   |
|         |       |      |         | 47.75       | - | 48.25 | 2    | 0.05 | 99.98   |
|         |       |      |         | 48.25       | - | 48.75 | 1    | 0.02 | 100.00  |

## (D29) THIGH LINK

The vertical distance between the trochanterion landmark and the lateral femoral epicondyle landmark is calculated as follows: TROCHANTERION HEIGHT minus LATERAL FEMORAL EPICONDYLE HEIGHT.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 32.60       | 12.83 | 1ST  | 34.60 | 13.62 |
| 33.10       | 13.03 | 2ND  | 35.30 | 13.90 |
| 33.40       | 13.15 | 3RD  | 35.90 | 14.13 |
| 34.00       | 13.39 | 5TH  | 36.40 | 14.33 |
| 34.90       | 13.74 | 10TH | 37.40 | 14.72 |
| 35.50       | 13.98 | 15TH | 38.00 | 14.96 |
| 35.90       | 14.13 | 20TH | 38.50 | 15.16 |
| 36.30       | 14.29 | 25TH | 39.00 | 15.35 |
| 36.70       | 14.45 | 30TH | 39.40 | 15.51 |
| 37.00       | 14.57 | 35TH | 39.80 | 15.67 |
| 37.30       | 14.69 | 40TH | 40.10 | 15.79 |
| 37.70       | 14.84 | 45TH | 40.50 | 15.94 |
| 37.90       | 14.92 | 50TH | 40.80 | 16.06 |
| 38.20       | 15.04 | 55TH | 41.20 | 16.22 |
| 38.50       | 15.16 | 60TH | 41.50 | 16.34 |
| 38.80       | 15.28 | 65TH | 41.90 | 16.50 |
| 39.10       | 15.39 | 70TH | 42.30 | 16.65 |
| 39.50       | 15.55 | 75TH | 42.70 | 16.81 |
| 40.00       | 15.75 | 80TH | 43.30 | 17.05 |
| 40.50       | 15.94 | 85TH | 43.90 | 17.28 |
| 41.00       | 16.14 | 90TH | 44.60 | 17.56 |
| 41.80       | 16.46 | 95TH | 45.80 | 18.03 |
| 42.50       | 16.73 | 97TH | 46.50 | 18.31 |
| 42.80       | 16.85 | 98TH | 47.00 | 18.50 |
| 43.80       | 17.24 | 99TH | 48.00 | 18.90 |

## (D29) THIGH LINK

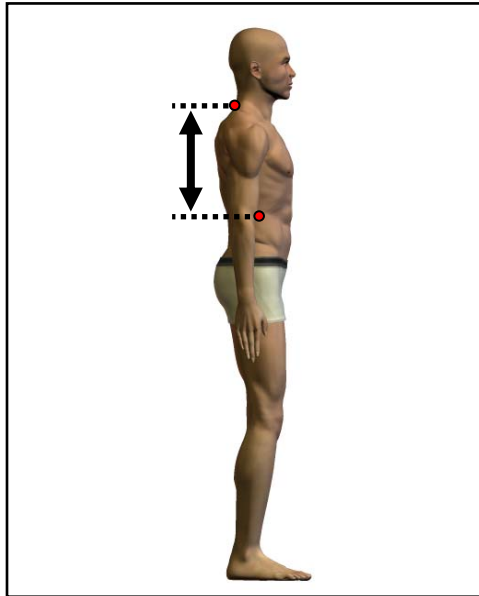
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 37.94                    | MEAN                 | 14.94 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 2.40                     | STANDARD DEVIATION   | 0.95  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 30.40                    | MINIMUM              | 11.97 |
| 47.40                    | MAXIMUM              | 18.66 |
| SKEWNESS                 |                      | 0.10  |
| KURTOSIS                 |                      | 3.15  |
| COEFFICIENT OF VARIATION |                      | 6.3%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 40.93                    | MEAN                 | 16.11 |
| 0.04                     | STD. ERROR (MEAN)    | 0.02  |
| 2.84                     | STANDARD DEVIATION   | 1.12  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 29.80                    | MINIMUM              | 11.73 |
| 52.00                    | MAXIMUM              | 20.47 |
| SKEWNESS                 |                      | 0.17  |
| KURTOSIS                 |                      | 3.12  |
| COEFFICIENT OF VARIATION |                      | 6.9%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | MALES         |     |      |      |
|---------|------|------|---------|---------------|-----|------|------|
| F       | FPct | CumF | CumFPct | CM            | F   | FPct | CumF |
| 3       | 0.15 | 3    | 0.15    | 29.75 - 30.25 | 1   | 0.02 | 1    |
| 3       | 0.15 | 6    | 0.30    | 30.25 - 30.75 | 0   | 0.00 | 1    |
| 3       | 0.15 | 9    | 0.45    | 30.75 - 31.25 | 0   | 0.00 | 1    |
| 5       | 0.25 | 14   | 0.70    | 31.25 - 31.75 | 0   | 0.00 | 1    |
| 13      | 0.65 | 27   | 1.36    | 31.75 - 32.25 | 1   | 0.02 | 2    |
| 18      | 0.91 | 45   | 2.27    | 32.25 - 32.75 | 2   | 0.05 | 4    |
| 37      | 1.86 | 82   | 4.13    | 32.75 - 33.25 | 4   | 0.10 | 8    |
| 39      | 1.96 | 121  | 6.09    | 33.25 - 33.75 | 7   | 0.17 | 15   |
| 55      | 2.77 | 176  | 8.86    | 33.75 - 34.25 | 11  | 0.27 | 26   |
| 74      | 3.73 | 250  | 12.59   | 34.25 - 34.75 | 26  | 0.64 | 52   |
| 109     | 5.49 | 359  | 18.08   | 34.75 - 35.25 | 27  | 0.66 | 79   |
| 119     | 5.99 | 478  | 24.07   | 35.25 - 35.75 | 34  | 0.83 | 113  |
| 134     | 6.75 | 612  | 30.82   | 35.75 - 36.25 | 59  | 1.45 | 172  |
| 153     | 7.70 | 765  | 38.52   | 36.25 - 36.75 | 88  | 2.16 | 260  |
| 161     | 8.11 | 926  | 46.63   | 36.75 - 37.25 | 117 | 2.87 | 377  |
| 194     | 9.77 | 1120 | 56.39   | 37.25 - 37.75 | 148 | 3.63 | 525  |
| 155     | 7.80 | 1275 | 64.20   | 37.75 - 38.25 | 175 | 4.29 | 700  |
| 140     | 7.05 | 1415 | 71.25   | 38.25 - 38.75 | 217 | 5.32 | 917  |
| 117     | 5.89 | 1532 | 77.14   | 38.75 - 39.25 | 258 | 6.32 | 1175 |
| 107     | 5.39 | 1639 | 82.53   | 39.25 - 39.75 | 217 | 5.32 | 1392 |
| 106     | 5.34 | 1745 | 87.87   | 39.75 - 40.25 | 307 | 7.52 | 1699 |
| 73      | 3.68 | 1818 | 91.54   | 40.25 - 40.75 | 307 | 7.52 | 2006 |
| 58      | 2.92 | 1876 | 94.46   | 40.75 - 41.25 | 267 | 6.54 | 2273 |
| 37      | 1.86 | 1913 | 96.32   | 41.25 - 41.75 | 282 | 6.91 | 2555 |
| 31      | 1.56 | 1944 | 97.89   | 41.75 - 42.25 | 270 | 6.61 | 2825 |
| 13      | 0.65 | 1957 | 98.54   | 42.25 - 42.75 | 237 | 5.81 | 3062 |
| 9       | 0.45 | 1966 | 98.99   | 42.75 - 43.25 | 199 | 4.88 | 3261 |
| 7       | 0.35 | 1973 | 99.35   | 43.25 - 43.75 | 164 | 4.02 | 3425 |
| 1       | 0.05 | 1974 | 99.40   | 43.75 - 44.25 | 153 | 3.75 | 3578 |
| 5       | 0.25 | 1979 | 99.65   | 44.25 - 44.75 | 124 | 3.04 | 3702 |
| 4       | 0.20 | 1983 | 99.85   | 44.75 - 45.25 | 91  | 2.23 | 3793 |
| 1       | 0.05 | 1984 | 99.90   | 45.25 - 45.75 | 76  | 1.86 | 3869 |
| 1       | 0.05 | 1985 | 99.95   | 45.75 - 46.25 | 64  | 1.57 | 3933 |
| 0       | 0.00 | 1985 | 99.95   | 46.25 - 46.75 | 53  | 1.30 | 3986 |
| 1       | 0.05 | 1986 | 100.00  | 46.75 - 47.25 | 33  | 0.81 | 4019 |
|         |      |      |         | 47.25 - 47.75 | 16  | 0.39 | 4035 |
|         |      |      |         | 47.75 - 48.25 | 13  | 0.32 | 4048 |
|         |      |      |         | 48.25 - 48.75 | 14  | 0.34 | 4062 |
|         |      |      |         | 48.75 - 49.25 | 9   | 0.22 | 4071 |
|         |      |      |         | 49.25 - 49.75 | 2   | 0.05 | 4073 |
|         |      |      |         | 49.75 - 50.25 | 2   | 0.05 | 4075 |
|         |      |      |         | 50.25 - 50.75 | 4   | 0.10 | 4079 |
|         |      |      |         | 50.75 - 51.25 | 1   | 0.02 | 4080 |
|         |      |      |         | 51.25 - 51.75 | 0   | 0.00 | 4080 |
|         |      |      |         | 51.75 - 52.25 | 2   | 0.05 | 4082 |

## (D30) THORAX LINK

The vertical distance between the cervicale landmark and tenth rib landmark is calculated as follows: CERVICALE HEIGHT minus TENTH RIB HEIGHT.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 29.50       | 11.61 | 1ST  | 34.40 | 13.54 |
| 29.80       | 11.73 | 2ND  | 35.00 | 13.78 |
| 30.20       | 11.89 | 3RD  | 35.40 | 13.94 |
| 30.70       | 12.09 | 5TH  | 35.90 | 14.13 |
| 31.40       | 12.36 | 10TH | 36.80 | 14.49 |
| 31.90       | 12.56 | 15TH | 37.30 | 14.69 |
| 32.30       | 12.72 | 20TH | 37.80 | 14.88 |
| 32.60       | 12.83 | 25TH | 38.20 | 15.04 |
| 32.90       | 12.95 | 30TH | 38.50 | 15.16 |
| 33.20       | 13.07 | 35TH | 38.90 | 15.31 |
| 33.40       | 13.15 | 40TH | 39.20 | 15.43 |
| 33.70       | 13.27 | 45TH | 39.50 | 15.55 |
| 34.00       | 13.39 | 50TH | 39.80 | 15.67 |
| 34.20       | 13.46 | 55TH | 40.00 | 15.75 |
| 34.40       | 13.54 | 60TH | 40.30 | 15.87 |
| 34.70       | 13.66 | 65TH | 40.60 | 15.98 |
| 35.00       | 13.78 | 70TH | 40.90 | 16.10 |
| 35.20       | 13.86 | 75TH | 41.20 | 16.22 |
| 35.50       | 13.98 | 80TH | 41.50 | 16.34 |
| 35.90       | 14.13 | 85TH | 41.90 | 16.50 |
| 36.40       | 14.33 | 90TH | 42.40 | 16.69 |
| 37.10       | 14.61 | 95TH | 43.10 | 16.97 |
| 37.70       | 14.84 | 97TH | 43.60 | 17.17 |
| 38.00       | 14.96 | 98TH | 44.00 | 17.32 |
| 38.40       | 15.12 | 99TH | 44.70 | 17.60 |

(D30) THORAX LINK

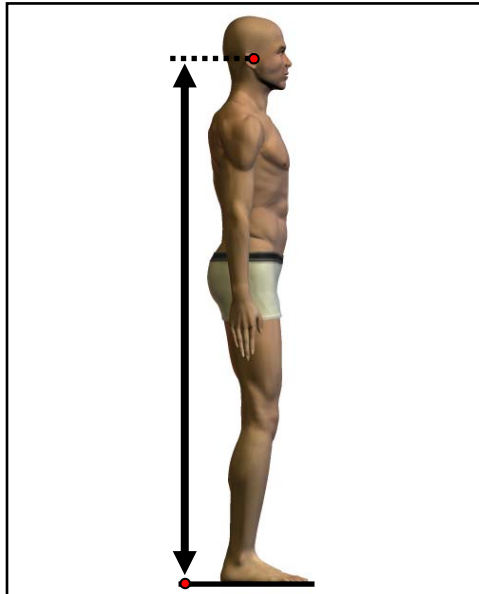
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 33.94                    | MEAN                 | 13.36 |
| 0.04                     | STD. ERROR (MEAN)    | 0.02  |
| 1.95                     | STANDARD DEVIATION   | 0.77  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 27.90                    | MINIMUM              | 10.98 |
| 41.00                    | MAXIMUM              | 16.14 |
| SKEWNESS                 |                      | 0.00  |
| KURTOSIS                 |                      | 2.96  |
| COEFFICIENT OF VARIATION |                      | 5.7%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 39.66                    | MEAN                 | 15.62 |
| 0.03                     | STD. ERROR (MEAN)    | 0.01  |
| 2.19                     | STANDARD DEVIATION   | 0.86  |
| 0.02                     | STD. ERROR (STD.DEV) | 0.01  |
| 32.30                    | MINIMUM              | 12.72 |
| 47.40                    | MAXIMUM              | 18.66 |
| SKEWNESS                 |                      | -0.12 |
| KURTOSIS                 |                      | 2.94  |
| COEFFICIENT OF VARIATION |                      | 5.5%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|-------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 5       | 0.25  | 5    | 0.25    | 27.75       | - | 28.25 |  |       |      |      |         |
| 3       | 0.15  | 8    | 0.40    | 28.25       | - | 28.75 |  |       |      |      |         |
| 7       | 0.35  | 15   | 0.76    | 28.75       | - | 29.25 |  |       |      |      |         |
| 20      | 1.01  | 35   | 1.76    | 29.25       | - | 29.75 |  |       |      |      |         |
| 25      | 1.26  | 60   | 3.02    | 29.75       | - | 30.25 |  |       |      |      |         |
| 41      | 2.06  | 101  | 5.09    | 30.25       | - | 30.75 |  |       |      |      |         |
| 67      | 3.37  | 168  | 8.46    | 30.75       | - | 31.25 |  |       |      |      |         |
| 84      | 4.23  | 252  | 12.69   | 31.25       | - | 31.75 |  |       |      |      |         |
| 127     | 6.39  | 379  | 19.08   | 31.75       | - | 32.25 |  |       |      |      |         |
| 173     | 8.71  | 552  | 27.79   | 32.25       | - | 32.75 |  | 3     | 0.07 | 3    | 0.07    |
| 173     | 8.71  | 725  | 36.51   | 32.75       | - | 33.25 |  | 5     | 0.12 | 8    | 0.20    |
| 169     | 8.51  | 894  | 45.02   | 33.25       | - | 33.75 |  | 6     | 0.15 | 14   | 0.34    |
| 234     | 11.78 | 1128 | 56.80   | 33.75       | - | 34.25 |  | 20    | 0.49 | 34   | 0.83    |
| 181     | 9.11  | 1309 | 65.91   | 34.25       | - | 34.75 |  | 27    | 0.66 | 61   | 1.49    |
| 188     | 9.47  | 1497 | 75.38   | 34.75       | - | 35.25 |  | 36    | 0.88 | 97   | 2.38    |
| 154     | 7.75  | 1651 | 83.13   | 35.25       | - | 35.75 |  | 73    | 1.79 | 170  | 4.16    |
| 97      | 4.88  | 1748 | 88.02   | 35.75       | - | 36.25 |  | 103   | 2.52 | 273  | 6.69    |
| 87      | 4.38  | 1835 | 92.40   | 36.25       | - | 36.75 |  | 130   | 3.18 | 403  | 9.87    |
| 59      | 2.97  | 1894 | 95.37   | 36.75       | - | 37.25 |  | 168   | 4.12 | 571  | 13.99   |
| 36      | 1.81  | 1930 | 97.18   | 37.25       | - | 37.75 |  | 216   | 5.29 | 787  | 19.28   |
| 27      | 1.36  | 1957 | 98.54   | 37.75       | - | 38.25 |  | 264   | 6.47 | 1051 | 25.75   |
| 17      | 0.86  | 1974 | 99.40   | 38.25       | - | 38.75 |  | 321   | 7.86 | 1372 | 33.61   |
| 7       | 0.35  | 1981 | 99.75   | 38.75       | - | 39.25 |  | 312   | 7.64 | 1684 | 41.25   |
| 3       | 0.15  | 1984 | 99.90   | 39.25       | - | 39.75 |  | 353   | 8.65 | 2037 | 49.90   |
| 1       | 0.05  | 1985 | 99.95   | 39.75       | - | 40.25 |  | 383   | 9.38 | 2420 | 59.28   |
| 0       | 0.00  | 1985 | 99.95   | 40.25       | - | 40.75 |  | 348   | 8.53 | 2768 | 67.81   |
| 1       | 0.05  | 1986 | 100.00  | 40.75       | - | 41.25 |  | 340   | 8.33 | 3108 | 76.14   |
|         |       |      |         | 41.25       | - | 41.75 |  | 292   | 7.15 | 3400 | 83.29   |
|         |       |      |         | 41.75       | - | 42.25 |  | 220   | 5.39 | 3620 | 88.68   |
|         |       |      |         | 42.25       | - | 42.75 |  | 171   | 4.19 | 3791 | 92.87   |
|         |       |      |         | 42.75       | - | 43.25 |  | 109   | 2.67 | 3900 | 95.54   |
|         |       |      |         | 43.25       | - | 43.75 |  | 75    | 1.84 | 3975 | 97.38   |
|         |       |      |         | 43.75       | - | 44.25 |  | 46    | 1.13 | 4021 | 98.51   |
|         |       |      |         | 44.25       | - | 44.75 |  | 28    | 0.69 | 4049 | 99.19   |
|         |       |      |         | 44.75       | - | 45.25 |  | 15    | 0.37 | 4064 | 99.56   |
|         |       |      |         | 45.25       | - | 45.75 |  | 10    | 0.24 | 4074 | 99.80   |
|         |       |      |         | 45.75       | - | 46.25 |  | 6     | 0.15 | 4080 | 99.95   |
|         |       |      |         | 46.25       | - | 46.75 |  | 0     | 0.00 | 4080 | 99.95   |
|         |       |      |         | 46.75       | - | 47.25 |  | 1     | 0.02 | 4081 | 99.98   |
|         |       |      |         | 47.25       | - | 47.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (D31) TRAGION HEIGHT

The vertical distance between a standing surface and the tragon landmark of a participant standing erect with the head in the Frankfurt plane is calculated as follows: STATURE minus TRAGION-TOP OF HEAD.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 135.90      | 53.50 | 1ST  | 147.30 | 57.99 |
| 137.30      | 54.06 | 2ND  | 148.90 | 58.62 |
| 138.30      | 54.45 | 3RD  | 150.10 | 59.09 |
| 140.20      | 55.20 | 5TH  | 151.70 | 59.72 |
| 142.30      | 56.02 | 10TH | 153.90 | 60.59 |
| 143.80      | 56.61 | 15TH | 155.50 | 61.22 |
| 145.10      | 57.13 | 20TH | 156.90 | 61.77 |
| 146.10      | 57.52 | 25TH | 158.00 | 62.20 |
| 146.90      | 57.83 | 30TH | 158.90 | 62.56 |
| 147.70      | 58.15 | 35TH | 159.80 | 62.91 |
| 148.40      | 58.43 | 40TH | 160.70 | 63.27 |
| 149.10      | 58.70 | 45TH | 161.50 | 63.58 |
| 149.90      | 59.02 | 50TH | 162.40 | 63.94 |
| 150.70      | 59.33 | 55TH | 163.30 | 64.29 |
| 151.50      | 59.65 | 60TH | 164.10 | 64.61 |
| 152.60      | 60.08 | 65TH | 165.00 | 64.96 |
| 153.50      | 60.43 | 70TH | 165.90 | 65.31 |
| 154.30      | 60.75 | 75TH | 166.90 | 65.71 |
| 155.30      | 61.14 | 80TH | 168.10 | 66.18 |
| 156.80      | 61.73 | 85TH | 169.30 | 66.65 |
| 158.50      | 62.40 | 90TH | 171.10 | 67.36 |
| 160.90      | 63.35 | 95TH | 173.70 | 68.39 |
| 162.50      | 63.98 | 97TH | 175.60 | 69.13 |
| 163.90      | 64.53 | 98TH | 177.00 | 69.69 |
| 165.40      | 65.12 | 99TH | 179.40 | 70.63 |

## (D31) TRAGION HEIGHT

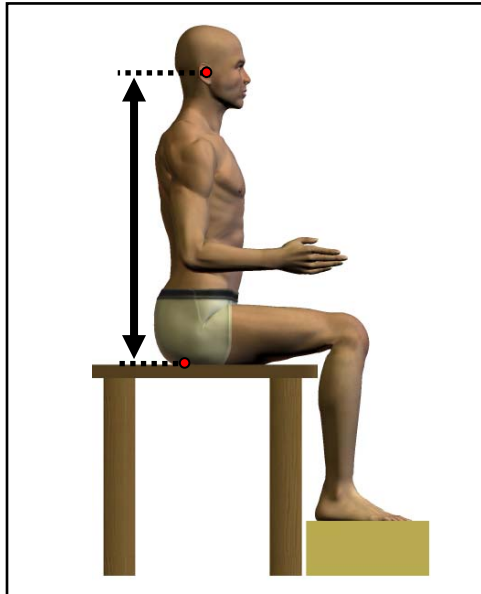
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 150.20                   | MEAN                 | 59.13 |
| 0.14                     | STD. ERROR (MEAN)    | 0.06  |
| 6.31                     | STANDARD DEVIATION   | 2.48  |
| 0.10                     | STD. ERROR (STD.DEV) | 0.04  |
| 128.50                   | MINIMUM              | 50.59 |
| 170.40                   | MAXIMUM              | 67.09 |
| SKEWNESS                 |                      | 0.10  |
| KURTOSIS                 |                      | 3.03  |
| COEFFICIENT OF VARIATION |                      | 4.2%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 162.51                   | MEAN                 | 63.98 |
| 0.11                     | STD. ERROR (MEAN)    | 0.04  |
| 6.76                     | STANDARD DEVIATION   | 2.66  |
| 0.07                     | STD. ERROR (STD.DEV) | 0.03  |
| 136.20                   | MINIMUM              | 53.62 |
| 185.90                   | MAXIMUM              | 73.19 |
| SKEWNESS                 |                      | 0.11  |
| KURTOSIS                 |                      | 3.07  |
| COEFFICIENT OF VARIATION |                      | 4.2%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   |        |  | MALES |      |      |         |
|---------|-------|------|---------|-------------|---|--------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 128.25      | - | 129.75 |  |       |      |      |         |
| 1       | 0.05  | 2    | 0.10    | 129.75      | - | 131.25 |  |       |      |      |         |
| 3       | 0.15  | 5    | 0.25    | 131.25      | - | 132.75 |  |       |      |      |         |
| 5       | 0.25  | 10   | 0.50    | 132.75      | - | 134.25 |  |       |      |      |         |
| 7       | 0.35  | 17   | 0.86    | 134.25      | - | 135.75 |  |       |      |      |         |
| 20      | 1.01  | 37   | 1.86    | 135.75      | - | 137.25 |  | 1     | 0.02 | 1    | 0.02    |
| 29      | 1.46  | 66   | 3.32    | 137.25      | - | 138.75 |  | 0     | 0.00 | 1    | 0.02    |
| 35      | 1.76  | 101  | 5.09    | 138.75      | - | 140.25 |  | 0     | 0.00 | 1    | 0.02    |
| 76      | 3.83  | 177  | 8.91    | 140.25      | - | 141.75 |  | 2     | 0.05 | 3    | 0.07    |
| 77      | 3.88  | 254  | 12.79   | 141.75      | - | 143.25 |  | 1     | 0.02 | 4    | 0.10    |
| 124     | 6.24  | 378  | 19.03   | 143.25      | - | 144.75 |  | 12    | 0.29 | 16   | 0.39    |
| 133     | 6.70  | 511  | 25.73   | 144.75      | - | 146.25 |  | 14    | 0.34 | 30   | 0.73    |
| 194     | 9.77  | 705  | 35.50   | 146.25      | - | 147.75 |  | 20    | 0.49 | 50   | 1.22    |
| 215     | 10.83 | 920  | 46.32   | 147.75      | - | 149.25 |  | 37    | 0.91 | 87   | 2.13    |
| 175     | 8.81  | 1095 | 55.14   | 149.25      | - | 150.75 |  | 65    | 1.59 | 152  | 3.72    |
| 168     | 8.46  | 1263 | 63.60   | 150.75      | - | 152.25 |  | 84    | 2.06 | 236  | 5.78    |
| 161     | 8.11  | 1424 | 71.70   | 152.25      | - | 153.75 |  | 157   | 3.85 | 393  | 9.63    |
| 164     | 8.26  | 1588 | 79.96   | 153.75      | - | 155.25 |  | 197   | 4.83 | 590  | 14.45   |
| 95      | 4.78  | 1683 | 84.74   | 155.25      | - | 156.75 |  | 211   | 5.17 | 801  | 19.62   |
| 87      | 4.38  | 1770 | 89.12   | 156.75      | - | 158.25 |  | 282   | 6.91 | 1083 | 26.53   |
| 73      | 3.68  | 1843 | 92.80   | 158.25      | - | 159.75 |  | 326   | 7.99 | 1409 | 34.52   |
| 52      | 2.62  | 1895 | 95.42   | 159.75      | - | 161.25 |  | 380   | 9.31 | 1789 | 43.83   |
| 36      | 1.81  | 1931 | 97.23   | 161.25      | - | 162.75 |  | 337   | 8.26 | 2126 | 52.08   |
| 25      | 1.26  | 1956 | 98.49   | 162.75      | - | 164.25 |  | 346   | 8.48 | 2472 | 60.56   |
| 17      | 0.86  | 1973 | 99.35   | 164.25      | - | 165.75 |  | 347   | 8.50 | 2819 | 69.06   |
| 5       | 0.25  | 1978 | 99.60   | 165.75      | - | 167.25 |  | 299   | 7.32 | 3118 | 76.38   |
| 2       | 0.10  | 1980 | 99.70   | 167.25      | - | 168.75 |  | 246   | 6.03 | 3364 | 82.41   |
| 4       | 0.20  | 1984 | 99.90   | 168.75      | - | 170.25 |  | 201   | 4.92 | 3565 | 87.33   |
| 2       | 0.10  | 1986 | 100.00  | 170.25      | - | 171.75 |  | 168   | 4.12 | 3733 | 91.45   |
|         |       |      |         | 171.75      | - | 173.25 |  | 115   | 2.82 | 3848 | 94.27   |
|         |       |      |         | 173.25      | - | 174.75 |  | 78    | 1.91 | 3926 | 96.18   |
|         |       |      |         | 174.75      | - | 176.25 |  | 57    | 1.40 | 3983 | 97.57   |
|         |       |      |         | 176.25      | - | 177.75 |  | 29    | 0.71 | 4012 | 98.29   |
|         |       |      |         | 177.75      | - | 179.25 |  | 28    | 0.69 | 4040 | 98.97   |
|         |       |      |         | 179.25      | - | 180.75 |  | 16    | 0.39 | 4056 | 99.36   |
|         |       |      |         | 180.75      | - | 182.25 |  | 15    | 0.37 | 4071 | 99.73   |
|         |       |      |         | 182.25      | - | 183.75 |  | 7     | 0.17 | 4078 | 99.90   |
|         |       |      |         | 183.75      | - | 185.25 |  | 3     | 0.07 | 4081 | 99.98   |
|         |       |      |         | 185.25      | - | 186.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (D32) TRAGION HEIGHT, SITTING

The vertical distance between a sitting surface and the tragon landmark of a participant sitting erect with the head in the Frankfurt plane is calculated as follows: SITTING HEIGHT minus TRAGION-TOP OF HEAD.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 66.00       | 25.98 | 1ST  | 70.60 | 27.80 |
| 66.50       | 26.18 | 2ND  | 71.80 | 28.27 |
| 67.00       | 26.38 | 3RD  | 72.20 | 28.43 |
| 67.70       | 26.65 | 5TH  | 73.10 | 28.78 |
| 68.80       | 27.09 | 10TH | 74.30 | 29.25 |
| 69.60       | 27.40 | 15TH | 75.20 | 29.61 |
| 70.30       | 27.68 | 20TH | 75.80 | 29.84 |
| 70.80       | 27.87 | 25TH | 76.40 | 30.08 |
| 71.30       | 28.07 | 30TH | 76.90 | 30.28 |
| 71.70       | 28.23 | 35TH | 77.40 | 30.47 |
| 72.10       | 28.39 | 40TH | 77.80 | 30.63 |
| 72.60       | 28.58 | 45TH | 78.20 | 30.79 |
| 73.00       | 28.74 | 50TH | 78.60 | 30.94 |
| 73.40       | 28.90 | 55TH | 79.10 | 31.14 |
| 73.80       | 29.06 | 60TH | 79.60 | 31.34 |
| 74.30       | 29.25 | 65TH | 80.00 | 31.50 |
| 74.70       | 29.41 | 70TH | 80.50 | 31.69 |
| 75.20       | 29.61 | 75TH | 81.10 | 31.93 |
| 75.70       | 29.80 | 80TH | 81.60 | 32.13 |
| 76.40       | 30.08 | 85TH | 82.30 | 32.40 |
| 77.20       | 30.39 | 90TH | 83.20 | 32.76 |
| 78.50       | 30.91 | 95TH | 84.50 | 33.27 |
| 79.10       | 31.14 | 97TH | 85.40 | 33.62 |
| 79.50       | 31.30 | 98TH | 86.00 | 33.86 |
| 80.50       | 31.69 | 99TH | 86.90 | 34.21 |

## (D32) TRAGION HEIGHT, SITTING

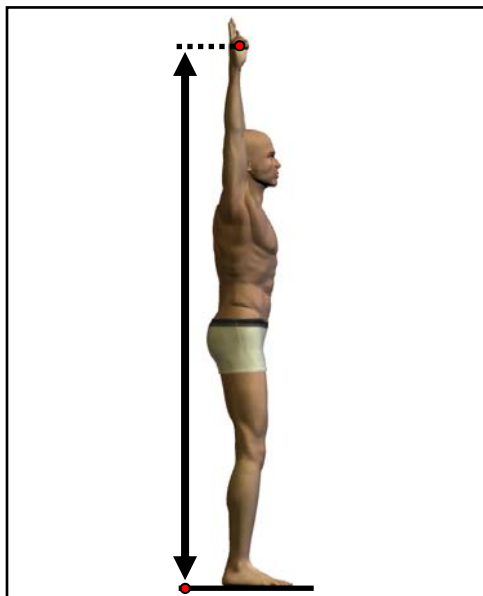
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 73.02                    | MEAN                 | 28.75 |
| 0.07                     | STD. ERROR (MEAN)    | 0.03  |
| 3.21                     | STANDARD DEVIATION   | 1.26  |
| 0.05                     | STD. ERROR (STD.DEV) | 0.02  |
| 62.30                    | MINIMUM              | 24.53 |
| 82.30                    | MAXIMUM              | 32.40 |
| SKEWNESS                 |                      | 0.04  |
| KURTOSIS                 |                      | 2.73  |
| COEFFICIENT OF VARIATION |                      | 4.4%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 78.71                    | MEAN                 | 30.99 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 3.47                     | STANDARD DEVIATION   | 1.36  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.02  |
| 66.70                    | MINIMUM              | 26.26 |
| 90.30                    | MAXIMUM              | 35.55 |
| SKEWNESS                 |                      | 0.03  |
| KURTOSIS                 |                      | 3.01  |
| COEFFICIENT OF VARIATION |                      | 4.4%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 62.25       | - | 63.00 |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 63.00       | - | 63.75 |      |      |         |
| 1       | 0.05 | 2    | 0.10    | 63.75       | - | 64.50 |      |      |         |
| 5       | 0.25 | 7    | 0.35    | 64.50       | - | 65.25 |      |      |         |
| 12      | 0.60 | 19   | 0.96    | 65.25       | - | 66.00 |      |      |         |
| 25      | 1.26 | 44   | 2.22    | 66.00       | - | 66.75 | 2    | 0.05 | 0.05    |
| 38      | 1.91 | 82   | 4.13    | 66.75       | - | 67.50 | 1    | 0.02 | 0.07    |
| 62      | 3.12 | 144  | 7.25    | 67.50       | - | 68.25 | 3    | 0.07 | 0.15    |
| 63      | 3.17 | 207  | 10.42   | 68.25       | - | 69.00 | 5    | 0.12 | 0.27    |
| 114     | 5.74 | 321  | 16.16   | 69.00       | - | 69.75 | 14   | 0.34 | 0.61    |
| 107     | 5.39 | 428  | 21.55   | 69.75       | - | 70.50 | 12   | 0.29 | 0.91    |
| 158     | 7.96 | 586  | 29.51   | 70.50       | - | 71.25 | 22   | 0.54 | 1.45    |
| 179     | 9.01 | 765  | 38.52   | 71.25       | - | 72.00 | 32   | 0.78 | 2.23    |
| 169     | 8.51 | 934  | 47.03   | 72.00       | - | 72.75 | 82   | 2.01 | 4.24    |
| 159     | 8.01 | 1093 | 55.04   | 72.75       | - | 73.50 | 85   | 2.08 | 6.32    |
| 197     | 9.92 | 1290 | 64.95   | 73.50       | - | 74.25 | 140  | 3.43 | 9.75    |
| 155     | 7.80 | 1445 | 72.76   | 74.25       | - | 75.00 | 161  | 3.94 | 13.69   |
| 149     | 7.50 | 1594 | 80.26   | 75.00       | - | 75.75 | 242  | 5.93 | 19.62   |
| 103     | 5.19 | 1697 | 85.45   | 75.75       | - | 76.50 | 255  | 6.25 | 25.87   |
| 93      | 4.68 | 1790 | 90.13   | 76.50       | - | 77.25 | 316  | 7.74 | 33.61   |
| 59      | 2.97 | 1849 | 93.10   | 77.25       | - | 78.00 | 327  | 8.01 | 41.62   |
| 54      | 2.72 | 1903 | 95.82   | 78.00       | - | 78.75 | 378  | 9.26 | 50.88   |
| 40      | 2.01 | 1943 | 97.83   | 78.75       | - | 79.50 | 311  | 7.62 | 58.50   |
| 20      | 1.01 | 1963 | 98.84   | 79.50       | - | 80.25 | 365  | 8.94 | 67.44   |
| 13      | 0.65 | 1976 | 99.50   | 80.25       | - | 81.00 | 266  | 6.52 | 73.96   |
| 6       | 0.30 | 1982 | 99.80   | 81.00       | - | 81.75 | 302  | 7.40 | 81.36   |
| 4       | 0.20 | 1986 | 100.00  | 81.75       | - | 82.50 | 190  | 4.65 | 86.01   |
|         |      |      |         | 82.50       | - | 83.25 | 175  | 4.29 | 90.30   |
|         |      |      |         | 83.25       | - | 84.00 | 118  | 2.89 | 93.19   |
|         |      |      |         | 84.00       | - | 84.75 | 104  | 2.55 | 95.74   |
|         |      |      |         | 84.75       | - | 85.50 | 59   | 1.45 | 97.18   |
|         |      |      |         | 85.50       | - | 86.25 | 46   | 1.13 | 98.31   |
|         |      |      |         | 86.25       | - | 87.00 | 30   | 0.73 | 99.04   |
|         |      |      |         | 87.00       | - | 87.75 | 21   | 0.51 | 99.56   |
|         |      |      |         | 87.75       | - | 88.50 | 9    | 0.22 | 99.78   |
|         |      |      |         | 88.50       | - | 89.25 | 4    | 0.10 | 99.88   |
|         |      |      |         | 89.25       | - | 90.00 | 4    | 0.10 | 99.98   |
|         |      |      |         | 90.00       | - | 90.75 | 1    | 0.02 | 100.00  |

### (D33) VERTICAL GRIP REACH

The vertical distance between a standing surface and the center of a 1-1/4-in diameter dowel gripped horizontally in the right hand of a participant standing erect with the shoulder, arm, and hand held straight overhead is calculated as follows: OVERHEAD FINGERTIP REACH SITTING plus (STATURE minus SITTING HEIGHT) minus ANSUR mean of HAND LENGTH plus ANSUR mean of WRIST-CENTER OF GRIP LENGTH.

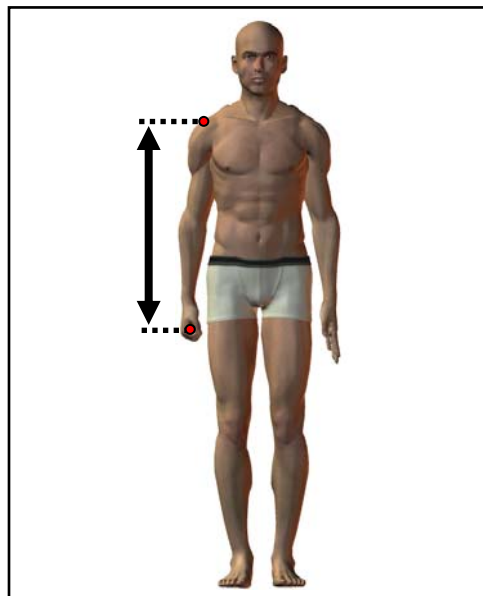


| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 174.90      | 68.86 | 1ST  | 190.70 | 75.08 |
| 176.90      | 69.65 | 2ND  | 193.40 | 76.14 |
| 178.30      | 70.20 | 3RD  | 194.90 | 76.73 |
| 181.20      | 71.34 | 5TH  | 197.30 | 77.68 |
| 184.60      | 72.68 | 10TH | 200.60 | 78.98 |
| 186.70      | 73.50 | 15TH | 203.20 | 80.00 |
| 188.60      | 74.25 | 20TH | 205.20 | 80.79 |
| 190.20      | 74.88 | 25TH | 207.00 | 81.50 |
| 191.60      | 75.43 | 30TH | 208.70 | 82.17 |
| 192.90      | 75.94 | 35TH | 210.10 | 82.72 |
| 193.90      | 76.34 | 40TH | 211.40 | 83.23 |
| 195.20      | 76.85 | 45TH | 212.70 | 83.74 |
| 196.40      | 77.32 | 50TH | 213.90 | 84.21 |
| 197.50      | 77.76 | 55TH | 215.20 | 84.72 |
| 198.70      | 78.23 | 60TH | 216.40 | 85.20 |
| 200.10      | 78.78 | 65TH | 217.90 | 85.79 |
| 201.50      | 79.33 | 70TH | 219.40 | 86.38 |
| 203.30      | 80.04 | 75TH | 220.80 | 86.93 |
| 205.10      | 80.75 | 80TH | 222.60 | 87.64 |
| 207.40      | 81.65 | 85TH | 224.90 | 88.54 |
| 210.00      | 82.68 | 90TH | 227.40 | 89.53 |
| 213.90      | 84.21 | 95TH | 231.40 | 91.10 |
| 215.30      | 84.76 | 97TH | 234.10 | 92.17 |
| 216.50      | 85.24 | 98TH | 236.40 | 93.07 |
| 219.30      | 86.34 | 99TH | 239.40 | 94.25 |



## (D34) VERTICAL GRIP REACH DOWN

The vertical distance between the acromion right landmark and the center of a 1-1/4-in diameter dowel gripped horizontally in the right hand of a participant standing erect with the arms held straight at the sides is calculated as follows: ACROMIAL HEIGHT minus WRIST HEIGHT plus ANSUR mean of WRIST-CENTER OF GRIP LENGTH.



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 53.90       | 21.22 | 1ST  | 59.30 | 23.35 |
| 54.80       | 21.57 | 2ND  | 60.00 | 23.62 |
| 55.30       | 21.77 | 3RD  | 60.60 | 23.86 |
| 55.90       | 22.01 | 5TH  | 61.20 | 24.09 |
| 56.90       | 22.40 | 10TH | 62.30 | 24.53 |
| 57.60       | 22.68 | 15TH | 63.00 | 24.80 |
| 58.30       | 22.95 | 20TH | 63.70 | 25.08 |
| 58.80       | 23.15 | 25TH | 64.10 | 25.24 |
| 59.10       | 23.27 | 30TH | 64.60 | 25.43 |
| 59.50       | 23.43 | 35TH | 65.00 | 25.59 |
| 59.80       | 23.54 | 40TH | 65.50 | 25.79 |
| 60.20       | 23.70 | 45TH | 65.90 | 25.94 |
| 60.60       | 23.86 | 50TH | 66.30 | 26.10 |
| 60.90       | 23.98 | 55TH | 66.70 | 26.26 |
| 61.30       | 24.13 | 60TH | 67.10 | 26.42 |
| 61.70       | 24.29 | 65TH | 67.50 | 26.57 |
| 62.20       | 24.49 | 70TH | 67.90 | 26.73 |
| 62.70       | 24.69 | 75TH | 68.40 | 26.93 |
| 63.20       | 24.88 | 80TH | 68.90 | 27.13 |
| 63.90       | 25.16 | 85TH | 69.50 | 27.36 |
| 64.50       | 25.39 | 90TH | 70.40 | 27.72 |
| 65.70       | 25.87 | 95TH | 71.80 | 28.27 |
| 66.30       | 26.10 | 97TH | 72.60 | 28.58 |
| 66.70       | 26.26 | 98TH | 73.00 | 28.74 |
| 67.70       | 26.65 | 99TH | 74.30 | 29.25 |

## (D34) VERTICAL GRIP REACH DOWN

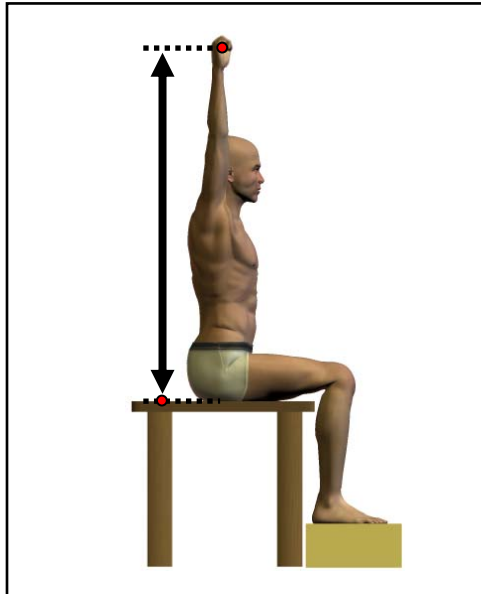
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 60.69                    | MEAN                 | 23.89 |
| 0.07                     | STD. ERROR (MEAN)    | 0.03  |
| 2.98                     | STANDARD DEVIATION   | 1.17  |
| 0.05                     | STD. ERROR (STD.DEV) | 0.02  |
| 47.80                    | MINIMUM              | 18.82 |
| 73.30                    | MAXIMUM              | 28.86 |
| SKEWNESS                 |                      | 0.06  |
| KURTOSIS                 |                      | 3.25  |
| COEFFICIENT OF VARIATION |                      | 4.9%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 66.32                    | MEAN                 | 26.11 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 3.17                     | STANDARD DEVIATION   | 1.25  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.01  |
| 55.80                    | MINIMUM              | 21.97 |
| 79.20                    | MAXIMUM              | 31.18 |
| SKEWNESS                 |                      | 0.15  |
| KURTOSIS                 |                      | 3.11  |
| COEFFICIENT OF VARIATION |                      | 4.8%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   |       |  | MALES |       |      |         |
|---------|-------|------|---------|-------------|---|-------|--|-------|-------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   |       |  | F     | FPct  | CumF | CumFPct |
| 1       | 0.05  | 1    | 0.05    | 47.75       | - | 48.50 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 48.50       | - | 49.25 |  |       |       |      |         |
| 0       | 0.00  | 1    | 0.05    | 49.25       | - | 50.00 |  |       |       |      |         |
| 1       | 0.05  | 2    | 0.10    | 50.00       | - | 50.75 |  |       |       |      |         |
| 1       | 0.05  | 3    | 0.15    | 50.75       | - | 51.50 |  |       |       |      |         |
| 5       | 0.25  | 8    | 0.40    | 51.50       | - | 52.25 |  |       |       |      |         |
| 3       | 0.15  | 11   | 0.55    | 52.25       | - | 53.00 |  |       |       |      |         |
| 5       | 0.25  | 16   | 0.81    | 53.00       | - | 53.75 |  |       |       |      |         |
| 16      | 0.81  | 32   | 1.61    | 53.75       | - | 54.50 |  |       |       |      |         |
| 27      | 1.36  | 59   | 2.97    | 54.50       | - | 55.25 |  |       |       |      |         |
| 41      | 2.06  | 100  | 5.04    | 55.25       | - | 56.00 |  |       |       |      |         |
| 82      | 4.13  | 182  | 9.16    | 56.00       | - | 56.75 |  | 1     | 0.02  | 1    | 0.02    |
| 86      | 4.33  | 268  | 13.49   | 56.75       | - | 57.50 |  | 2     | 0.05  | 3    | 0.07    |
| 119     | 5.99  | 387  | 19.49   | 57.50       | - | 58.25 |  | 6     | 0.15  | 9    | 0.22    |
| 159     | 8.01  | 546  | 27.49   | 58.25       | - | 59.00 |  | 8     | 0.20  | 17   | 0.42    |
| 216     | 10.88 | 762  | 38.37   | 59.00       | - | 59.75 |  | 11    | 0.27  | 28   | 0.69    |
| 199     | 10.02 | 961  | 48.39   | 59.75       | - | 60.50 |  | 34    | 0.83  | 62   | 1.52    |
| 204     | 10.27 | 1165 | 58.66   | 60.50       | - | 61.25 |  | 46    | 1.13  | 108  | 2.65    |
| 182     | 9.16  | 1347 | 67.82   | 61.25       | - | 62.00 |  | 98    | 2.40  | 206  | 5.05    |
| 145     | 7.30  | 1492 | 75.13   | 62.00       | - | 62.75 |  | 128   | 3.14  | 334  | 8.18    |
| 135     | 6.80  | 1627 | 81.92   | 62.75       | - | 63.50 |  | 190   | 4.65  | 524  | 12.84   |
| 122     | 6.14  | 1749 | 88.07   | 63.50       | - | 64.25 |  | 212   | 5.19  | 736  | 18.03   |
| 76      | 3.83  | 1825 | 91.89   | 64.25       | - | 65.00 |  | 326   | 7.99  | 1062 | 26.02   |
| 69      | 3.47  | 1894 | 95.37   | 65.00       | - | 65.75 |  | 342   | 8.38  | 1404 | 34.39   |
| 40      | 2.01  | 1934 | 97.38   | 65.75       | - | 66.50 |  | 365   | 8.94  | 1769 | 43.34   |
| 26      | 1.31  | 1960 | 98.69   | 66.50       | - | 67.25 |  | 360   | 8.82  | 2129 | 52.16   |
| 12      | 0.60  | 1972 | 99.30   | 67.25       | - | 68.00 |  | 424   | 10.39 | 2553 | 62.54   |
| 4       | 0.20  | 1976 | 99.50   | 68.00       | - | 68.75 |  | 320   | 7.84  | 2873 | 70.38   |
| 4       | 0.20  | 1980 | 99.70   | 68.75       | - | 69.50 |  | 345   | 8.45  | 3218 | 78.83   |
| 5       | 0.25  | 1985 | 99.95   | 69.50       | - | 70.25 |  | 224   | 5.49  | 3442 | 84.32   |
| 0       | 0.00  | 1985 | 99.95   | 70.25       | - | 71.00 |  | 202   | 4.95  | 3644 | 89.27   |
| 0       | 0.00  | 1985 | 99.95   | 71.00       | - | 71.75 |  | 129   | 3.16  | 3773 | 92.43   |
| 0       | 0.00  | 1985 | 99.95   | 71.75       | - | 72.50 |  | 99    | 2.43  | 3872 | 94.86   |
| 0       | 0.00  | 1985 | 99.95   | 72.50       | - | 73.25 |  | 78    | 1.91  | 3950 | 96.77   |
| 1       | 0.05  | 1986 | 100.00  | 73.25       | - | 74.00 |  | 59    | 1.45  | 4009 | 98.21   |
|         |       |      |         | 73.25       | - | 74.00 |  | 26    | 0.64  | 4035 | 98.85   |
|         |       |      |         | 74.00       | - | 74.75 |  | 19    | 0.47  | 4054 | 99.31   |
|         |       |      |         | 74.75       | - | 75.50 |  | 12    | 0.29  | 4066 | 99.61   |
|         |       |      |         | 75.50       | - | 76.25 |  | 9     | 0.22  | 4075 | 99.83   |
|         |       |      |         | 76.25       | - | 77.00 |  | 4     | 0.10  | 4079 | 99.93   |
|         |       |      |         | 77.00       | - | 77.75 |  | 0     | 0.00  | 4079 | 99.93   |
|         |       |      |         | 77.75       | - | 78.50 |  | 2     | 0.05  | 4081 | 99.98   |
|         |       |      |         | 78.50       | - | 79.25 |  | 1     | 0.02  | 4082 | 100.00  |

## (D35) VERTICAL GRIP REACH, SITTING

The vertical distance between a sitting surface and the center of a 1-1/4-in diameter dowel gripped horizontally in the right hand of a participant sitting erect with the arm held straight overhead is calculated as follows: OVERHEAD FINGERTIP REACH SITTING minus ANSUR mean of HAND LENGTH plus ANSUR mean of WRIST-CENTER OF GRIP LENGTH.

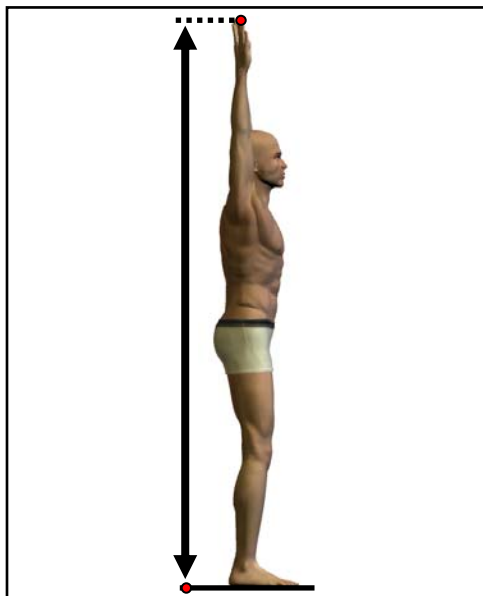


| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 105.10      | 41.38 | 1ST  | 115.20 | 45.35 |
| 107.00      | 42.13 | 2ND  | 116.60 | 45.91 |
| 108.00      | 42.52 | 3RD  | 117.80 | 46.38 |
| 109.30      | 43.03 | 5TH  | 119.20 | 46.93 |
| 111.60      | 43.94 | 10TH | 121.60 | 47.87 |
| 113.20      | 44.57 | 15TH | 123.10 | 48.46 |
| 114.30      | 45.00 | 20TH | 124.50 | 49.02 |
| 115.30      | 45.39 | 25TH | 125.60 | 49.45 |
| 116.20      | 45.75 | 30TH | 126.70 | 49.88 |
| 117.10      | 46.10 | 35TH | 127.70 | 50.28 |
| 117.90      | 46.42 | 40TH | 128.50 | 50.59 |
| 118.70      | 46.73 | 45TH | 129.30 | 50.91 |
| 119.50      | 47.05 | 50TH | 130.20 | 51.26 |
| 120.40      | 47.40 | 55TH | 130.90 | 51.54 |
| 121.00      | 47.64 | 60TH | 131.80 | 51.89 |
| 121.70      | 47.91 | 65TH | 132.80 | 52.28 |
| 122.60      | 48.27 | 70TH | 133.70 | 52.64 |
| 123.60      | 48.66 | 75TH | 134.80 | 53.07 |
| 124.70      | 49.09 | 80TH | 135.90 | 53.50 |
| 126.20      | 49.69 | 85TH | 137.40 | 54.09 |
| 128.10      | 50.43 | 90TH | 139.10 | 54.76 |
| 129.90      | 51.14 | 95TH | 141.60 | 55.75 |
| 131.50      | 51.77 | 97TH | 143.10 | 56.34 |
| 132.60      | 52.20 | 98TH | 144.60 | 56.93 |
| 133.90      | 52.72 | 99TH | 146.40 | 57.64 |



### (D36) VERTICAL INDEX FINGERTIP REACH

The vertical distance between a standing surface and the tip of the right index finger of a participant standing erect with the right shoulder, arm, and fingers stretched straight overhead is calculated as follows: OVERHEAD FINGERTIP REACH SITTING plus (STATURE minus SITTING HEIGHT) minus (ANSUR mean of HAND LENGTH minus ANSUR mean of WRIST-INDEX FINGER LENGTH).



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 185.20      | 72.91 | 1ST  | 201.80 | 79.45 |
| 187.20      | 73.70 | 2ND  | 204.50 | 80.51 |
| 188.60      | 74.25 | 3RD  | 206.00 | 81.10 |
| 191.50      | 75.39 | 5TH  | 208.40 | 82.05 |
| 194.90      | 76.73 | 10TH | 211.70 | 83.35 |
| 197.00      | 77.56 | 15TH | 214.30 | 84.37 |
| 198.90      | 78.31 | 20TH | 216.30 | 85.16 |
| 200.50      | 78.94 | 25TH | 218.10 | 85.87 |
| 201.90      | 79.49 | 30TH | 219.80 | 86.54 |
| 203.20      | 80.00 | 35TH | 221.20 | 87.09 |
| 204.20      | 80.39 | 40TH | 222.50 | 87.60 |
| 205.50      | 80.91 | 45TH | 223.80 | 88.11 |
| 206.70      | 81.38 | 50TH | 225.00 | 88.58 |
| 207.80      | 81.81 | 55TH | 226.30 | 89.09 |
| 209.00      | 82.28 | 60TH | 227.50 | 89.57 |
| 210.40      | 82.83 | 65TH | 229.00 | 90.16 |
| 211.80      | 83.39 | 70TH | 230.50 | 90.75 |
| 213.60      | 84.09 | 75TH | 231.90 | 91.30 |
| 215.40      | 84.80 | 80TH | 233.70 | 92.01 |
| 217.70      | 85.71 | 85TH | 236.00 | 92.91 |
| 220.30      | 86.73 | 90TH | 238.50 | 93.90 |
| 224.20      | 88.27 | 95TH | 242.50 | 95.47 |
| 225.60      | 88.82 | 97TH | 245.20 | 96.54 |
| 226.80      | 89.29 | 98TH | 247.50 | 97.44 |
| 229.60      | 90.39 | 99TH | 250.50 | 98.62 |

## (D36) VERTICAL INDEX FINGERTIP REACH

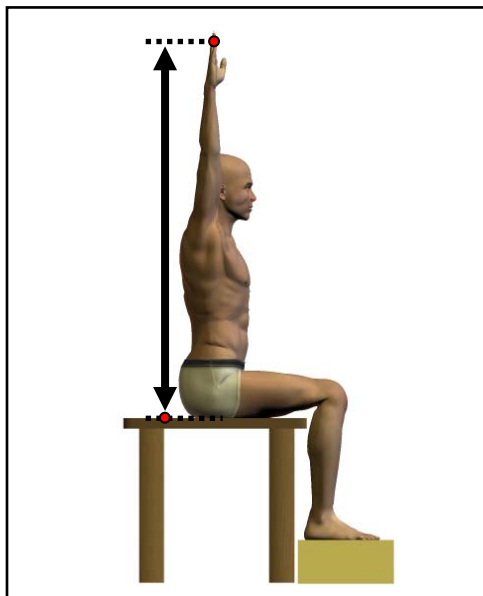
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 207.06                   | MEAN                 | 81.52 |
| 0.22                     | STD. ERROR (MEAN)    | 0.09  |
| 9.82                     | STANDARD DEVIATION   | 3.87  |
| 0.16                     | STD. ERROR (STD.DEV) | 0.06  |
| 175.30                   | MINIMUM              | 69.02 |
| 240.70                   | MAXIMUM              | 94.76 |
| SKEWNESS                 |                      | 0.10  |
| KURTOSIS                 |                      | 2.96  |
| COEFFICIENT OF VARIATION |                      | 4.7%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |        |
|--------------------------|----------------------|--------|
| CM                       |                      | IN     |
| 225.16                   | MEAN                 | 88.65  |
| 0.16                     | STD. ERROR (MEAN)    | 0.06   |
| 10.44                    | STANDARD DEVIATION   | 4.11   |
| 0.12                     | STD. ERROR (STD.DEV) | 0.05   |
| 185.80                   | MINIMUM              | 73.15  |
| 263.80                   | MAXIMUM              | 103.86 |
| SKEWNESS                 |                      | 0.11   |
| KURTOSIS                 |                      | 3.06   |
| COEFFICIENT OF VARIATION |                      | 4.6%   |
| NUMBER OF PARTICIPANTS   |                      | 4082   |

| FEMALES |      |      |         | MALES  |   |      |      |
|---------|------|------|---------|--------|---|------|------|
| F       | FPct | CumF | CumFPct | CM     | F | FPct | CumF |
| 3       | 0.15 | 3    | 0.15    | 174.55 | - | -    | -    |
| 1       | 0.05 | 4    | 0.20    | 176.55 | - | -    | -    |
| 0       | 0.00 | 4    | 0.20    | 178.55 | - | -    | -    |
| 7       | 0.35 | 11   | 0.55    | 180.55 | - | -    | -    |
| 7       | 0.35 | 18   | 0.91    | 182.55 | - | -    | -    |
| 17      | 0.86 | 35   | 1.76    | 184.55 | - | -    | -    |
| 21      | 1.06 | 56   | 2.82    | 186.55 | - | -    | -    |
| 28      | 1.41 | 84   | 4.23    | 188.55 | - | -    | -    |
| 42      | 2.11 | 126  | 6.34    | 190.55 | - | -    | -    |
| 58      | 2.92 | 184  | 9.26    | 192.55 | - | -    | -    |
| 86      | 4.33 | 270  | 13.60   | 194.55 | - | -    | -    |
| 114     | 5.74 | 384  | 19.34   | 196.55 | - | -    | -    |
| 115     | 5.79 | 499  | 25.13   | 198.55 | - | -    | -    |
| 145     | 7.30 | 644  | 32.43   | 200.55 | - | -    | -    |
| 176     | 8.86 | 820  | 41.29   | 202.55 | - | -    | -    |
| 165     | 8.31 | 985  | 49.60   | 204.55 | - | -    | -    |
| 168     | 8.46 | 1153 | 58.06   | 206.55 | - | -    | -    |
| 150     | 7.55 | 1303 | 65.61   | 208.55 | - | -    | -    |
| 133     | 6.70 | 1436 | 72.31   | 210.55 | - | -    | -    |
| 108     | 5.44 | 1544 | 77.74   | 212.55 | - | -    | -    |
| 96      | 4.83 | 1640 | 82.58   | 214.55 | - | -    | -    |
| 84      | 4.23 | 1724 | 86.81   | 216.55 | - | -    | -    |
| 71      | 3.58 | 1795 | 90.38   | 218.55 | - | -    | -    |
| 57      | 2.87 | 1852 | 93.25   | 220.55 | - | -    | -    |
| 43      | 2.17 | 1895 | 95.42   | 222.55 | - | -    | -    |
| 46      | 2.32 | 1941 | 97.73   | 224.55 | - | -    | -    |
| 20      | 1.01 | 1961 | 98.74   | 226.55 | - | -    | -    |
| 10      | 0.50 | 1971 | 99.24   | 228.55 | - | -    | -    |
| 4       | 0.20 | 1975 | 99.45   | 230.55 | - | -    | -    |
| 6       | 0.30 | 1981 | 99.75   | 232.55 | - | -    | -    |
| 2       | 0.10 | 1983 | 99.85   | 234.55 | - | -    | -    |
| 1       | 0.05 | 1984 | 99.90   | 236.55 | - | -    | -    |
| 1       | 0.05 | 1985 | 99.95   | 238.55 | - | -    | -    |
| 1       | 0.05 | 1986 | 100.00  | 240.55 | - | -    | -    |
|         |      |      |         | 242.55 | - | -    | -    |
|         |      |      |         | 244.55 | - | -    | -    |
|         |      |      |         | 246.55 | - | -    | -    |
|         |      |      |         | 248.55 | - | -    | -    |
|         |      |      |         | 248.55 | - | -    | -    |
|         |      |      |         | 250.55 | - | -    | -    |
|         |      |      |         | 250.55 | - | -    | -    |
|         |      |      |         | 252.55 | - | -    | -    |
|         |      |      |         | 252.55 | - | -    | -    |
|         |      |      |         | 254.55 | - | -    | -    |
|         |      |      |         | 254.55 | - | -    | -    |
|         |      |      |         | 256.55 | - | -    | -    |
|         |      |      |         | 256.55 | - | -    | -    |
|         |      |      |         | 258.55 | - | -    | -    |
|         |      |      |         | 258.55 | - | -    | -    |
|         |      |      |         | 260.55 | - | -    | -    |
|         |      |      |         | 260.55 | - | -    | -    |
|         |      |      |         | 262.55 | - | -    | -    |
|         |      |      |         | 262.55 | - | -    | -    |

### (D37) VERTICAL INDEX FINGERTIP REACH, SITTING

The vertical distance between a sitting surface and the tip of the right index finger of a participant sitting erect and raising the right shoulder, arm, and fingers straight overhead is calculated as follows: OVERHEAD FINGERTIP REACH SITTING minus ANSUR mean of HAND LENGTH plus ANSUR mean of WRIST-INDEX FINGER LENGTH.



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 115.40      | 45.43 | 1ST  | 126.30 | 49.72 |
| 117.30      | 46.18 | 2ND  | 127.70 | 50.28 |
| 118.30      | 46.57 | 3RD  | 128.90 | 50.75 |
| 119.60      | 47.09 | 5TH  | 130.30 | 51.30 |
| 121.90      | 47.99 | 10TH | 132.70 | 52.24 |
| 123.50      | 48.62 | 15TH | 134.20 | 52.83 |
| 124.60      | 49.06 | 20TH | 135.60 | 53.39 |
| 125.60      | 49.45 | 25TH | 136.70 | 53.82 |
| 126.50      | 49.80 | 30TH | 137.80 | 54.25 |
| 127.40      | 50.16 | 35TH | 138.80 | 54.65 |
| 128.20      | 50.47 | 40TH | 139.60 | 54.96 |
| 129.00      | 50.79 | 45TH | 140.40 | 55.28 |
| 129.80      | 51.10 | 50TH | 141.30 | 55.63 |
| 130.70      | 51.46 | 55TH | 142.00 | 55.91 |
| 131.30      | 51.69 | 60TH | 142.90 | 56.26 |
| 132.00      | 51.97 | 65TH | 143.90 | 56.65 |
| 132.90      | 52.32 | 70TH | 144.80 | 57.01 |
| 133.90      | 52.72 | 75TH | 145.90 | 57.44 |
| 135.00      | 53.15 | 80TH | 147.00 | 57.87 |
| 136.50      | 53.74 | 85TH | 148.50 | 58.46 |
| 138.40      | 54.49 | 90TH | 150.20 | 59.13 |
| 140.20      | 55.20 | 95TH | 152.70 | 60.12 |
| 141.80      | 55.83 | 97TH | 154.20 | 60.71 |
| 142.90      | 56.26 | 98TH | 155.70 | 61.30 |
| 144.20      | 56.77 | 99TH | 157.50 | 62.01 |

# (D37) VERTICAL INDEX FINGERTIP REACH, SITTING

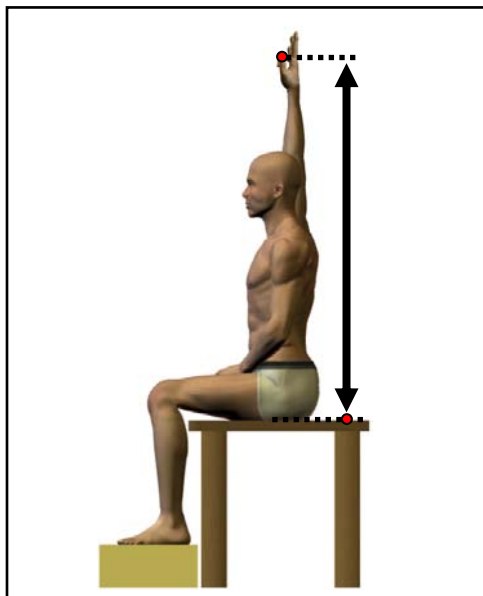
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 129.87                   | MEAN                 | 51.13 |
| 0.14                     | STD. ERROR (MEAN)    | 0.06  |
| 6.24                     | STANDARD DEVIATION   | 2.46  |
| 0.10                     | STD. ERROR (STD.DEV) | 0.04  |
| 110.00                   | MINIMUM              | 43.31 |
| 152.70                   | MAXIMUM              | 60.12 |
| SKEWNESS                 |                      | 0.06  |
| KURTOSIS                 |                      | 2.91  |
| COEFFICIENT OF VARIATION |                      | 4.8%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 141.37                   | MEAN                 | 55.66 |
| 0.11                     | STD. ERROR (MEAN)    | 0.04  |
| 6.77                     | STANDARD DEVIATION   | 2.67  |
| 0.07                     | STD. ERROR (STD.DEV) | 0.03  |
| 118.40                   | MINIMUM              | 46.61 |
| 163.80                   | MAXIMUM              | 64.49 |
| SKEWNESS                 |                      | 0.07  |
| KURTOSIS                 |                      | 2.96  |
| COEFFICIENT OF VARIATION |                      | 4.8%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |   |        |  | MALES |      |      |         |
|---------|-------|------|---------|-------------|---|--------|--|-------|------|------|---------|
| F       | FPct  | CumF | CumFPct | CM          |   | CM     |  | F     | FPct | CumF | CumFPct |
| 2       | 0.10  | 2    | 0.10    | 109.25      | - | 110.75 |  |       |      |      |         |
| 1       | 0.05  | 3    | 0.15    | 110.75      | - | 112.25 |  |       |      |      |         |
| 3       | 0.15  | 6    | 0.30    | 112.25      | - | 113.75 |  |       |      |      |         |
| 9       | 0.45  | 15   | 0.76    | 113.75      | - | 115.25 |  |       |      |      |         |
| 20      | 1.01  | 35   | 1.76    | 115.25      | - | 116.75 |  |       |      |      |         |
| 23      | 1.16  | 58   | 2.92    | 116.75      | - | 118.25 |  |       |      |      |         |
| 43      | 2.17  | 101  | 5.09    | 118.25      | - | 119.75 |  | 2     | 0.05 | 2    | 0.05    |
| 67      | 3.37  | 168  | 8.46    | 119.75      | - | 121.25 |  | 3     | 0.07 | 5    | 0.12    |
| 77      | 3.88  | 245  | 12.34   | 121.25      | - | 122.75 |  | 3     | 0.07 | 8    | 0.20    |
| 119     | 5.99  | 364  | 18.33   | 122.75      | - | 124.25 |  | 12    | 0.29 | 20   | 0.49    |
| 147     | 7.40  | 511  | 25.73   | 124.25      | - | 125.75 |  | 11    | 0.27 | 31   | 0.76    |
| 173     | 8.71  | 684  | 34.44   | 125.75      | - | 127.25 |  | 35    | 0.86 | 66   | 1.62    |
| 176     | 8.86  | 860  | 43.30   | 127.25      | - | 128.75 |  | 52    | 1.27 | 118  | 2.89    |
| 178     | 8.96  | 1038 | 52.27   | 128.75      | - | 130.25 |  | 85    | 2.08 | 203  | 4.97    |
| 211     | 10.62 | 1249 | 62.89   | 130.25      | - | 131.75 |  | 109   | 2.67 | 312  | 7.64    |
| 172     | 8.66  | 1421 | 71.55   | 131.75      | - | 133.25 |  | 160   | 3.92 | 472  | 11.56   |
| 138     | 6.95  | 1559 | 78.50   | 133.25      | - | 134.75 |  | 205   | 5.02 | 677  | 16.59   |
| 111     | 5.59  | 1670 | 84.09   | 134.75      | - | 136.25 |  | 255   | 6.25 | 932  | 22.83   |
| 83      | 4.18  | 1753 | 88.27   | 136.25      | - | 137.75 |  | 281   | 6.88 | 1213 | 29.72   |
| 91      | 4.58  | 1844 | 92.85   | 137.75      | - | 139.25 |  | 313   | 7.67 | 1526 | 37.38   |
| 62      | 3.12  | 1906 | 95.97   | 139.25      | - | 140.75 |  | 380   | 9.31 | 1906 | 46.69   |
| 27      | 1.36  | 1933 | 97.33   | 140.75      | - | 142.25 |  | 398   | 9.75 | 2304 | 56.44   |
| 25      | 1.26  | 1958 | 98.59   | 142.25      | - | 143.75 |  | 313   | 7.67 | 2617 | 64.11   |
| 15      | 0.76  | 1973 | 99.35   | 143.75      | - | 145.25 |  | 318   | 7.79 | 2935 | 71.90   |
| 8       | 0.40  | 1981 | 99.75   | 145.25      | - | 146.75 |  | 294   | 7.20 | 3229 | 79.10   |
| 3       | 0.15  | 1984 | 99.90   | 146.75      | - | 148.25 |  | 213   | 5.22 | 3442 | 84.32   |
| 1       | 0.05  | 1985 | 99.95   | 148.25      | - | 149.75 |  | 183   | 4.48 | 3625 | 88.80   |
| 0       | 0.00  | 1985 | 99.95   | 149.75      | - | 151.25 |  | 152   | 3.72 | 3777 | 92.53   |
| 1       | 0.05  | 1986 | 100.00  | 151.25      | - | 152.75 |  | 101   | 2.47 | 3878 | 95.00   |
|         |       |      |         | 152.75      | - | 154.25 |  | 84    | 2.06 | 3962 | 97.06   |
|         |       |      |         | 154.25      | - | 155.75 |  | 41    | 1.00 | 4003 | 98.06   |
|         |       |      |         | 155.75      | - | 157.25 |  | 35    | 0.86 | 4038 | 98.92   |
|         |       |      |         | 157.25      | - | 158.75 |  | 23    | 0.56 | 4061 | 99.49   |
|         |       |      |         | 158.75      | - | 160.25 |  | 7     | 0.17 | 4068 | 99.66   |
|         |       |      |         | 160.25      | - | 161.75 |  | 5     | 0.12 | 4073 | 99.78   |
|         |       |      |         | 161.75      | - | 163.25 |  | 5     | 0.12 | 4078 | 99.90   |
|         |       |      |         | 163.25      | - | 164.75 |  | 4     | 0.10 | 4082 | 100.00  |

### (D38) VERTICAL THUMB TIP REACH, SITTING

The vertical distance between a sitting surface and the tip of the right thumb of a participant sitting erect with the right shoulder, arm, and hand held straight overhead with the thumb lying on the first knuckle of the index finger is calculated as follows: OVERHEAD FINGERTIP REACH SITTING minus ANSUR mean of HAND LENGTH plus ANSUR mean of WRIST-THUMB TIP LENGTH.

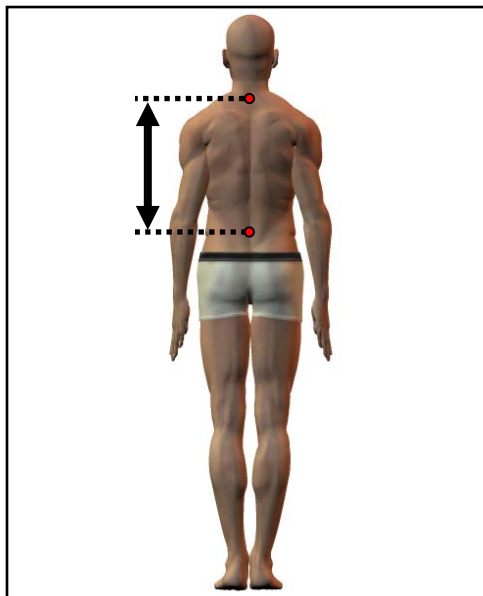


| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 110.20      | 43.39 | 1ST  | 120.70 | 47.52 |
| 112.10      | 44.13 | 2ND  | 122.10 | 48.07 |
| 113.10      | 44.53 | 3RD  | 123.30 | 48.54 |
| 114.40      | 45.04 | 5TH  | 124.70 | 49.09 |
| 116.70      | 45.94 | 10TH | 127.10 | 50.04 |
| 118.30      | 46.57 | 15TH | 128.60 | 50.63 |
| 119.40      | 47.01 | 20TH | 130.00 | 51.18 |
| 120.40      | 47.40 | 25TH | 131.10 | 51.61 |
| 121.30      | 47.76 | 30TH | 132.20 | 52.05 |
| 122.20      | 48.11 | 35TH | 133.20 | 52.44 |
| 123.00      | 48.43 | 40TH | 134.00 | 52.76 |
| 123.80      | 48.74 | 45TH | 134.80 | 53.07 |
| 124.60      | 49.06 | 50TH | 135.70 | 53.43 |
| 125.50      | 49.41 | 55TH | 136.40 | 53.70 |
| 126.10      | 49.65 | 60TH | 137.30 | 54.06 |
| 126.80      | 49.92 | 65TH | 138.30 | 54.45 |
| 127.70      | 50.28 | 70TH | 139.20 | 54.80 |
| 128.70      | 50.67 | 75TH | 140.30 | 55.24 |
| 129.80      | 51.10 | 80TH | 141.40 | 55.67 |
| 131.30      | 51.69 | 85TH | 142.90 | 56.26 |
| 133.20      | 52.44 | 90TH | 144.60 | 56.93 |
| 135.00      | 53.15 | 95TH | 147.10 | 57.91 |
| 136.60      | 53.78 | 97TH | 148.60 | 58.50 |
| 137.70      | 54.21 | 98TH | 150.10 | 59.09 |
| 139.00      | 54.72 | 99TH | 151.90 | 59.80 |



### (D39) WAIST BACK, VERTICAL (OMPHALION)\*

The vertical distance between the cervicale landmark and the waist at the level of the navel (omphalion) is calculated as follows: CERVICALE HEIGHT minus WAIST HEIGHT (OMPHALION).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 35.90       | 14.13 | 1ST  | 40.30 | 15.87 |
| 36.70       | 14.45 | 2ND  | 40.90 | 16.10 |
| 37.30       | 14.69 | 3RD  | 41.30 | 16.26 |
| 37.90       | 14.92 | 5TH  | 41.90 | 16.50 |
| 38.70       | 15.24 | 10TH | 42.70 | 16.81 |
| 39.20       | 15.43 | 15TH | 43.40 | 17.09 |
| 39.60       | 15.59 | 20TH | 43.90 | 17.28 |
| 40.00       | 15.75 | 25TH | 44.30 | 17.44 |
| 40.30       | 15.87 | 30TH | 44.70 | 17.60 |
| 40.60       | 15.98 | 35TH | 45.10 | 17.76 |
| 40.90       | 16.10 | 40TH | 45.40 | 17.87 |
| 41.20       | 16.22 | 45TH | 45.70 | 17.99 |
| 41.50       | 16.34 | 50TH | 46.00 | 18.11 |
| 41.70       | 16.42 | 55TH | 46.40 | 18.27 |
| 42.10       | 16.57 | 60TH | 46.70 | 18.39 |
| 42.40       | 16.69 | 65TH | 47.00 | 18.50 |
| 42.70       | 16.81 | 70TH | 47.30 | 18.62 |
| 43.10       | 16.97 | 75TH | 47.70 | 18.78 |
| 43.50       | 17.13 | 80TH | 48.20 | 18.98 |
| 43.90       | 17.28 | 85TH | 48.70 | 19.17 |
| 44.60       | 17.56 | 90TH | 49.40 | 19.45 |
| 45.50       | 17.91 | 95TH | 50.40 | 19.84 |
| 46.10       | 18.15 | 97TH | 51.20 | 20.16 |
| 46.60       | 18.35 | 98TH | 51.70 | 20.35 |
| 47.30       | 18.62 | 99TH | 52.80 | 20.79 |

\* In ANSUR cervicale was defined as the highest point on the seventh cervical vertebra. For consistency with international standards, it is now the most prominent point on the seventh cervical vertebra.

(D39) WAIST BACK, VERTICAL (OMPHALION)

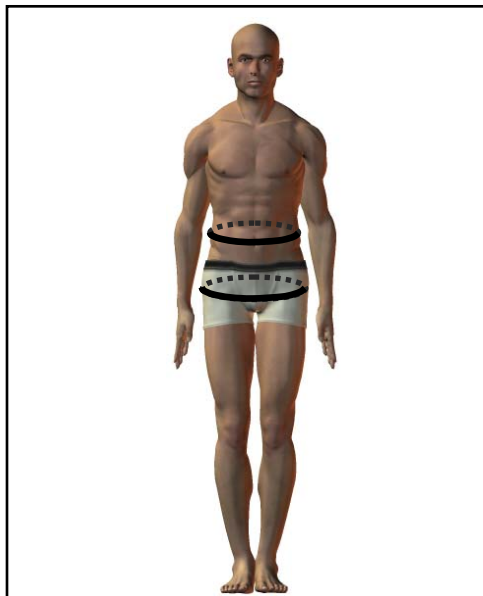
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 41.55                    | MEAN                 | 16.36 |
| 0.05                     | STD. ERROR (MEAN)    | 0.02  |
| 2.34                     | STANDARD DEVIATION   | 0.92  |
| 0.04                     | STD. ERROR (STD.DEV) | 0.01  |
| 34.60                    | MINIMUM              | 13.62 |
| 50.50                    | MAXIMUM              | 19.88 |
| SKEWNESS                 |                      | 0.13  |
| KURTOSIS                 |                      | 3.20  |
| COEFFICIENT OF VARIATION |                      | 5.6%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 46.08                    | MEAN                 | 18.14 |
| 0.04                     | STD. ERROR (MEAN)    | 0.02  |
| 2.61                     | STANDARD DEVIATION   | 1.03  |
| 0.03                     | STD. ERROR (STD.DEV) | 0.01  |
| 37.50                    | MINIMUM              | 14.76 |
| 57.30                    | MAXIMUM              | 22.56 |
| SKEWNESS                 |                      | 0.16  |
| KURTOSIS                 |                      | 3.23  |
| COEFFICIENT OF VARIATION |                      | 5.7%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |      |      |         | FREQUENCIES |   |       |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|-------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |       |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 34.25       | - | 34.75 |  |       |      |      |         |
| 8       | 0.40 | 9    | 0.45    | 34.75       | - | 35.25 |  |       |      |      |         |
| 6       | 0.30 | 15   | 0.76    | 35.25       | - | 35.75 |  |       |      |      |         |
| 14      | 0.70 | 29   | 1.46    | 35.75       | - | 36.25 |  |       |      |      |         |
| 12      | 0.60 | 41   | 2.06    | 36.25       | - | 36.75 |  |       |      |      |         |
| 15      | 0.76 | 56   | 2.82    | 36.75       | - | 37.25 |  |       |      |      |         |
| 30      | 1.51 | 86   | 4.33    | 37.25       | - | 37.75 |  | 1     | 0.02 | 1    | 0.02    |
| 48      | 2.42 | 134  | 6.75    | 37.75       | - | 38.25 |  | 3     | 0.07 | 4    | 0.10    |
| 83      | 4.18 | 217  | 10.93   | 38.25       | - | 38.75 |  | 6     | 0.15 | 10   | 0.24    |
| 97      | 4.88 | 314  | 15.81   | 38.75       | - | 39.25 |  | 7     | 0.17 | 17   | 0.42    |
| 121     | 6.09 | 435  | 21.90   | 39.25       | - | 39.75 |  | 7     | 0.17 | 24   | 0.59    |
| 127     | 6.39 | 562  | 28.30   | 39.75       | - | 40.25 |  | 16    | 0.39 | 40   | 0.98    |
| 166     | 8.36 | 728  | 36.66   | 40.25       | - | 40.75 |  | 25    | 0.61 | 65   | 1.59    |
| 183     | 9.21 | 911  | 45.87   | 40.75       | - | 41.25 |  | 46    | 1.13 | 111  | 2.72    |
| 182     | 9.16 | 1093 | 55.04   | 41.25       | - | 41.75 |  | 68    | 1.67 | 179  | 4.39    |
| 156     | 7.85 | 1249 | 62.89   | 41.75       | - | 42.25 |  | 97    | 2.38 | 276  | 6.76    |
| 159     | 8.01 | 1408 | 70.90   | 42.25       | - | 42.75 |  | 135   | 3.31 | 411  | 10.07   |
| 115     | 5.79 | 1523 | 76.69   | 42.75       | - | 43.25 |  | 151   | 3.70 | 562  | 13.77   |
| 134     | 6.75 | 1657 | 83.43   | 43.25       | - | 43.75 |  | 184   | 4.51 | 746  | 18.28   |
| 91      | 4.58 | 1748 | 88.02   | 43.75       | - | 44.25 |  | 228   | 5.59 | 974  | 23.86   |
| 62      | 3.12 | 1810 | 91.14   | 44.25       | - | 44.75 |  | 277   | 6.79 | 1251 | 30.65   |
| 58      | 2.92 | 1868 | 94.06   | 44.75       | - | 45.25 |  | 251   | 6.15 | 1502 | 36.80   |
| 33      | 1.66 | 1901 | 95.72   | 45.25       | - | 45.75 |  | 353   | 8.65 | 1855 | 45.44   |
| 30      | 1.51 | 1931 | 97.23   | 45.75       | - | 46.25 |  | 327   | 8.01 | 2182 | 53.45   |
| 21      | 1.06 | 1952 | 98.29   | 46.25       | - | 46.75 |  | 326   | 7.99 | 2508 | 61.44   |
| 14      | 0.70 | 1966 | 98.99   | 46.75       | - | 47.25 |  | 297   | 7.28 | 2805 | 68.72   |
| 10      | 0.50 | 1976 | 99.50   | 47.25       | - | 47.75 |  | 267   | 6.54 | 3072 | 75.26   |
| 3       | 0.15 | 1979 | 99.65   | 47.75       | - | 48.25 |  | 217   | 5.32 | 3289 | 80.57   |
| 1       | 0.05 | 1980 | 99.70   | 48.25       | - | 48.75 |  | 182   | 4.46 | 3471 | 85.03   |
| 3       | 0.15 | 1983 | 99.85   | 48.75       | - | 49.25 |  | 159   | 3.90 | 3630 | 88.93   |
| 2       | 0.10 | 1985 | 99.95   | 49.25       | - | 49.75 |  | 127   | 3.11 | 3757 | 92.04   |
| 0       | 0.00 | 1985 | 99.95   | 49.75       | - | 50.25 |  | 95    | 2.33 | 3852 | 94.37   |
| 1       | 0.05 | 1986 | 100.00  | 50.25       | - | 50.75 |  | 65    | 1.59 | 3917 | 95.96   |
|         |      |      |         | 50.75       | - | 51.25 |  | 47    | 1.15 | 3964 | 97.11   |
|         |      |      |         | 51.25       | - | 51.75 |  | 37    | 0.91 | 4001 | 98.02   |
|         |      |      |         | 51.75       | - | 52.25 |  | 18    | 0.44 | 4019 | 98.46   |
|         |      |      |         | 52.25       | - | 52.75 |  | 19    | 0.47 | 4038 | 98.92   |
|         |      |      |         | 52.75       | - | 53.25 |  | 17    | 0.42 | 4055 | 99.34   |
|         |      |      |         | 53.25       | - | 53.75 |  | 12    | 0.29 | 4067 | 99.63   |
|         |      |      |         | 53.75       | - | 54.25 |  | 9     | 0.22 | 4076 | 99.85   |
|         |      |      |         | 54.25       | - | 54.75 |  | 2     | 0.05 | 4078 | 99.90   |
|         |      |      |         | 54.75       | - | 55.25 |  | 1     | 0.02 | 4079 | 99.93   |
|         |      |      |         | 55.25       | - | 55.75 |  | 1     | 0.02 | 4080 | 99.95   |
|         |      |      |         | 55.75       | - | 56.25 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 56.25       | - | 56.75 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 56.75       | - | 57.25 |  | 0     | 0.00 | 4081 | 99.98   |
|         |      |      |         | 57.25       | - | 57.75 |  | 1     | 0.02 | 4082 | 100.00  |

## (D40) WAIST-BUTTOCK DROP (OMPHALION)

The difference between the circumference of the waist at the level of the navel (omphalion) and the circumference at the level of the buttock point landmarks is calculated as follows: BUTTOCK CIRCUMFERENCE minus WAIST CIRCUMFERENCE (OMPHALION).



| PERCENTILES |       |      |       |       |
|-------------|-------|------|-------|-------|
| FEMALES     |       |      | MALES |       |
| CM          | IN    |      | CM    | IN    |
| 0.60        | 0.24  | 1ST  | -6.30 | -2.48 |
| 2.50        | 0.98  | 2ND  | -4.70 | -1.85 |
| 3.80        | 1.50  | 3RD  | -3.40 | -1.34 |
| 5.70        | 2.24  | 5TH  | -2.10 | -0.83 |
| 8.20        | 3.23  | 10TH | 0.20  | 0.08  |
| 9.80        | 3.86  | 15TH | 1.60  | 0.63  |
| 11.20       | 4.41  | 20TH | 2.90  | 1.14  |
| 12.30       | 4.84  | 25TH | 3.90  | 1.54  |
| 13.40       | 5.28  | 30TH | 4.80  | 1.89  |
| 14.20       | 5.59  | 35TH | 5.80  | 2.28  |
| 15.00       | 5.91  | 40TH | 6.60  | 2.60  |
| 15.70       | 6.18  | 45TH | 7.40  | 2.91  |
| 16.40       | 6.46  | 50TH | 8.20  | 3.23  |
| 17.00       | 6.69  | 55TH | 9.00  | 3.54  |
| 17.80       | 7.01  | 60TH | 9.90  | 3.90  |
| 18.60       | 7.32  | 65TH | 10.60 | 4.17  |
| 19.30       | 7.60  | 70TH | 11.40 | 4.49  |
| 20.00       | 7.87  | 75TH | 12.30 | 4.84  |
| 20.90       | 8.23  | 80TH | 13.20 | 5.20  |
| 21.90       | 8.62  | 85TH | 14.00 | 5.51  |
| 23.30       | 9.17  | 90TH | 15.00 | 5.91  |
| 25.20       | 9.92  | 95TH | 16.40 | 6.46  |
| 26.60       | 10.47 | 97TH | 17.60 | 6.93  |
| 27.70       | 10.91 | 98TH | 18.40 | 7.24  |
| 29.00       | 11.42 | 99TH | 19.40 | 7.64  |

## (D40) WAIST-BUTTOCK DROP (OMPHALION)

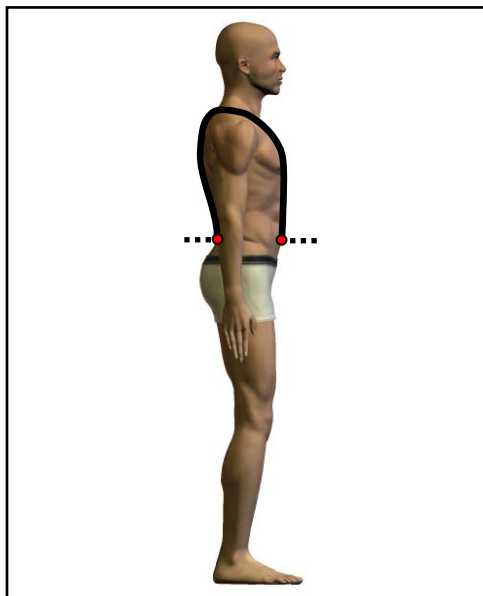
| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 16.03                    | MEAN                 | 6.31  |
| 0.13                     | STD. ERROR (MEAN)    | 0.05  |
| 5.98                     | STANDARD DEVIATION   | 2.35  |
| 0.09                     | STD. ERROR (STD.DEV) | 0.04  |
| -10.60                   | MINIMUM              | -4.17 |
| 34.70                    | MAXIMUM              | 13.66 |
| SKEWNESS                 |                      | -0.30 |
| KURTOSIS                 |                      | 3.28  |
| COEFFICIENT OF VARIATION |                      | 37.3% |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 7.89                     | MEAN                 | 3.11  |
| 0.09                     | STD. ERROR (MEAN)    | 0.04  |
| 5.79                     | STANDARD DEVIATION   | 2.28  |
| 0.06                     | STD. ERROR (STD.DEV) | 0.03  |
| -24.50                   | MINIMUM              | -9.65 |
| 24.50                    | MAXIMUM              | 9.65  |
| SKEWNESS                 |                      | -0.35 |
| KURTOSIS                 |                      | 3.03  |
| COEFFICIENT OF VARIATION |                      | 73.4% |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

| FEMALES |       |      |         | FREQUENCIES |    |        |  | MALES |      |      |         |
|---------|-------|------|---------|-------------|----|--------|--|-------|------|------|---------|
| E       | FPct  | CumF | CumFPct |             | CM |        |  | E     | FPct | CumF | CumFPct |
|         |       |      |         | -25.75      | -  | -24.25 |  | 1     | 0.02 | 1    | 0.02    |
|         |       |      |         | -24.25      | -  | -22.75 |  | 0     | 0.00 | 1    | 0.02    |
|         |       |      |         | -22.75      | -  | -21.25 |  | 0     | 0.00 | 1    | 0.02    |
|         |       |      |         | -21.25      | -  | -19.75 |  | 0     | 0.00 | 1    | 0.02    |
|         |       |      |         | -19.75      | -  | -18.25 |  | 0     | 0.00 | 1    | 0.02    |
|         |       |      |         | -18.25      | -  | -16.75 |  | 1     | 0.02 | 2    | 0.05    |
|         |       |      |         | -16.75      | -  | -15.25 |  | 1     | 0.02 | 3    | 0.07    |
|         |       |      |         | -15.25      | -  | -13.75 |  | 0     | 0.00 | 3    | 0.07    |
|         |       |      |         | -13.75      | -  | -12.25 |  | 1     | 0.02 | 4    | 0.10    |
|         |       |      |         | -12.25      | -  | -10.75 |  | 2     | 0.05 | 6    | 0.15    |
| 1       | 0.05  | 1    | 0.05    | -10.75      | -  | -9.25  |  | 3     | 0.07 | 9    | 0.22    |
| 0       | 0.00  | 1    | 0.05    | -9.25       | -  | -7.75  |  | 12    | 0.29 | 21   | 0.51    |
| 0       | 0.00  | 1    | 0.05    | -7.75       | -  | -6.25  |  | 21    | 0.51 | 42   | 1.03    |
| 0       | 0.00  | 1    | 0.05    | -6.25       | -  | -4.75  |  | 37    | 0.91 | 79   | 1.94    |
| 2       | 0.10  | 3    | 0.15    | -4.75       | -  | -3.25  |  | 52    | 1.27 | 131  | 3.21    |
| 4       | 0.20  | 7    | 0.35    | -3.25       | -  | -1.75  |  | 93    | 2.28 | 224  | 5.49    |
| 10      | 0.50  | 17   | 0.86    | -1.75       | -  | -0.25  |  | 126   | 3.09 | 350  | 8.57    |
| 6       | 0.30  | 23   | 1.16    | -0.25       | -  | 1.25   |  | 202   | 4.95 | 552  | 13.52   |
| 19      | 0.96  | 42   | 2.11    | 1.25        | -  | 2.75   |  | 245   | 6.00 | 797  | 19.52   |
| 24      | 1.21  | 66   | 3.32    | 2.75        | -  | 4.25   |  | 301   | 7.37 | 1098 | 26.90   |
| 35      | 1.76  | 101  | 5.09    | 4.25        | -  | 5.75   |  | 324   | 7.94 | 1422 | 34.84   |
| 58      | 2.92  | 159  | 8.01    | 5.75        | -  | 7.25   |  | 367   | 8.99 | 1789 | 43.83   |
| 80      | 4.03  | 239  | 12.03   | 7.25        | -  | 8.75   |  | 372   | 9.11 | 2161 | 52.94   |
| 88      | 4.43  | 327  | 16.47   | 8.75        | -  | 10.25  |  | 389   | 9.53 | 2550 | 62.47   |
| 126     | 6.34  | 453  | 22.81   | 10.25       | -  | 11.75  |  | 363   | 8.89 | 2913 | 71.36   |
| 133     | 6.70  | 586  | 29.51   | 11.75       | -  | 13.25  |  | 380   | 9.31 | 3293 | 80.67   |
| 173     | 8.71  | 759  | 38.22   | 13.25       | -  | 14.75  |  | 339   | 8.30 | 3632 | 88.98   |
| 215     | 10.83 | 974  | 49.04   | 14.75       | -  | 16.25  |  | 224   | 5.49 | 3856 | 94.46   |
| 214     | 10.78 | 1188 | 59.82   | 16.25       | -  | 17.75  |  | 118   | 2.89 | 3974 | 97.35   |
| 197     | 9.92  | 1385 | 69.74   | 17.75       | -  | 19.25  |  | 65    | 1.59 | 4039 | 98.95   |
| 179     | 9.01  | 1564 | 78.75   | 19.25       | -  | 20.75  |  | 27    | 0.66 | 4066 | 99.61   |
| 151     | 7.60  | 1715 | 86.35   | 20.75       | -  | 22.25  |  | 12    | 0.29 | 4078 | 99.90   |
| 98      | 4.93  | 1813 | 91.29   | 22.25       | -  | 23.75  |  | 3     | 0.07 | 4081 | 99.98   |
| 75      | 3.78  | 1888 | 95.07   | 23.75       | -  | 25.25  |  | 1     | 0.02 | 4082 | 100.00  |
| 41      | 2.06  | 1929 | 97.13   | 25.25       | -  | 26.75  |  |       |      |      |         |
| 24      | 1.21  | 1953 | 98.34   | 26.75       | -  | 28.25  |  |       |      |      |         |
| 21      | 1.06  | 1974 | 99.40   | 28.25       | -  | 29.75  |  |       |      |      |         |
| 5       | 0.25  | 1979 | 99.65   | 29.75       | -  | 31.25  |  |       |      |      |         |
| 5       | 0.25  | 1984 | 99.90   | 31.25       | -  | 32.75  |  |       |      |      |         |
| 1       | 0.05  | 1985 | 99.95   | 32.75       | -  | 34.25  |  |       |      |      |         |
| 1       | 0.05  | 1986 | 100.00  | 34.25       | -  | 35.75  |  |       |      |      |         |

## (D41) WAIST-WAIST (OMPHALION) OVER SHOULDER

The vertical circumference of the upper torso between the front of the waist at the navel (omphalion) passing up over the midpoint between the sternum and the anterior axillary fold, over the midshoulder landmark, and down the back to the waist (omphalion) posterior landmark is calculated as follows: VERTICAL TRUNK CIRCUMFERENCE (USA) minus CROTCH LENGTH (OMPHALION).



| PERCENTILES |       |      |        |       |
|-------------|-------|------|--------|-------|
| FEMALES     |       |      | MALES  |       |
| CM          | IN    |      | CM     | IN    |
| 81.40       | 32.05 | 1ST  | 91.00  | 35.83 |
| 82.90       | 32.64 | 2ND  | 92.10  | 36.26 |
| 83.50       | 32.87 | 3RD  | 93.20  | 36.69 |
| 84.70       | 33.35 | 5TH  | 94.60  | 37.24 |
| 86.70       | 34.13 | 10TH | 96.70  | 38.07 |
| 88.00       | 34.65 | 15TH | 98.00  | 38.58 |
| 89.10       | 35.08 | 20TH | 99.10  | 39.02 |
| 89.80       | 35.35 | 25TH | 100.00 | 39.37 |
| 90.60       | 35.67 | 30TH | 100.90 | 39.72 |
| 91.40       | 35.98 | 35TH | 101.70 | 40.04 |
| 92.30       | 36.34 | 40TH | 102.50 | 40.35 |
| 93.00       | 36.61 | 45TH | 103.30 | 40.67 |
| 93.50       | 36.81 | 50TH | 104.10 | 40.98 |
| 94.30       | 37.13 | 55TH | 104.80 | 41.26 |
| 95.10       | 37.44 | 60TH | 105.50 | 41.54 |
| 95.90       | 37.76 | 65TH | 106.40 | 41.89 |
| 96.70       | 38.07 | 70TH | 107.20 | 42.20 |
| 97.60       | 38.43 | 75TH | 108.20 | 42.60 |
| 98.70       | 38.86 | 80TH | 109.30 | 43.03 |
| 99.90       | 39.33 | 85TH | 110.60 | 43.54 |
| 101.30      | 39.88 | 90TH | 112.20 | 44.17 |
| 103.50      | 40.75 | 95TH | 114.30 | 45.00 |
| 105.20      | 41.42 | 97TH | 116.30 | 45.79 |
| 106.40      | 41.89 | 98TH | 117.50 | 46.26 |
| 108.20      | 42.60 | 99TH | 119.90 | 47.20 |

## (D41) WAIST-WAIST (OMPHALION) OVER SHOULDER

| FEMALES                  |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 93.86                    | MEAN                 | 36.95 |
| 0.13                     | STD. ERROR (MEAN)    | 0.05  |
| 5.70                     | STANDARD DEVIATION   | 2.25  |
| 0.09                     | STD. ERROR (STD.DEV) | 0.04  |
| 76.10                    | MINIMUM              | 29.96 |
| 114.10                   | MAXIMUM              | 44.92 |
| SKEWNESS                 |                      | 0.19  |
| KURTOSIS                 |                      | 2.95  |
| COEFFICIENT OF VARIATION |                      | 6.1%  |
| NUMBER OF PARTICIPANTS   |                      | 1986  |

| MALES                    |                      |       |
|--------------------------|----------------------|-------|
| CM                       |                      | IN    |
| 104.25                   | MEAN                 | 41.04 |
| 0.10                     | STD. ERROR (MEAN)    | 0.04  |
| 6.09                     | STANDARD DEVIATION   | 2.40  |
| 0.07                     | STD. ERROR (STD.DEV) | 0.03  |
| 85.60                    | MINIMUM              | 33.70 |
| 127.90                   | MAXIMUM              | 50.35 |
| SKEWNESS                 |                      | 0.22  |
| KURTOSIS                 |                      | 3.09  |
| COEFFICIENT OF VARIATION |                      | 5.8%  |
| NUMBER OF PARTICIPANTS   |                      | 4082  |

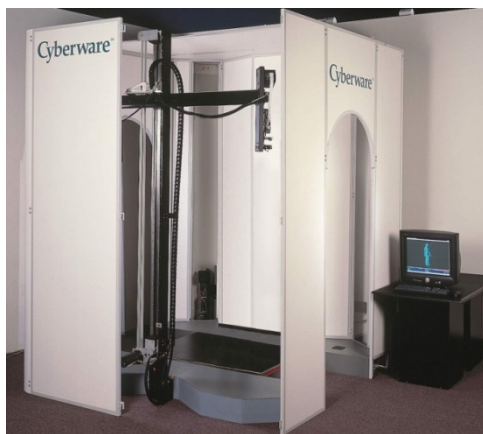
| FEMALES |      |      |         | FREQUENCIES |   |        |  | MALES |      |      |         |
|---------|------|------|---------|-------------|---|--------|--|-------|------|------|---------|
| F       | FPct | CumF | CumFPct | CM          |   |        |  | F     | FPct | CumF | CumFPct |
| 1       | 0.05 | 1    | 0.05    | 75.55       | - | 76.55  |  |       |      |      |         |
| 0       | 0.00 | 1    | 0.05    | 76.55       | - | 77.55  |  |       |      |      |         |
| 3       | 0.15 | 4    | 0.20    | 77.55       | - | 78.55  |  |       |      |      |         |
| 2       | 0.10 | 6    | 0.30    | 78.55       | - | 79.55  |  |       |      |      |         |
| 9       | 0.45 | 15   | 0.76    | 79.55       | - | 80.55  |  |       |      |      |         |
| 5       | 0.25 | 20   | 1.01    | 80.55       | - | 81.55  |  |       |      |      |         |
| 10      | 0.50 | 30   | 1.51    | 81.55       | - | 82.55  |  |       |      |      |         |
| 30      | 1.51 | 60   | 3.02    | 82.55       | - | 83.55  |  |       |      |      |         |
| 29      | 1.46 | 89   | 4.48    | 83.55       | - | 84.55  |  |       |      |      |         |
| 45      | 2.27 | 134  | 6.75    | 84.55       | - | 85.55  |  |       |      |      |         |
| 55      | 2.77 | 189  | 9.52    | 85.55       | - | 86.55  |  | 1     | 0.02 | 1    | 0.02    |
| 63      | 3.17 | 252  | 12.69   | 86.55       | - | 87.55  |  | 2     | 0.05 | 3    | 0.07    |
| 92      | 4.63 | 344  | 17.32   | 87.55       | - | 88.55  |  | 5     | 0.12 | 8    | 0.20    |
| 107     | 5.39 | 451  | 22.71   | 88.55       | - | 89.55  |  | 9     | 0.22 | 17   | 0.42    |
| 136     | 6.85 | 587  | 29.56   | 89.55       | - | 90.55  |  | 16    | 0.39 | 33   | 0.81    |
| 125     | 6.29 | 712  | 35.85   | 90.55       | - | 91.55  |  | 26    | 0.64 | 59   | 1.45    |
| 124     | 6.24 | 836  | 42.09   | 91.55       | - | 92.55  |  | 37    | 0.91 | 96   | 2.35    |
| 158     | 7.96 | 994  | 50.05   | 92.55       | - | 93.55  |  | 42    | 1.03 | 138  | 3.38    |
| 129     | 6.50 | 1123 | 56.55   | 93.55       | - | 94.55  |  | 61    | 1.49 | 199  | 4.88    |
| 121     | 6.09 | 1244 | 62.64   | 94.55       | - | 95.55  |  | 87    | 2.13 | 286  | 7.01    |
| 125     | 6.29 | 1369 | 68.93   | 95.55       | - | 96.55  |  | 109   | 2.67 | 395  | 9.68    |
| 118     | 5.94 | 1487 | 74.87   | 96.55       | - | 97.55  |  | 133   | 3.26 | 528  | 12.93   |
| 83      | 4.18 | 1570 | 79.05   | 97.55       | - | 98.55  |  | 182   | 4.46 | 710  | 17.39   |
| 98      | 4.93 | 1668 | 83.99   | 98.55       | - | 99.55  |  | 214   | 5.24 | 924  | 22.64   |
| 68      | 3.42 | 1736 | 87.41   | 99.55       | - | 100.55 |  | 203   | 4.97 | 1127 | 27.61   |
| 67      | 3.37 | 1803 | 90.79   | 100.55      | - | 101.55 |  | 260   | 6.37 | 1387 | 33.98   |
| 46      | 2.32 | 1849 | 93.10   | 101.55      | - | 102.55 |  | 265   | 6.49 | 1652 | 40.47   |
| 39      | 1.96 | 1888 | 95.07   | 102.55      | - | 103.55 |  | 262   | 6.42 | 1914 | 46.89   |
| 28      | 1.41 | 1916 | 96.48   | 103.55      | - | 104.55 |  | 260   | 6.37 | 2174 | 53.26   |
| 14      | 0.70 | 1930 | 97.18   | 104.55      | - | 105.55 |  | 284   | 6.96 | 2458 | 60.22   |
| 20      | 1.01 | 1950 | 98.19   | 105.55      | - | 106.55 |  | 239   | 5.85 | 2697 | 66.07   |
| 11      | 0.55 | 1961 | 98.74   | 106.55      | - | 107.55 |  | 231   | 5.66 | 2928 | 71.73   |
| 10      | 0.50 | 1971 | 99.24   | 107.55      | - | 108.55 |  | 199   | 4.88 | 3127 | 76.60   |
| 7       | 0.35 | 1978 | 99.60   | 108.55      | - | 109.55 |  | 168   | 4.12 | 3295 | 80.72   |
| 4       | 0.20 | 1982 | 99.80   | 109.55      | - | 110.55 |  | 167   | 4.09 | 3462 | 84.81   |
| 3       | 0.15 | 1985 | 99.95   | 110.55      | - | 111.55 |  | 131   | 3.21 | 3593 | 88.02   |
| 0       | 0.00 | 1985 | 99.95   | 111.55      | - | 112.55 |  | 127   | 3.11 | 3720 | 91.13   |
| 0       | 0.00 | 1985 | 99.95   | 112.55      | - | 113.55 |  | 109   | 2.67 | 3829 | 93.80   |
| 1       | 0.05 | 1986 | 100.00  | 113.55      | - | 114.55 |  | 59    | 1.45 | 3888 | 95.25   |
|         |      |      |         | 114.55      | - | 115.55 |  | 49    | 1.20 | 3937 | 96.45   |
|         |      |      |         | 115.55      | - | 116.55 |  | 33    | 0.81 | 3970 | 97.26   |
|         |      |      |         | 116.55      | - | 117.55 |  | 31    | 0.76 | 4001 | 98.02   |
|         |      |      |         | 117.55      | - | 118.55 |  | 21    | 0.51 | 4022 | 98.53   |
|         |      |      |         | 118.55      | - | 119.55 |  | 15    | 0.37 | 4037 | 98.90   |
|         |      |      |         | 119.55      | - | 120.55 |  | 19    | 0.47 | 4056 | 99.36   |
|         |      |      |         | 120.55      | - | 121.55 |  | 5     | 0.12 | 4061 | 99.49   |
|         |      |      |         | 121.55      | - | 122.55 |  | 9     | 0.22 | 4070 | 99.71   |
|         |      |      |         | 122.55      | - | 123.55 |  | 4     | 0.10 | 4074 | 99.80   |
|         |      |      |         | 123.55      | - | 124.55 |  | 3     | 0.07 | 4077 | 99.88   |
|         |      |      |         | 124.55      | - | 125.55 |  | 2     | 0.05 | 4079 | 99.93   |
|         |      |      |         | 125.55      | - | 126.55 |  | 1     | 0.02 | 4080 | 99.95   |
|         |      |      |         | 126.55      | - | 127.55 |  | 1     | 0.02 | 4081 | 99.98   |
|         |      |      |         | 127.55      | - | 128.55 |  | 1     | 0.02 | 4082 | 100.00  |

## CHAPTER VI

### THREE-DIMENSIONAL SCANNING

In addition to the traditional measurement stations, ANSUR II participants also visited the scanning station, where 3-D images were taken by three digital scanners: whole-body, head, and foot. Team members directed participants to each of the three scanners in a sequence that minimized wait time.

All three machines used in this survey—the Cyberware WBX and PX scanners, and the INFOOT foot scanner—were low-power, infrared laser systems that offer no risk of damage to the body (Figure 21). The machines were calibrated daily. Cyscan, the software for the WBX and PX systems, runs on the Windows XP operating system, as does the INFOOT software used in conjunction with the foot scanner. The computers associated with the scanners were set up so that they only connected with the in-field Anthrotech network. Scan data files were transferred over this network via Ethernet data cable connection to the local system server and then uploaded daily to a server located in Yellow Springs, OH (Anthrotech HQ). Data files were transferred daily to a secure server at NSRDEC via a secure connection.



WBX Scanner



PX Scanner



Foot Scanner

FIGURE 21

#### Scanning Instruments

Furnished by the Government, the CyScan software on the WBX runs in conjunction with the EARS program. EARS (Yin et al., 2009; Yin et al., 2010), also furnished by the Government, was used as an evaluation step to assist the operator in evaluating scan quality.

#### 6.1 PARTICIPANT PREPARATION

When participants arrived at the scanning stations, they were shown to a changing room and asked to change into the appropriately sized scan wear. Scan wear

was spandex compression shorts for men and spandex shorts and a jog bra for women. Wig caps were placed on the participants' heads to 1) allow capture of the head surface and 2) compress the hair to minimize the increase to apparent head size caused by hair bulk. Some hair types and styles also caused irregular reflections of the laser light, resulting in extraneous points on the scan; the wig cap minimized this effect as well. A team member placed orange half-inch adhesive dots over selected landmarks previously drawn on the body and orange quarter-inch adhesive dots on all head landmarks. Wooden disks were used to mark left and right acromion landmarks. The landmarks used for the scan procedure are illustrated in Figures 22 through 25.

The participant was then directed to whichever scanner was available. Scanning of a single participant took approximately 15-20 s to complete for each scanner, but he/she was asked to remain in the scanner while the operator checked the visual images, as rescans were sometimes necessary to correct problems.

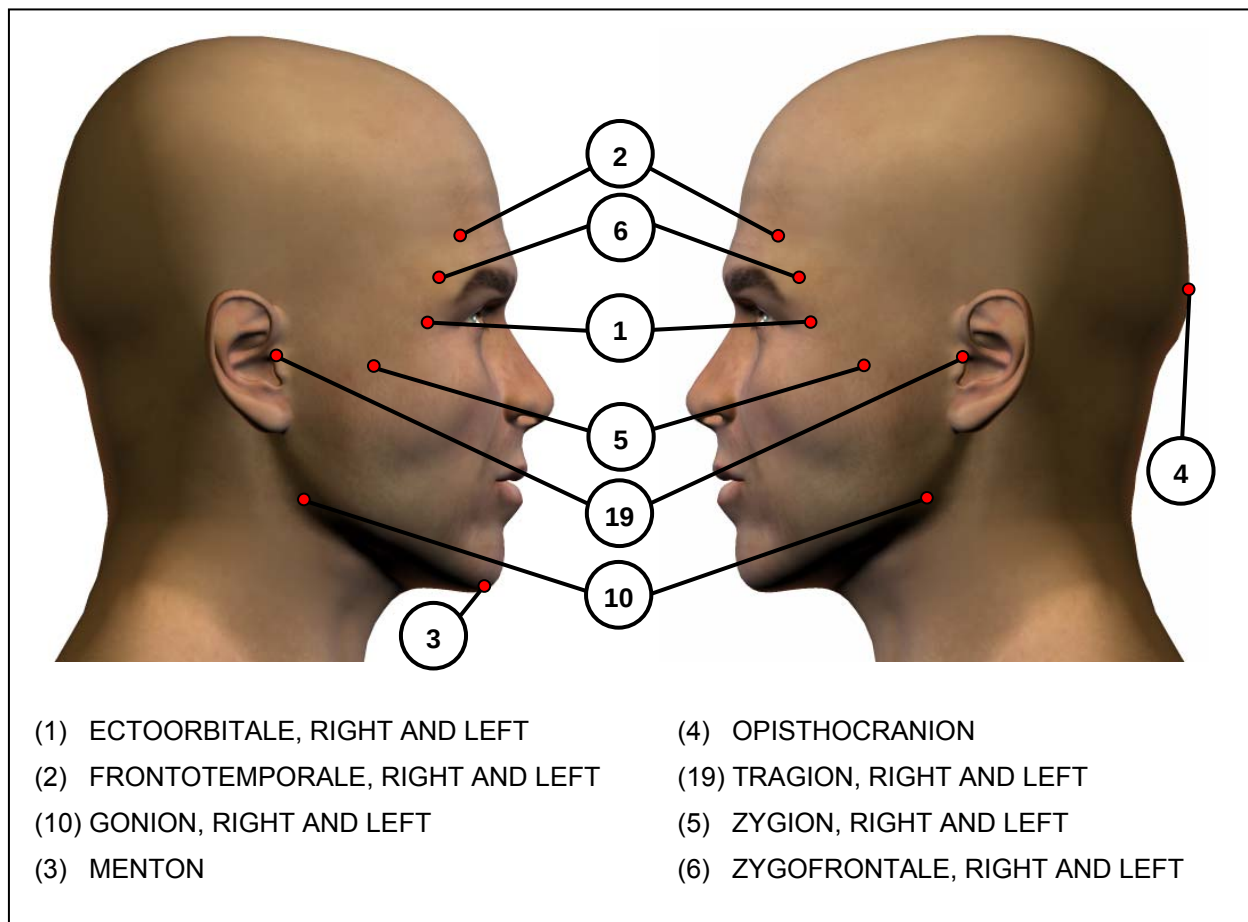


FIGURE 22

Lateral View of Head Scanning Landmarks

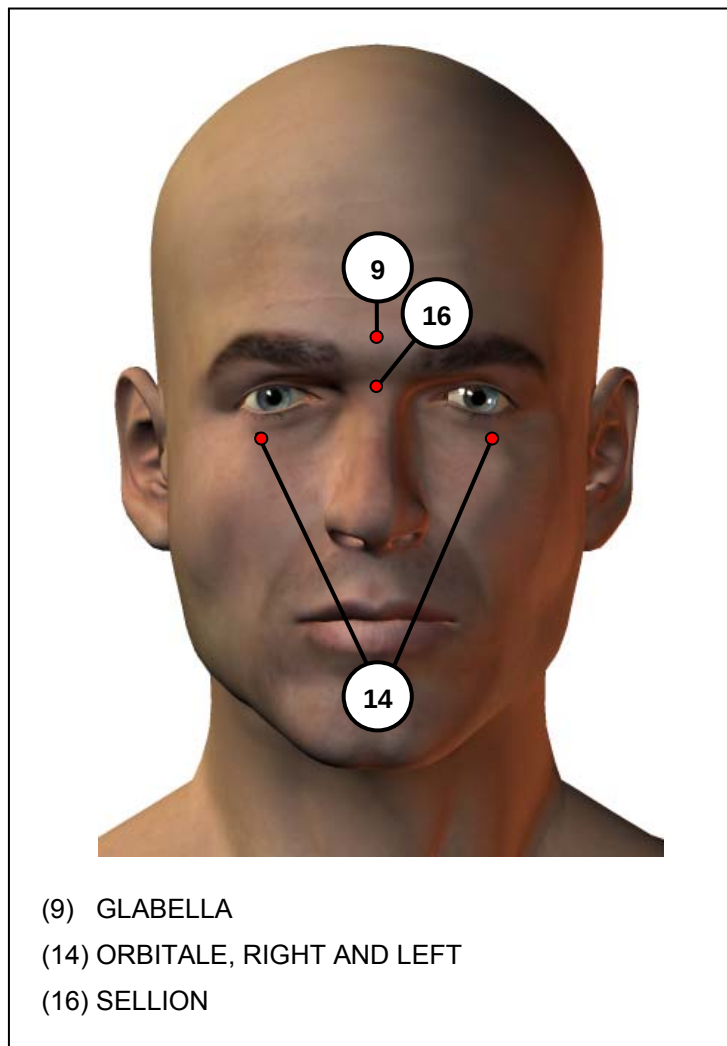
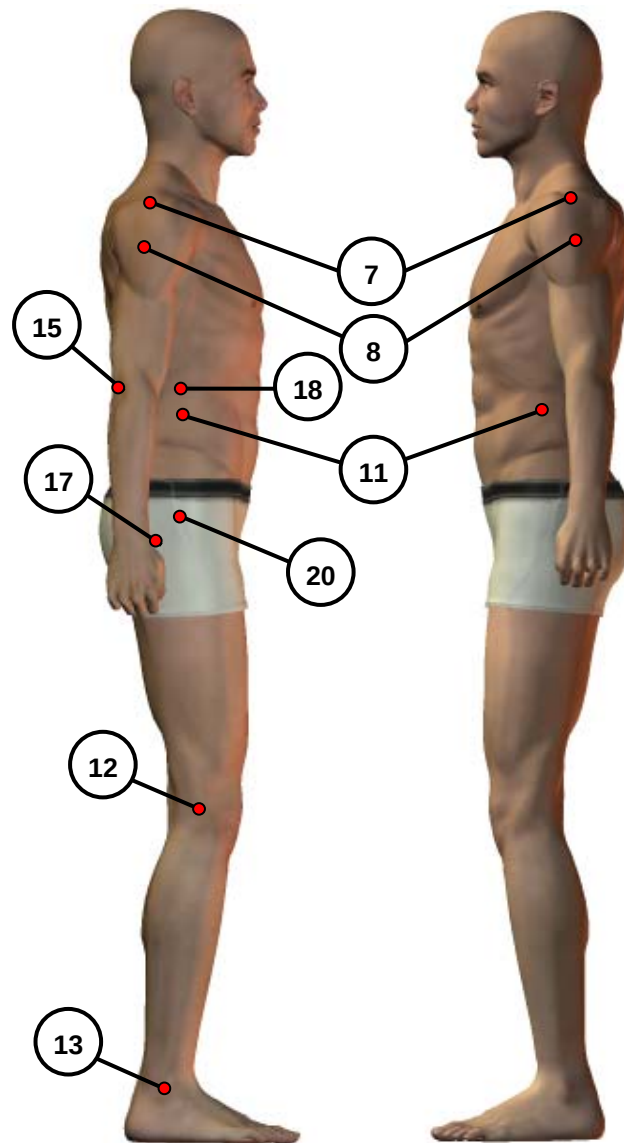


FIGURE 23

Anterior View of Head Scanning Landmarks



(7) ACROMION, RIGHT AND LEFT  
 (8) DELTOID POINT, RIGHT AND LEFT  
 (11) ILIOCRISTALE, RIGHT AND LEFT  
 (12) LATERAL FEMORAL EPICONDYLE,  
 STANDING, RIGHT

(13) LATERAL MALLEOLUS, RIGHT  
 (15) RADIALE, RIGHT  
 (17) STYLION, RIGHT  
 (18) TENTH RIB, RIGHT  
 (20) TROCHANTERION, RIGHT

FIGURE 24

Lateral View of Body Scanning Landmarks

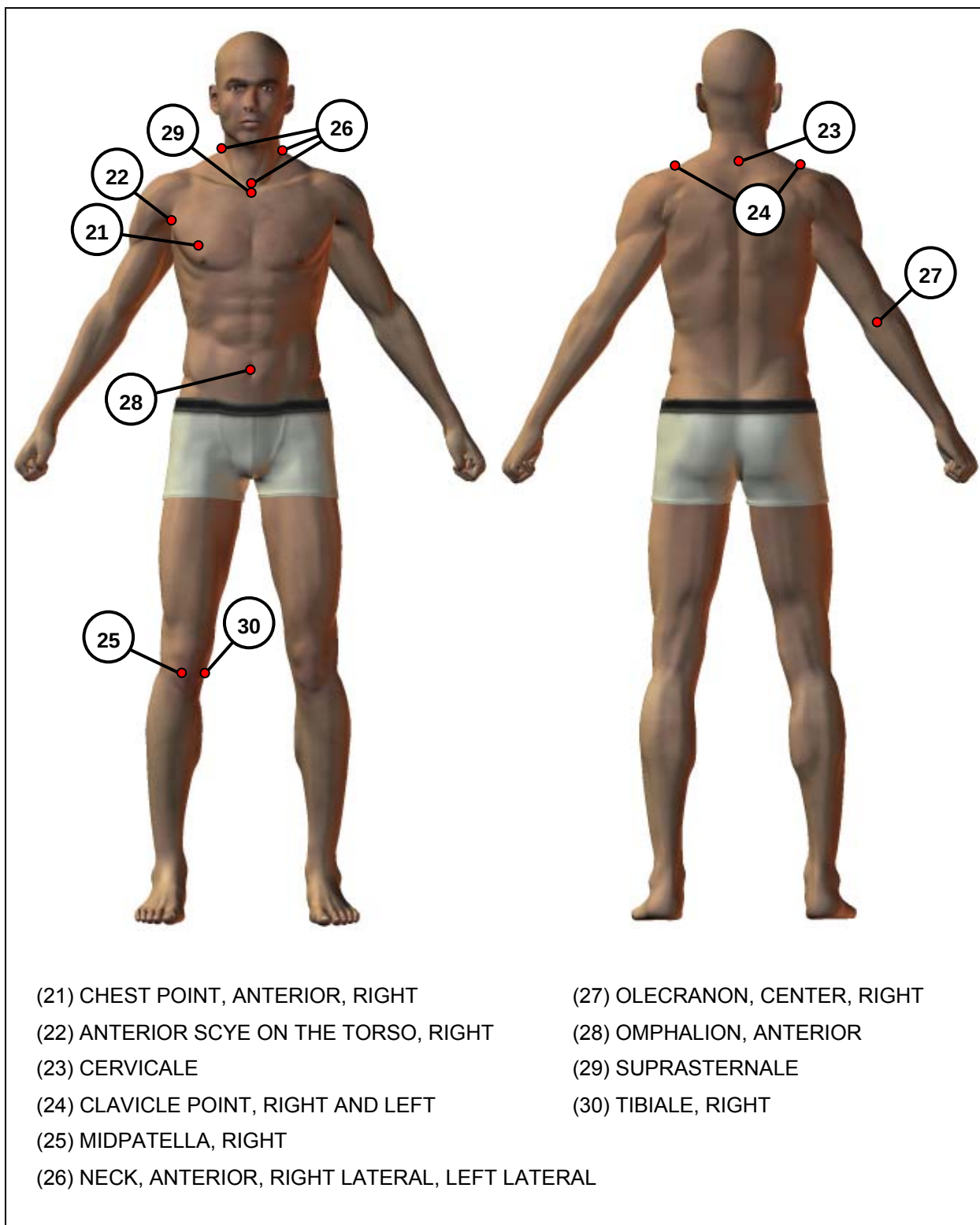


FIGURE 25

Anterior (Left) and Posterior (Right) Views of Body Scanning Landmarks

### 6.1.1 Whole-Body Scanning

Participants were briefed on the proper posture to assume for the whole-body scan (Figures 26 and 27). In general, the position required that participants stand erect without stiffness. The feet were positioned 30 cm apart and parallel to one another. The arms were straight and held away from the body with fists clenched. The head was in the Frankfurt plane. When participants stepped onto the scan platform, a team member checked to make sure that the scan wear was wrinkle-free, that the wig caps were placed correctly, and that all the landmark dots were in place.

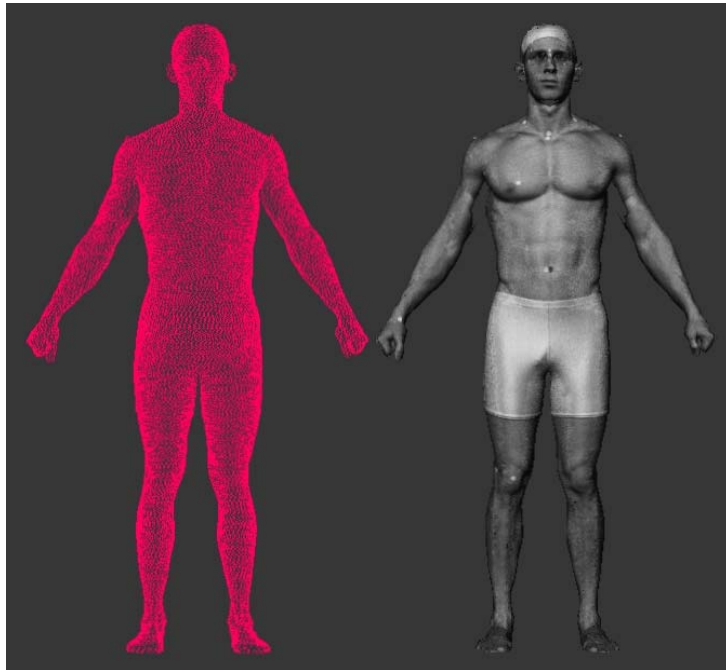


FIGURE 26

Anterior View of Whole-Body Scan\*

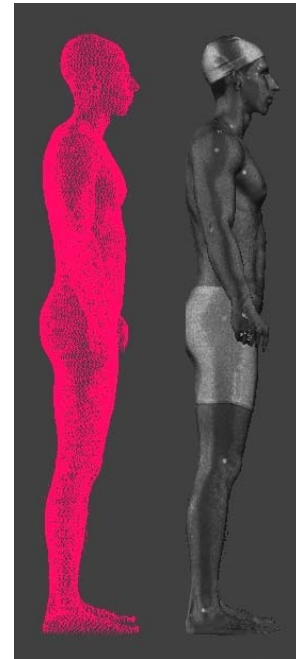


FIGURE 27

Lateral View of Whole-Body Scan

### 6.1.2 Head Scanning

Head scans were taken with participants in the seated position. Operators adjusted the height of the chair to ensure that the head was within the scanner field and lightly touched the head stabilizer. Participants were positioned with their heads in the Frankfurt plane and then asked to lift their chins slightly to enable the scanner to completely capture the region beneath the chin (Figures 28 and 29).

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\* The individual shown in Figures 26-31 is a civilian model, and was not part of ANSUR II.

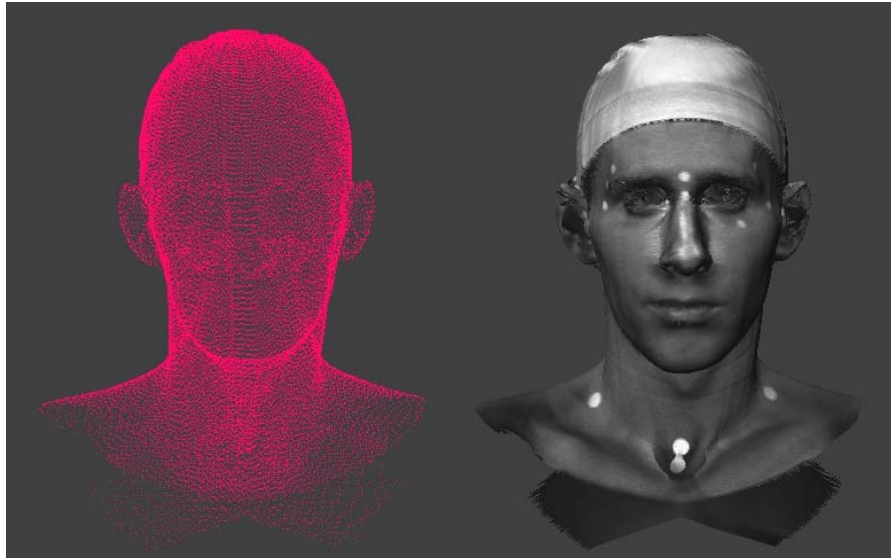


FIGURE 28

Anterior View of Head Scan

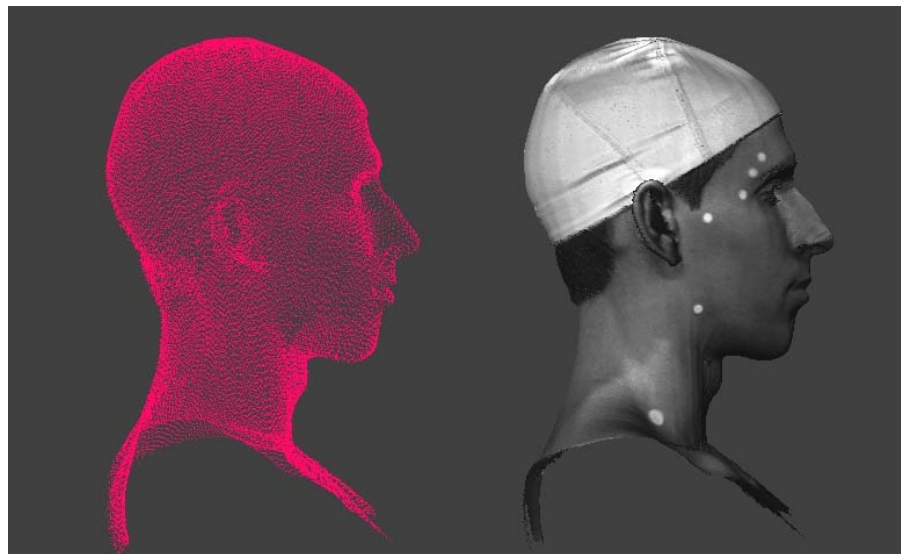


FIGURE 29

Lateral View of Head Scan

### 6.1.3 Foot Scanning

In preparation for foot scanning, which was done on the right foot only, a team member checked that the right foot was clean and dry (without perspiration). If the participant had noticeable leg hair, he or she was asked to put on a stocking from ankle to knee to prevent scan distortion caused by hair. A sanitary protective paper was

wrapped around the leg just below the knee where the scanner closed around the leg. Each participant was asked to step onto the left-foot stage with the left foot and to place the right foot into the scanner. The right foot was aligned with marks on the bottom of the scanner base. Scans were taken in the standing posture with the weight distributed evenly between both feet. Foot scans are seen in Figures 30 and 31.

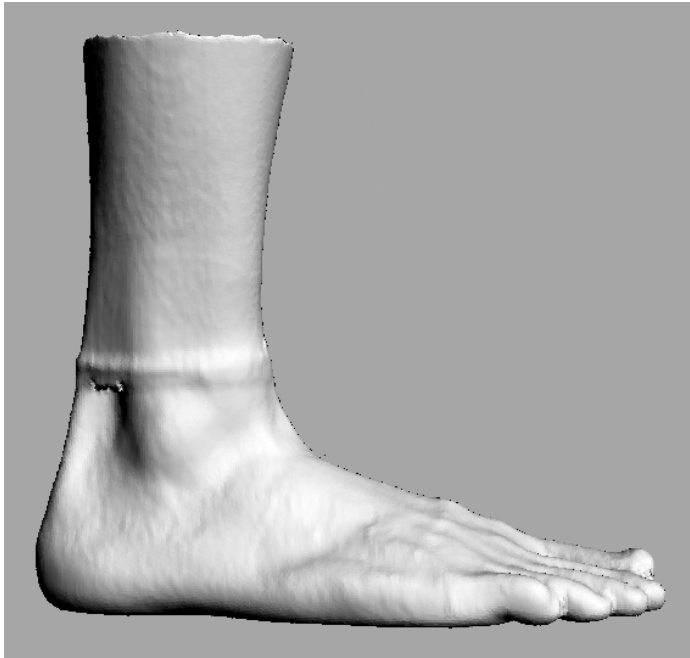


FIGURE 30

Lateral View of Foot Scan



FIGURE 31

Plantar View of Foot Scan

## 6.2 THE UTILITY OF 3-D SCANNING

Until the 1980s, anthropometric databases consisted almost wholly of hundreds of manually measured body-size variables obtained by using traditional instruments such as anthropometers, calipers, and tapes. These methods, when properly employed, were—and still are—a highly accurate means of documenting the body sizes of individuals and of whole populations. What traditional anthropometry cannot do well, however, is reflect human shape. Approximately 30 years ago, the nation's military services began to explore 3-D scanning methodology as a means of supplementing their existing anthropometric databases—beginning with the use of smaller devices for scanning heads and other body parts and, today, use of whole-body scanners.

The two most common uses of 3-D scan data in an ergonomic context are in the design, sizing, and production of military clothing and equipment and the creation of accurately proportioned 3-D computer-aided design (CAD) models for the ergonomic design of working environments. Today, the entire production chain for a piece of clothing, beginning with the design and sizing of an item and culminating in the

fabrication of the garment, can be achieved in a computer environment populated by 3-D models (Grotepass et al., 2002). While a large-scale operation such as this is still in the future for the nation's military services, a digital system for custom designing clothing for service personnel who fall outside established anthropometric design limits is already under limited trial (Gentsch et al., 2000). The obvious advantages of 3-D scan images for this undertaking include the production of better-fitting garments, reduction in the costs of stocking unusual sizes, and faster response time between measurement and delivery.

Three-dimensional human analogues created from scanned images have an almost infinite number of uses in the design of workplaces such as military vehicles and cockpits where accommodation, lines of vision, and ability to reach hand and foot controls can be tested on a computer screen. Fully dressed and equipped soldiers can also be scanned for input into CAD models for assessing workplace interactions.

Other uses for 3-D images stem from the ability of the scanner to record the surface area and volume of the body or any of its parts. The Army made early use of this capacity, for example, by writing software for the scanner to assess the degree of ballistic protection afforded soldiers wearing various designs of protective body armor (Paquette, 1996).

As an anthropometric tool, 3-D scanning complements traditional methods in two ways. First, a participant can be scanned in a matter of seconds, and the scanned images become permanent records. Users can return to them as many times as needed to extract new dimensions or to employ them in the creation of computer models. Second, the relationship of one dimension to another, or to several other dimensions, is clearly apparent. This aids in understanding body shape, as well as body size.

### 6.3 TRADITIONAL ANTHROPOMETRY AND 3-D SCANNING

While some progress has been made in achieving consistency between traditional anthropometric measurements and those obtained by extraction from 3-D scans, significant differences between the two techniques remain. While researchers have identified a number of reasons for these differences (Han et al., 2010; Kouchi & Mochimaru, 2006; Perkins et al., 2000), the three chief causes appear to be tissue compression that occurs in manual measurements, algorithms used to extract measurements from 3-D images, and posture.

Comparisons show that scan-generated measurements tend to be significantly larger than those obtained by manual measurement. One way to assess the importance of these differences is to determine whether they exceed the allowable errors established for interobserver differences in the first ANSUR survey (Gordon et al., 1989) and subsequently adopted by the International Organization for Standardization (ISO) (ISO 20685). A recent study of 14 comparative measurements, for example,

found that the differences between the scanned and traditional measurements exceeded the allowable errors specified by ISO 20685 in all cases (Han et al., 2010).

In these comparisons, circumference measurements are the most problematic. Manual methods of measuring around the body and its parts generally require that the tape be in contact with the skin all the way around the body part. This is difficult to achieve without slightly compressing the flesh and, thus, may result in a somewhat smaller value than that obtained by the scanner, which simply “sees” the outlines and has no effect on the tissue. An alternative explanation, persuasive especially for scanners with lower point density, is that the scanner-extracted circumference must use available points, essentially “connecting the dots” and that that route between dots may be more jagged (and therefore longer) than the smooth route taken by the tape.

When sufficient care is taken in positioning the participant and ensuring that the hair is covered by a bald cap, heights and lengths in general show smaller, though sometimes significant, discrepancies. Han and her colleagues (2010) have developed regression equations for adjusting values of some extracted scan data to make them more consistent with traditionally measured values.

## 6.4 POSTURE

Consistent participant positioning is a major factor in obtaining reliable body-size measurements in both traditional and 3-D scanning methods, as well as a source of differences in outcome between the two methods when whole-body scanning is required. The basic standing posture used in manual measuring calls for the participant to stand straight with the heels together and the arms hanging relaxed at the sides. This position is impractical for a system that uses light to produce digital images. When arms and legs are too close to the torso, or too close together, they prevent the scanner from capturing other parts of the body (such as the crotch and armpits). Thus, scanned participants are asked to stand with arms held away from the body and legs placed farther apart.

Experiments conducted by Kouchi and Mochimaru (2006) established the effects of postural differences in 42 manual and scanned measurements of 40 Japanese adults. Participants were measured and scanned in four different positions, the basic traditional posture (Figure 32a), and in three postures in which the arms were held increasingly away from the body and the feet were spread increasingly apart. The researchers found that leg abduction significantly affected hip and thigh measurements, while abduction of the arms significantly affected measurements of the shoulder and chest. For most other variables, when the feet were placed less than 25 cm apart and the arms were abducted less than 10°, the measurements were comparable to those obtained in the basic traditional posture. The posture used in ANSUR II is very similar to this posture (Figure 32b).

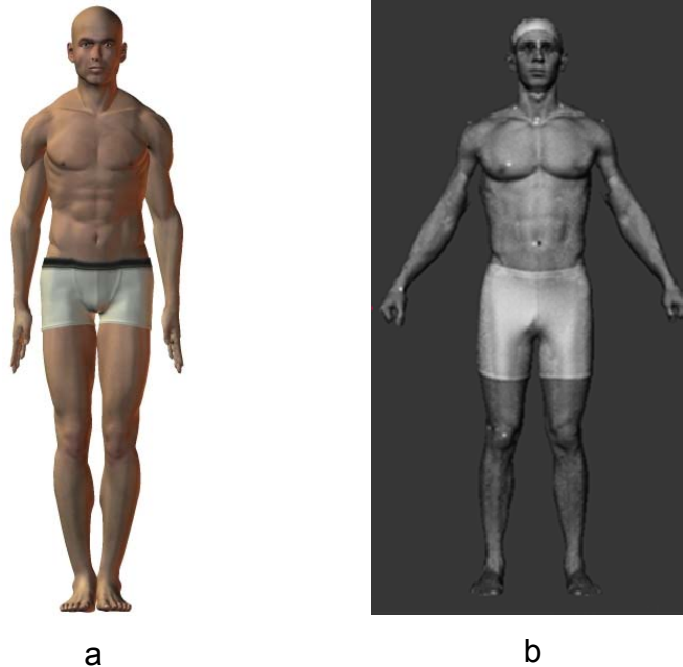


FIGURE 32

#### Traditional and ANSUR II Posture

Posture is especially important in systems where measurements and landmarks are located automatically. The algorithms that locate measurement points assume a particular posture on the part of the participant. If the participant is in a posture that differs from the assumed posture, even slightly, then measurements can be taken at inappropriate locations. Of course, such measurements are never comparable. Automatic landmark location was not used in the ANSUR II survey.

In general, it is difficult to draw too many conclusions about the comparability of scan-extracted and directly measured anthropometry from the published literature. The tested systems vary in scan quality, and they vary in the mathematical techniques used in extracting dimensions. Some of these applications can be used on any scan; others function only on one system. Some systems are fully automatic—they can extract dimensions from a scan whose participant has had no preparation. Others require an operator to identify a set of key landmarks before extraction can begin. Still others identify landmarks that have been identified through palpation (by a trained anthropometrist) prior to scanning. The consensus in the anthropometric community is that the most likely way to obtain scan-extracted dimensions that are similar to traditionally measured ones is to pre-mark the study participants using palpation of traditional landmarks. That was the approach taken in this study. As scan extraction software continues to improve, this data set will continue to be useful, since the landmarks were verified through palpation and they are visible on the scan.

## CHAPTER VII

### OBSERVER ERROR

Since anthropometric data are used in the design of workspaces, uniforms, and personal protective clothing and equipment, excessive error in the data can result in badly designed workspaces, poorly fitting uniforms, and potentially unsafe protective gear. Further, several studies have shown that insufficient information about observer error can lead to misinterpretation of population comparisons (Jamison and Zegura, 1974; Utermohle and Zegura, 1982; Utermohle et al., 1983). While considerable effort was made to minimize the amount of interobserver error (hereafter, observer error) in the ANSUR II survey, observer error is a fact of life in almost any scientific endeavor. Because such problems cannot be eliminated entirely, the most responsible approach is to measure the observer error so that users of the data will be able to judge for themselves its effects on their particular applications.

Error analysis of anthropometric data is usually performed *after* the data collection has been completed. The approach used in the ANSUR II survey was to establish an allowable observer error for each dimension *prior* to the commencement of data collection. This enabled the use of repeated measures data during the survey to monitor and improve the quality of the data. Selected participants were re-measured daily at each station throughout the course of the survey and the resultant data were analyzed weekly for observer error. This information was used as continuous feedback to the team to maintain the high quality of the data collection.

The allowable errors were established for three purposes. First, they were used during the initial training period as an indicator that measurers had successfully learned their tasks. Team members conducted practice measurements on a group of participants to learn their assigned dimensions. Observer error results were calculated regularly to assess the ability of each measurer to repeat measurements within fixed limitations, and the ability of each pair of measurers to achieve interobserver consistency. The performance of measurers in training was rated against standards established by experienced measurers (see Section 7.2).

The second use of the allowable observer error levels was to "recalibrate" the team at the beginning of each new survey location. Because the team traveled by car to each new location, there was often a period of several days between measuring sessions. In order to ensure consistency from one location to the next and to minimize measurer "drift" during the course of the survey, error trials were conducted at the beginning of each new location.

Finally, allowable observer error was used as a standard for daily error checks. Twice a day, at each station, a participant was re-measured to provide error data on actual participants during the course of the survey. These data were examined daily and analyzed weekly. If a measuring pair consistently exceeded the allowable observer error for a given dimension, the cause of the drift was determined and corrective action

taken. Thus, the allowable error values in a very real sense established the minimum reliability for the data collected in the survey.

## 7.1 OBSERVER ERROR IN THE ANTHROPOMETRIC LITERATURE

There are a number of different analytical methods and approaches to error analysis. A literature review of anthropometric error data revealed six approaches: analysis of variance (Bennett and Osborne, 1986; Jamison and Zegura, 1974; Kouchi et al., 1999; Utermohle and Zegura, 1982), correlation coefficients (Branson et al., 1982; Gordon and Bradtmiller, 1992; Jamison and Ward, 1993; Jamison and Zegura, 1974; Kouchi et al., 1996; Kemper and Pieters, 1974; Uljaszek and Kerr, 1999; Uljaszek and Lourie, 1994), mean differences (Branson et al., 1982; Gordon and Bradtmiller, 1992; Kouchi et al., 1996), technical error measurement (Branson et al., 1982; Cameron, 1984; Gordon and Bradtmiller, 1992; Goto and Mascie-Taylor, 2007; Harris and Smith, 2009; Jamison and Ward, 1993; Johnston and Mack, 1985; Kouchi et al., 1996; Uljaszek and Kerr, 1999; Uljaszek and Lourie, 1994; Utermohle and Zegura, 1982), paired T-tests (Albrecht, 1983; Utermohle and Zegura, 1982), 11 separate univariate measures (Utermohle et al., 1983), and various multivariate measures (Jamison and Zegura, 1974; Page, 1976; Utermohle et al., 1983). Utermohle and colleagues (1983) have observed: "There is no consensus concerning which statistical procedures are optimal or even important for the analysis of measurement error in physical anthropology." This literature review appears to bear that out.

Analysis of variance is a generally useful technique, which has often been applied to error data. Depending upon how it is applied, it can show how much of the measurement error is due to *interobserver* differences, how much to *intraobserver* differences and, where applicable, how much is due to the use of varying measurement methods or instruments. As Bennett and Osborne (1986) emphasize, analyses of variance are often used as a measure of differences between populations. Thus, when these analyses of variance can demonstrate statistically significant differences between groups as defined by measurers (interobserver error), the conclusions of a large number of studies showing anthropometric differences between populations should be questioned. This point is also made by Jamison and Zegura (1974) about multivariate techniques and by Page (1976) about principal components.

While the partitioning of error variance into interobserver and intraobserver components can be useful for population comparisons, and is of interest in its own right, it nevertheless has little to offer for the setting of permissible error levels in advance of data collection. Indeed in the present case, because the sample size is large, an analysis that relies solely on statistical significance must be regarded with extreme caution. What is needed in addition is a technique that examines observer differences in terms of the units of measurement.

A second analytical approach to error data is exemplified by Kemper and Pieters (1974). In that study, the investigators compared nine measurements obtained on the same participants by measurers at two different research institutes in The Netherlands.

(An important distinction here is that the two teams were trained on the basis of the same written document, but were not trained by the same persons or trained with each other.) The authors calculated the mean differences between measurements, including the sign (positive or negative) of the differences. Additionally, they calculated correlation coefficients between the two measurements. These ranged from 0.872 for Biacromial Diameter to 0.996 for Stature. A third value calculated in their study was a correlation coefficient between the difference (between the two measurements) and the mean of the two measurements. This last value was a measure of whether the difference increases with an increase in the absolute size of the measurement. Most correlation coefficients were not statistically different from zero, and all but three were less than 0.2. Here again, however, these values are useful in analyzing data after they have been collected, but are not directly applicable to setting maximum acceptable error levels in advance of data collection, or monitoring measurer performance during data collection.

In the context of this lack of consensus for reporting statistics and the lack of utility of many of these statistics for ongoing data monitoring, the 1988 ANSUR (Gordon et al., 1989) set allowable error rates based on the mean of absolute differences. This was simple to calculate and easily interpretable. The decision at that time was validated by the usefulness of those data during data collection, and by their usefulness in data interpretation following the survey. Those values have been incorporated into an international standard as well (ISO 20685:2010).

## 7.2 OBSERVER ERROR TEST

The vast majority of the traditional anthropometric dimensions measured in this study were duplicated from the 1987-1988 U.S. Army ANSUR (Gordon et al., 1989). The values established for the ANSUR survey were developed from three main sources: 1) the research literature, 2) examination of test/retest values from surveys in the Harry G. Armstrong Aerospace Medical Research Laboratory Anthropometric Data Bank, and 3) analysis of the results of an observer error test conducted specifically for the ANSUR survey by acknowledged experts in anthropometry. For the ANSUR dimensions retained in the ANSUR II survey, there was no need to re-validate the allowable errors, since it was known in advance that the measurements could be reliably done and in every case the ANSUR actual observer errors were within the allowable error limits. Not all the dimensions to be measured in the ANSUR II survey were pre-validated by ANSUR, however. Anthrotech performed a new validation trial on a subset of ANSUR II dimensions for three reasons: 1) the dimension was new, 2) the ANSUR dimension was modified in some way, or 3) the actual observer errors in ANSUR suggested that the pre-set allowable errors could be lowered.

Validation trials were conducted over 2 days, using 10 participants and 4 experienced measurers, following the validation procedures first used in ANSUR (Gordon et al., 1989; Hotzman et al., 2010). Each participant was measured twice—once in the morning and once in the afternoon—by each measurer for a total of eight

values for each dimension. Landmarks were retained throughout the day, and refreshed after lunch as needed. The same procedure was repeated the following day on five different participants. For those dimensions that were new or for which it was proposed that the allowable error be adjusted, the MAD for each measurer was calculated and, in most cases, the largest MAD was chosen as the new recommended allowable error.

The new dimensions tested were:

Bicristal Breadth  
Forearm-Center of Grip Length  
Palm Length  
Tibial Height  
Waist Front Length, Sitting

The established dimensions whose ANSUR allowable errors were thought to be too high were tested to determine if the errors could be lowered. These dimensions were:

|                          |                          |
|--------------------------|--------------------------|
| Axilla Height            | Head Circumference       |
| Ball of Foot Length      | Heel-Ankle Circumference |
| Bideltoid Breadth        | Hip Breadth              |
| Buttock Height           | Lateral Malleolus Height |
| Calf Circumference       | Neck Circumference, Base |
| Cervicale Height         | Popliteal Height         |
| Chest Breadth            | Shoulder Circumference   |
| Chest Circumference      | Span                     |
| Chest Height             | Stature                  |
| Ear Breadth              | Trochanterion Height     |
| Ear Protrusion           | Waist Depth              |
| Foot Breadth, Horizontal | Weight                   |
| Functional Leg Length    | Wrist Circumference      |
| Hand Circumference       |                          |

Finally, some measurements, including five from the list above, were modified for a number of reasons and re-tested.

Waist Circumference (Omphalion), Waist Breadth, Hip Breadth, Shoulder Circumference, and Buttock Circumference were tested to see if they could be reliably measured with only the key landmark marked—in other words, to determine whether the transferred landmarks could be eliminated. Thigh Clearance was tested to determine if a change in the foot platform would affect the measurement. The original platform consisted of a foot board that was raised and lowered with screw jacks. The new platform consisted of a foot board that adjusts in height based on the number of Styrofoam squares placed underneath. Two methods of measuring Calf Circumference were tested. The first method involved moving the tape up and down the calf to locate

the greatest circumference, marking the calf at that point, and taking the measurement at that level. The second method was to identify the area that appeared to have the largest circumference, taking the measurement with the tape three times in that area, and recording the highest value.

The remaining three dimensions (Foot Length, Ball of Foot Length, and Foot Breadth, Horizontal) traditionally involved the use of a foot box. Use of a Brannock Device<sup>®</sup> (the typical foot measuring apparatus seen in shoe stores) that had been modified to show metric scales instead of American shoe sizes was proposed. For all of these technique/instrument changes, both methods (the original ANSUR method and the proposed new method) were tested to ensure that 1) the resulting measurement values were the same and 2) the reliability (as measured by observer error) was the same or better.

### 7.3 RESULTS

The analysis of observer error—on new dimensions and on modified dimensions—was done for all dimensions in the validation study. The absolute differences between the first and second measurements for each measurer are reported in Tables 21 and 22, along with the MAD for each dimension. Table 21 shows the validation data for the new dimensions and Table 22 shows the dimensions for which new allowable errors were proposed.

TABLE 21

Absolute Differences (ABS) of Dimensions by Measurer: New Dimensions  
 (values in mm)

| Dimension                   | ABS Means  |            |            |            | Grand<br>MAD |
|-----------------------------|------------|------------|------------|------------|--------------|
|                             | Measurer 1 | Measurer 2 | Measurer 3 | Measurer 4 |              |
| Bicristal Breadth           | 4.2        | 10.7       | 9.3        | 5.6        | 7.5          |
| Forearm-Center of Grip      | 3.1        | 3.2        | 6.9        | 6.7        | 5.0          |
| Palm Length                 | 1.0        | 1.3        | 2          | 2.1        | 1.6          |
| Tibial Height               | 2.0        | 2.3        | 1.7        | 1.9        | 2.0          |
| Waist Front Length, Sitting | 7.2        | 7.1        | 8.2        | 8.1        | 7.7          |

TABLE 22

Absolute Differences (ABS) of Dimensions by Measurer:  
 Dimensions for Which New Allowable Errors Were Proposed  
 (values in mm and kg)

| Dimension*                | ABS Means  |            |            |            | Grand<br>MAD |
|---------------------------|------------|------------|------------|------------|--------------|
|                           | Measurer 1 | Measurer 2 | Measurer 3 | Measurer 4 |              |
| Axilla Height             | 7.5        | 6.4        | 5.9        | 7.4        | 6.8          |
| Ball of Foot Length 2     | 0.7        | 1.4        | 1.8        | 0.7        | 1.2          |
| Bideltoid Breadth         | 6.7        | 2.7        | 5.3        | 5.7        | 5.1          |
| Buttock Height            | 2.8        | 2.7        | 2.7        | 4.4        | 3.2          |
| Calf Circumference 2      | 1.3        | 1.6        | 2.1        | 1.5        | 1.6          |
| Cervicale Height          | 2.3        | 3.6        | 3.1        | 4.6        | 3.4          |
| Chest Breadth             | 4.3        | 3.5        | 3.2        | 6.8        | 4.5          |
| Chest Circumference       | 12.9       | 17.7       | 8          | 6.9        | 11.4         |
| Chest Height              | 4.9        | 4.7        | 6.1        | 3.0        | 4.7          |
| Ear Breadth               | 1.2        | 1.3        | 1.7        | 1.5        | 1.4          |
| Ear Protrusion            | 2.3        | 2.6        | 1.8        | 2.0        | 2.2          |
| Foot Breadth Horizontal 2 | 1.1        | 1.6        | 2.3        | 1.1        | 1.5          |
| Functional Leg Length     | 8.3        | 20.5       | 19.4       | 22.7       | 17.7         |
| Hand Circumference        | 2.1        | 1.8        | 2.8        | 2.7        | 2.4          |
| Head Circumference        | 2.2        | 2.0        | 3.4        | 4.2        | 3.0          |
| Heel Ankle Circumference  | 2.0        | 2.5        | 1.9        | 1.7        | 2.0          |
| Hip Breadth 1             | 2.6        | 5.5        | 3.7        | 2.3        | 3.5          |
| Lateral Malleolus Height  | 1.0        | 0.7        | 1.7        | 1.2        | 1.2          |
| Neck Circumference, Base  | 6.6        | 5.3        | 7.6        | 11.3       | 7.7          |
| Popliteal Height          | 2.9        | 3.5        | 5.1        | 2.6        | 3.5          |
| Shoulder Circumference 1  | 6.4        | 6.1        | 6.3        | 5.8        | 6.2          |
| Span                      | 7.8        | 6.1        | 5.1        | 5.9        | 6.2          |
| Stature                   | 2.4        | 3.6        | 3.6        | 4.2        | 3.5          |
| Trochanterion Height      | 4.3        | 3.3        | 8.8        | 6.6        | 5.7          |
| Waist Depth (O)           | 7.0        | 5.5        | 7.6        | 4.9        | 6.3          |
| Weight                    | .40        | .35        | .34        | .38        | .37          |
| Wrist Circumference       | 1.8        | 3.0        | 1.8        | 1.8        | 2.1          |

\* Variables listed with a "1" indicate the original measuring techniques; those listed with a "2" indicate proposed new measuring techniques.

Following ANSUR procedures, the absolute differences between the first and second measurements for each measurer are reported in Table 23, along with the MAD for each dimension.

TABLE 23

Absolute Differences (ABS) of Dimensions by Measurer: Modified Technique  
 (values in mm)

| Dimension*                | ABS Means  |            |            |            | Grand<br>MAD |
|---------------------------|------------|------------|------------|------------|--------------|
|                           | Measurer 1 | Measurer 2 | Measurer 3 | Measurer 4 |              |
| Ball of Foot Length 2     | 0.7        | 1.4        | 1.8        | 0.7        | 1.2          |
| Ball of Foot Length 1     | 1.6        | 1.3        | 1.2        | 1.2        | 1.3          |
| Buttock Circumference 2   | 4.5        | 6.0        | 6.4        | 7.5        | 6.1          |
| Buttock Circumference 1   | 5.2        | 4.9        | 5.2        | 4.0        | 4.8          |
| Calf Circumference 2      | 1.3        | 1.6        | 2.1        | 1.5        | 1.6          |
| Calf Circumference 1      | 1.3        | 2.0        | 1.0        | 1.0        | 1.3          |
| Foot Breadth Horizontal 2 | 1.1        | 1.6        | 2.3        | 1.1        | 1.5          |
| Foot Breadth Horizontal 1 | 1.4        | 1.1        | 1.2        | 1.5        | 1.3          |
| Foot Length 2             | 1.2        | 1.9        | 1.0        | 0.7        | 1.2          |
| Foot Length 1             | 1.1        | 1.2        | 1.2        | 1.4        | 1.2          |
| Hip Breadth 2             | 4.0        | 2.6        | 6.4        | 4.9        | 4.5          |
| Hip Breadth 1             | 2.6        | 5.5        | 3.7        | 2.3        | 3.5          |
| Shoulder Circumference 2  | 11.3       | 18.2       | 7.9        | 6.6        | 11.0         |
| Shoulder Circumference 1  | 6.4        | 6.1        | 6.3        | 5.8        | 6.2          |
| Thigh Clearance 2         | 3.8        | 1.7        | 4.0        | 2.7        | 3.1          |
| Thigh Clearance 1         | 3.6        | 2.1        | 3.7        | 3.2        | 3.2          |
| Waist Breadth (O) 2       | 4.6        | 7.4        | 6.8        | 3.4        | 5.6          |
| Waist Breadth (O) 1       | 4.9        | 3.5        | 4.1        | 2.8        | 3.8          |
| Waist Circumference (O) 2 | 18.3       | 15.8       | 13.4       | 13.1       | 15.2         |
| Waist Circumference (O) 1 | 3.8        | 6.6        | 7.1        | 6.6        | 6.0          |

\* Variables listed with a "1" indicate the original measuring techniques; those listed with a "2" indicate proposed new measuring techniques.

For the dimensions in which a new instrument or new technique was tested, the individual measurement values were compared to determine whether or not the two instruments/techniques were comparable. Table 24 provides the measurement data for both techniques and the differences between them. The values shown in the table are the mean of the four measurers on their first trial. Note that the differences seen in Table 24 are not absolute differences, but they are signed differences, as it is useful to know whether a new method produces a larger, smaller or, on average, the same measurement.

TABLE 24

Measurements Tested for Technique/Instrument Modification: Mean over Four Measurers  
 (values in mm)

| Dimension*                     | Participant |       |       |       |       |       |       |       |       |       | Overall<br>Mean<br>Difference<br>(Signed) |
|--------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------------------------------|
|                                | 1           | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |                                           |
| Ball of Foot Length 2          | 183.3       | 172.4 | 169.6 | 200.1 | 175.5 | 202.0 | 197.5 | 198.4 | 197.6 | 206.1 |                                           |
| Ball of Foot Length 1          | 181.6       | 170.0 | 169.8 | 196.4 | 174.4 | 201.1 | 195.5 | 197.5 | 194.4 | 205.8 |                                           |
| Difference                     | 1.7         | 2.4   | -0.2  | 3.7   | 1.1   | 0.9   | 2.0   | 0.9   | 3.2   | 0.3   | 1.6                                       |
| Calf Circumference 2<br>(3X's) | 347.6       | 347.9 | 335.6 | 380.6 | 392.5 | 341.1 | 361.8 | 371.6 | 391.3 | 338.9 |                                           |
| Calf Circumference 1           | 347.3       | 349.3 | 334.3 | 381.1 | 393.3 | 341.5 | 361.0 | 372.6 | 391.4 | 338.0 |                                           |
| Difference                     | 0.3         | -1.4  | 1.4   | -0.5  | -0.8  | -0.4  | 0.8   | -1.0  | -0.1  | 0.9   | -0.1                                      |
| Foot Breadth Horizontal 2      | 89.0        | 94.8  | 88.5  | 97.0  | 92.1  | 98.4  | 97.5  | 98.5  | 96.3  | 105.6 |                                           |
| Foot Breadth Horizontal 1      | 89.4        | 92.6  | 85.6  | 98.0  | 92.6  | 96.3  | 96.1  | 94.8  | 94.9  | 103.6 |                                           |
| Difference                     | -0.4        | 2.2   | 2.9   | -1.0  | -0.5  | 2.1   | 1.4   | 3.7   | 1.4   | 2.0   | 1.4                                       |
| Foot Length 2                  | 249.4       | 242.3 | 228.4 | 269.0 | 241.5 | 272.6 | 265.8 | 263.5 | 263.5 | 278.4 |                                           |
| Foot Length 1                  | 248.8       | 240.1 | 228.6 | 267.0 | 239.9 | 271.4 | 263.5 | 262.4 | 261.1 | 277.4 |                                           |
| Difference                     | 0.6         | 2.2   | -0.2  | 2.0   | 1.6   | 1.2   | 2.3   | 1.1   | 2.4   | 1.0   | 1.4                                       |
| Thigh Clearance 2              | 141.9       | 154.9 | 152.8 | 172.6 | 159.5 | 163.6 | 167.8 | 168.9 | 191.4 | 166.5 |                                           |
| Thigh Clearance 1              | 142.5       | 155.6 | 151.1 | 174.3 | 160.5 | 164.8 | 166.8 | 171.5 | 193.3 | 165.0 |                                           |
| Difference                     | -0.6        | -0.7  | 1.7   | -1.7  | -1.0  | -1.2  | 1.0   | -2.6  | -1.9  | 1.5   | -0.6                                      |

\* Variables listed with a "1" indicate the original measuring techniques; those listed with a "2" indicate proposed new measuring techniques.

Transferring landmarks takes considerable time during landmarking, and it had been observed in the years since ANSUR that this process was sometimes carried out too quickly, with the result that the transferred landmarks were not on a horizontal line with the key landmark. In such cases the measurers had always been instructed to measure a horizontal circumference, even if it was not on the transferred mark. Therefore, in some studies, assessment of horizontality had been done on a visual basis, at the time of measurement. However, no test had been done to verify that a visual test was superior or inferior to transferred landmarks.

The five horizontal circumferences were tested to determine whether the investment of landmark transfer time had an effect on reliability. To test this question, the MADs between the two methods were compared. Table 25 lists these measurements and the differences between the observer errors under the old and new methods. In each case, the observer error increased, indicating that transferring the landmarks, even if it is an imperfect method, yields better data than not transferring the marks.

TABLE 25

Landmark Transfer/No Landmark Transfer Decision Summary  
 (values in mm)

| Dimension              | Difference<br>Between MADs | Decision          |
|------------------------|----------------------------|-------------------|
| Buttock Circumference  | 1.3                        | Landmark Transfer |
| Hip Breadth            | 1.0                        | Landmark Transfer |
| Shoulder Circumference | 4.8                        | Landmark Transfer |
| Waist Breadth          | 1.8                        | Landmark Transfer |
| Waist Circumference    | 9.2                        | Landmark Transfer |

The decision to keep the original method for Hip Breadth was due to the need for the same transferred landmark for Buttock Circumference. This rationale also applied to Waist Breadth, i.e., the landmark is needed for Waist Circumference; therefore it will be used for Waist Breadth as well.

The dimensions involving a new technique or a new instrument were evaluated based on examining the differences between the two methods. Table 26 summarizes the decisions made based on these trials.

TABLE 26

New Technique/Instrument Decision Summary  
 (values in mm)

| Dimension                | Mean Difference | Decision       |
|--------------------------|-----------------|----------------|
| Ball of Foot Length      | 1.61            | New Instrument |
| Calf Circumference       | -0.08           | New Method     |
| Foot Breadth, Horizontal | 1.38            | New Instrument |
| Foot Length              | 1.41            | New Instrument |
| Thigh Clearance          | -0.55           | New Method     |

For Thigh Clearance, the proposed new platform allows for quicker height adjustment. Although there are a number of seated dimensions which require the use of the foot platform, Thigh Clearance is the most sensitive with respect to the positioning of the legs. Thigh Clearance was used therefore as a proxy for all the seated dimensions requiring a foot platform. Since there is less than 1 mm difference between the two types of foot platform, the quicker method was used.

The new method for Calf Circumference involved taking three measurements and using the highest value as opposed to measuring the calf at the level of the calf landmark. There is less than 0.1 mm difference between the two methods. Since Calf Height was not measured as it was in ANSUR (requiring a calf landmark), the three-time method was used instead. Even though measuring Calf Circumference three times was slightly slower than measuring once at the marked point, this method was faster overall, since the calf mark could be eliminated.

For the three foot dimensions, the modified Brannock Device<sup>®</sup> was used in place of the foot boxes. For Foot Breadth, Foot Length and Ball of Foot Length, the Brannock Device<sup>®</sup> produced very slightly larger measurements, but the differences were less than the allowable error of 2 mm. The decision was to use the new (Brannock) method because it was considerably faster than the foot box.

Most of the dimensions measured in ANSUR were measured using the same landmarks and procedures in ANSUR II. However, results of the in-field observer error data from ANSUR were examined to determine if some of the allowable errors should be changed, based on the experience of the ANSUR measurers over the course of the 11-month data collection. Using that analysis, proposed changes to some of the ANSUR allowable errors were made even when nothing about the procedure had changed. As noted above, in some cases the actual observer error in ANSUR was significantly lower than the allowable error, so the possibility of reducing the allowable error was explored. In most cases, the validation trials supported the proposed changes. The exceptions were: Ear Protrusion, Foot Breadth Horizontal, Functional Leg Length, Span, Hand Circumference, and Weight. Only one of the measurer's MADs for Ear Protrusion was below the proposed allowable error of 2 mm. The other three were all above, and two of the three were above the original allowable error of 3 mm. Thus the allowable error was retained at 3 mm. Functional Leg Length is a

difficult dimension to measure repeatedly. A number of improvements had been made in standardizing the body position prior to measurement in order to improve repeatability, but three of the four experienced measurers were outside the original allowable error of 17 mm. Thus the allowable error for that dimension was not lowered. Only one of the measurers had a mean ABS below 2 mm for Hand Circumference; therefore, the allowable error of 3 mm was retained for this dimension. Finally, the validation trial data suggested that the proposed 0.2 kg was too small a window for Weight. The MADs of the four measurers ranged from 0.34 kg to 0.40 kg, with a grand mean of 0.37 kg. The original allowable error of 0.3 kg was retained.

For the new dimensions, the procedures in ANSUR for setting the allowable errors were generally followed. The ANSUR procedures for Bicristal Breadth would have produced an allowable error of 11 mm. Some improvements were made in the procedures (after the validation trial data collection) to reduce the observer error and the provisional allowable error was set at 5 mm. Time did not permit a formal repeat of the validation trial to test whether this was reasonable. The improvements made some difference in the observer error, but were not enough to justify the optimistic 5 mm value. It was later learned that the allowable error for this dimension in the Fels Longitudinal Study is set at 10 mm (Payne, personal communication, 2010). The ANSUR II allowable error for Bicristal Breadth was therefore adjusted to 8 mm. Tragon – Top of Head was tested during measurer training. The MAD for the measurers was 2.6; thus, the proposed allowable error of 4 mm was retained. The final list of new allowable errors is seen in Table 27, along with the corresponding values from ANSUR, where applicable.

The validation trial was useful in setting (and in some cases re-setting) the allowable errors to be used in evaluating data quality during the ANSUR II data collection. It also served, as such experiments often do, to highlight specific points in some measurement procedures that could be improved. Finally, it allowed testing of some new measurement methods against the original ANSUR methods, to determine whether the proposed new methods were equivalent. In cases where equivalence was shown, the switch was made to the new methods, which were generally faster. In other cases, it was shown that the faster method resulted in less reliable data. In those cases the original slower, but more reliable, method was retained.

TABLE 27

Allowable Errors: Tested Dimensions  
 (values in mm and kg)

| Dimension                      | ANSUR<br>Allowable Error | ANSUR II<br>Allowable Error |
|--------------------------------|--------------------------|-----------------------------|
| Axilla Height                  | 10                       | 7                           |
| Ball of Foot Length            | 6                        | 2                           |
| Bicristal Breadth*             |                          | 8                           |
| Bideltoid Breadth              | 8                        | 8                           |
| Buttock Height                 | 7                        | 4                           |
| Calf Circumference             | 5                        | 4                           |
| Cervicale Height               | 7                        | 7                           |
| Chest Breadth                  | 8                        | 7                           |
| Chest Circumference            | 15                       | 14                          |
| Chest Height                   | 11                       | 9                           |
| Ear Breadth                    | 3                        | 2                           |
| Ear Protrusion                 | 3                        | 3                           |
| Foot Breadth, Horizontal       | 2                        | 2                           |
| Forearm-Center of Grip Length* |                          | 7                           |
| Functional Leg Length          | 17                       | 17                          |
| Hand Circumference             | 4                        | 3                           |
| Head Circumference             | 5                        | 3                           |
| Heel-Ankle Circumference       | 6                        | 4                           |
| Hip Breadth                    | 7                        | 6                           |
| Lateral Malleolus Height       | 3                        | 2                           |
| Neck Circumference, Base       | 11                       | 8                           |
| Palm Length*                   |                          | 2                           |
| Popliteal Height               | 7                        | 6                           |
| Shoulder Circumference         | 22                       | 12                          |
| Span                           | 10                       | 10                          |
| Stature                        | 11                       | 6                           |
| Tibial Height*                 |                          | 2                           |
| Tragion-Top of Head*           |                          | 4                           |
| Trochanterion Height           | 7                        | 4                           |
| Waist Depth                    | 8                        | 6                           |
| Waist Front Length, Sitting*   |                          | 7                           |
| Weight                         | 0.3                      | 0.3                         |
| Wrist Circumference            | 5                        | 3                           |

\* New dimensions tested

## 7.4 DAILY OBSERVER ERROR

As noted in Chapter II, data collection was organized into half-day units. In each half day, each station measured one participant twice. Each station therefore had a total of 10 re-measure participants for each full week of measuring. The re-measure participants were typically measured by the second measurer at the station. Exceptions occurred when a team member was absent, or during transitions when one team member was being replaced by another. In those cases a substitute recorder was used, as only trained measurers collected data. When substitute recorders were used, the sole measurer measured the participant for both the original measure and the repeat measure. Thus most data collected were inter-observer data, but there were occasions where intra-observer data were collected. For simplicity of presentation, the small amount of intra-observer error data was combined with the much larger body of inter-observer error data for analysis. In addition, where permanent measurer substitutions were made, the inter-observer error data from all measurer pairs at a station were combined for analysis. At the end of each week, a weekly summary of re-measure data for each station was compiled. The MADs for the re-measure participants were evaluated. If the mean of the deltas exceeded the allowable error, the team supervisor met with the measurers at that station to determine the cause of the difficulty. Even when no mean delta exceeded the allowable error, however, the weekly summary was shown to the measurers so they could monitor their own performance over the course of the survey. Note that participants were also sent for repeat scans, but data from those scans were not examined during data collection, nor are they analyzed here.

Tables 28 through 38 show the means of the absolute values of the deltas for each measured dimension. The right-hand columns show the allowable error for each dimension. Dimensions are grouped by type. In nearly every case, the MAD (observer error) was lower than the allowable error. The observer errors ranged from a low of 0.9 mm for both male and female Interpupillary Breadths, as well as male Head Breadth to a high of 16.8 mm for the male Vertical Trunk Circumference (USA). Although the observer errors were lower than the allowable errors, the larger observer errors were associated with dimensions which have the larger allowable errors. The standing heights (Table 28) generally had observer errors in the 2- to 6-mm range, with the exception of Crotch Height, which involves subjective judgment about the amount of pressure used, and Wrist Height, which is highly sensitive to the position of the shoulders. Errors in the sitting heights (Table 29) were somewhat higher, being generally in the 2- to 5-mm range. Errors were higher in Elbow Rest Height, since it is sensitive to both arm and torso positioning, and errors were higher in Waist Front Length, Sitting (5.3 mm males; 5.4 mm females), since it is sensitive to torso positioning.

TABLE 28

Observer Error for Standing Heights<sup>2</sup>  
 (values in mm)

| Dimension                         | Males |                 | Females |                | Allowable Error |
|-----------------------------------|-------|-----------------|---------|----------------|-----------------|
|                                   | n     | Observer* Error | n       | Observer Error |                 |
| Acromial Height                   | 337   | 3.6             | 174     | 3.4            | 7               |
| Axilla Height                     | 337   | 4.2             | 174     | 4.8            | 7               |
| Buttock Height                    | 354   | 2.4             | 201     | 2.3            | 4               |
| Cervicale Height                  | 337   | 2.8             | 174     | 3.0            | 7               |
| Chest Height                      | 354   | 4.9             | 201     | 6.0            | 9               |
| Crotch Height                     | 354   | 6.2             | 201     | 5.8            | 10              |
| Iliocristale Height               | 337   | 2.6             | 174     | 3.1            | 5               |
| Knee Height, Midpatella           | 354   | 2.8             | 201     | 2.2            | 6               |
| Lateral Femoral Epicondyle Height | 354   | 1.6             | 201     | 1.7            | 3               |
| Lateral Malleolus Height          | 300   | 1.1             | 161     | 1.2            | 2               |
| Stature                           | 337   | 3.1             | 174     | 2.8            | 6               |
| Suprasternale Height              | 337   | 3.5             | 174     | 3.4            | 5               |
| Tenth Rib Height                  | 337   | 2.6             | 174     | 2.3            | 5               |
| Tibial Height                     | 354   | 1.9             | 201     | 1.9            | 2               |
| Trochanterion Height              | 354   | 2.5             | 201     | 2.6            | 4               |
| Waist Height (Omphalion)          | 337   | 3.6             | 174     | 4.0            | 7               |
| Wrist Height                      | 337   | 6.4             | 174     | 5.8            | 11              |

\*MAD

TABLE 29

Observer Error for Sitting Heights  
 (values in mm)

| Dimension                   | Males |                | Females |                | Allowable Error |
|-----------------------------|-------|----------------|---------|----------------|-----------------|
|                             | n     | Observer Error | n       | Observer Error |                 |
| Elbow Rest Height           | 345   | 5.5            | 166     | 5.5            | 10              |
| Eye Height, Sitting         | 345   | 3.9            | 166     | 4.4            | 8               |
| Knee Height, Sitting        | 345   | 1.8            | 166     | 2.1            | 2               |
| Popliteal Height            | 345   | 2.2            | 166     | 2.6            | 6               |
| Sitting Height              | 345   | 2.7            | 166     | 3.1            | 6               |
| Thigh Clearance             | 345   | 1.7            | 166     | 1.8            | 3               |
| Waist Front Length, Sitting | 345   | 5.3            | 166     | 5.5            | 7               |

<sup>2</sup> The dimensions are grouped here by type, but were grouped for efficiency into several stations for data collection (see Chapter II). The different n's in these tables reflect different number of repeat participants by station, due to absent and replaced team members.

The errors for length dimensions (Table 30) ranged generally from 2 to 12 mm. The lower errors were associated with dimensions encompassing bony landmarks, e.g., Acromion-Radiale Length (2.5 mm males; 2.8 mm females). The higher errors were for dimensions involving soft tissue landmarks, e.g., Interscye II (5.1 mm males; 5.2 mm females). Variable tape tension and interference from the running shorts as the tape passes through the crotch contribute to observer error in both crotch lengths. Functional Leg Length was also among the higher observer error dimensions; this can be attributed to the difficulty of achieving consistency in body position.

TABLE 30

Observer Error for Lengths  
(values in mm)

| Dimension                            | Males |                | Females |                | Allowable Error |
|--------------------------------------|-------|----------------|---------|----------------|-----------------|
|                                      | n     | Observer Error | n       | Observer Error |                 |
| Acromion-Radiale Length              | 337   | 2.5            | 174     | 2.7            | 4               |
| Buttock-Knee Length                  | 345   | 5.1            | 166     | 5.1            | 6               |
| Buttock-Popliteal Length             | 345   | 5.8            | 166     | 5.8            | 7               |
| Crotch Length (Omphalion)            | 354   | 11.6           | 201     | 8.1            | 18              |
| Crotch Length, Posterior (Omphalion) | 354   | 8.6            | 201     | 7.4            | 11              |
| Forearm-Center of Grip Length        | 337   | 4.1            | 174     | 4.8            | 7               |
| Forearm-Hand Length                  | 337   | 2.4            | 174     | 2.3            | 4               |
| Functional Leg Length                | 345   | 7.8            | 166     | 13.0           | 17              |
| Interscye I                          | 337   | 5.3            | 174     | 5.7            | 10              |
| Interscye II                         | 337   | 5.1            | 174     | 5.2            | 13              |
| Radiale-Stylian Length               | 337   | 3.4            | 174     | 3.5            | 6               |
| Shoulder-Elbow Length                | 337   | 2.5            | 174     | 2.7            | 6               |
| Shoulder Length                      | 337   | 2.2            | 174     | 2.4            | 3               |
| Sleeve Length: Spine-Wrist           | 337   | 5.3            | 174     | 3.7            | 9               |
| Sleeve Outseam                       | 337   | 3.8            | 174     | 3.7            | 6               |
| Waist Back Length (Omphalion)        | 337   | 3.0            | 174     | 2.9            | 5               |

Observer errors for breadths and depths (Tables 31 and 32, respectively) ranged generally from 2 to 6 mm. One exception was Forearm-Forearm Breadth (8.4 mm males; 10.5 mm females) for which both body position and breathing cycle are important factors in measurement. The errors in large horizontal circumferences (Table 33) ranged from 5 to 8 mm, while the Vertical Trunk Circumference (USA) errors ranged from 11 to 17 mm. The considerable difference in observer error between male and female Vertical Trunk Circumference can be attributed to the difficulty in standardizing tape tension near the male genitalia. The observer errors for small circumferences (Table 34), as a whole, ranged from 2 to 5 mm.

TABLE 31

Observer Error for Breadths  
 (values in mm)

| Dimension               | Males |                | Females |                | Allowable Error |
|-------------------------|-------|----------------|---------|----------------|-----------------|
|                         | n     | Observer Error | n       | Observer Error |                 |
| Biacromial Breadth      | 345   | 3.4            | 166     | 4.3            | 8               |
| Bicristal Breadth       | 354   | 4.3            | 201     | 5.7            | 8               |
| Bideltoid Breadth       | 345   | 4.6            | 166     | 5.0            | 8               |
| Bimalleolar Breadth     | 300   | 1.2            | 161     | 1.0            | 2               |
| Chest Breadth           | 354   | 5.0            | 201     | 4.9            | 7               |
| Forearm-Forearm Breadth | 345   | 8.4            | 166     | 10.4           | 17              |
| Hip Breadth             | 354   | 2.4            | 201     | 3.2            | 6               |
| Hip Breadth, Sitting    | 345   | 3.8            | 166     | 4.9            | 6               |
| Waist Breadth           | 354   | 3.5            | 201     | 3.9            | 6               |

TABLE 32

Observer Error for Depths and Weight  
 (values in mm and kg)

| Dimension                          | Males |                | Females |                | Allowable Error |
|------------------------------------|-------|----------------|---------|----------------|-----------------|
|                                    | n     | Observer Error | n       | Observer Error |                 |
| Abdominal Extension Depth, Sitting | 345   | 4.5            | 166     | 4.8            | 10              |
| Buttock Depth                      | 354   | 4.9            | 201     | 5.0            | 8               |
| Chest Depth                        | 354   | 3.5            | 201     | 3.5            | 4               |
| Waist Depth                        | 354   | 3.7            | 201     | 3.5            | 6               |
| Weight                             | 337   | 0.1            | 174     | 0.1            | 0.3             |

TABLE 33

Observer Error for Large Circumferences  
 (values in mm)

| Dimension                          | Males |                | Females |                | Allowable Error |
|------------------------------------|-------|----------------|---------|----------------|-----------------|
|                                    | n     | Observer Error | n       | Observer Error |                 |
| Buttock Circumference              | 354   | 5.6            | 201     | 4.8            | 12              |
| Chest Circumference                | 354   | 8.2            | 201     | 8.5            | 14              |
| Shoulder Circumference             | 338   | 5.6            | 172     | 5.1            | 12              |
| Vertical Trunk Circumference (USA) | 354   | 16.8           | 201     | 11.8           | 24              |
| Waist Circumference (Omphalion)    | 338   | 5.9            | 172     | 5.9            | 12              |

TABLE 34

Observer Error for Small Circumferences  
(values in mm)

| Dimension                     | Males |                | Females |                | Allowable Error |
|-------------------------------|-------|----------------|---------|----------------|-----------------|
|                               | n     | Observer Error | n       | Observer Error |                 |
| Ankle Circumference           | 300   | 1.8            | 161     | 2.0            | 4               |
| Biceps Circumference, Flexed  | 337   | 3.2            | 174     | 4.8            | 6               |
| Calf Circumference            | 300   | 1.8            | 161     | 1.8            | 4               |
| Forearm Circumference, Flexed | 337   | 3.5            | 174     | 3.7            | 5               |
| Heel-Ankle Circumference      | 300   | 2.0            | 161     | 1.9            | 4               |
| Lower Thigh Circumference     | 334   | 2.2            | 163     | 3.0            | 4               |
| Neck Circumference            | 337   | 3.0            | 174     | 3.5            | 6               |
| Neck Circumference, Base      | 337   | 3.6            | 174     | 4.4            | 8               |
| Thigh Circumference           | 354   | 5.1            | 201     | 4.3            | 6               |
| Wrist Circumference           | 337   | 1.9            | 174     | 2.0            | 3               |

Observer errors for the head (Table 35), hand (Table 36), and foot dimensions (Table 37) were generally quite low. All were less than 3 mm, and most approached 1 mm, the smallest unit to which these measurements are recorded. These dimensions are small in magnitude, and body position and breathing cycle generally do not affect their measurement. Bitracion Submandibular Arc (3.5 mm males; 4.3 mm females) may have been affected by compression of the soft tissue of the mandible. The reaches (Table 38), on the other hand, are the most sensitive of all dimensions to body positioning difficulties. The observer errors for most reaches ranged from 7 to 11 mm.

TABLE 35

Observer Error for Head Dimensions  
(values in mm)

| Dimension                   | Males |                | Females |                | Allowable Error |
|-----------------------------|-------|----------------|---------|----------------|-----------------|
|                             | n     | Observer Error | n       | Observer Error |                 |
| Bitracion Chin Arc          | 300   | 3.0            | 161     | 3.0            | 8               |
| Bitracion Submandibular Arc | 300   | 3.4            | 161     | 4.3            | 6               |
| Bizygomatic Breadth         | 300   | 1.2            | 161     | 1.3            | 2               |
| Ear Breadth                 | 300   | 1.2            | 161     | 1.2            | 2               |
| Ear Length                  | 300   | 1.4            | 161     | 1.3            | 2               |
| Ear Protrusion              | 300   | 1.0            | 161     | 1.2            | 3               |
| Head Breadth                | 300   | 0.9            | 161     | 1.1            | 2               |
| Head Circumference          | 300   | 1.8            | 161     | 2.0            | 3               |
| Head Length                 | 300   | 1.0            | 161     | 1.6            | 2               |
| Interpupillary Breadth      | 300   | 0.8            | 161     | 0.9            | 2               |
| Menton-Sellion Length       | 300   | 1.7            | 161     | 1.8            | 3               |
| Tracion-Top of Head         | 300   | 1.8            | 161     | 2.1            | 4               |

TABLE 36

Observer Error for Hand Dimensions  
 (values in mm)

| Dimension          | Males |                | Females |                | Allowable Error |
|--------------------|-------|----------------|---------|----------------|-----------------|
|                    | N     | Observer Error | n       | Observer Error |                 |
| Hand Breadth       | 300   | 1.3            | 161     | 1.3            | 2               |
| Hand Circumference | 300   | 1.6            | 161     | 1.7            | 3               |
| Hand Length        | 300   | 1.6            | 161     | 1.6            | 3               |
| Palm Length        | 300   | 1.4            | 161     | 1.5            | 2               |

TABLE 37

Observer Error for Foot Dimensions  
 (values in mm)

| Dimension                  | Males |                | Females |                | Allowable Error |
|----------------------------|-------|----------------|---------|----------------|-----------------|
|                            | N     | Observer Error | n       | Observer Error |                 |
| Ball of Foot Circumference | 300   | 1.9            | 161     | 1.9            | 4               |
| Ball of Foot Length        | 299   | 1.4            | 161     | 1.3            | 2               |
| Foot Breadth, Horizontal   | 299   | 1.3            | 161     | 1.4            | 2               |
| Foot Length                | 299   | 1.2            | 161     | 1.3            | 3               |
| Heel Breadth               | 300   | 1.2            | 161     | 1.3            | 2               |

TABLE 38

Observer Error for Reach Dimensions  
 (values in mm)

| Dimension                         | Males |                | Females |                | Allowable Error |
|-----------------------------------|-------|----------------|---------|----------------|-----------------|
|                                   | N     | Observer Error | n       | Observer Error |                 |
| Overhead Fingertip Reach, Sitting | 345   | 7.7            | 166     | 10.1           | 20              |
| Span                              | 345   | 7.6            | 166     | 9.7            | 10              |
| Thumbtip Reach                    | 345   | 8.6            | 166     | 11.0           | 20              |

The allowable errors were of considerable value in monitoring the progress of training. In the past, the assessment of whether team members were ready to begin data collection was subjective. In ANSUR II, there was a fixed standard, the allowable error, which told both trainers and team members alike when the team was ready to begin actual data collection. Allowable errors also aided in maintaining measurement standards and avoiding measurer drift over the course of a long data collection period. This was of critical importance because the ANSUR II survey took place over 18 months, with as much as 1 to 2 weeks between some measuring sites.

A potential disadvantage of establishing maximum allowable errors in advance is that team members might strive to achieve that level of interpair comparability and then stop trying to improve. As many of the mean observer errors were considerably lower than the allowable errors, however, this appears not to have been the case in this survey. It remains a potential difficulty, though, in cases where team motivation is a problem.

Observer error measured on a daily basis, as was done in this survey, has two advantages. First, because observer error data are collected throughout the survey, the data collected can be assumed to be "real", i.e., not an artifact of the team making special efforts for a single day of re-measured participants. Second, the daily checking can be used to detect measurement technique problems as soon as they arise, and they can be corrected before the problems become entrenched in the data.

On the other hand, there are two disadvantages to daily collection of observer error data, although they are believed to be outweighed by the advantages. First, the re-measure participants, who are generally not especially pleased to be measured in the first place, are even less pleased to be measured again. This is generally not a significant problem with military participants who are accustomed to following orders. Second, time spent measuring participants a second time is time not spent measuring new participants, but this is a small price to pay for the assurance of data quality gained by including the daily error checks. No modifications in this approach to daily observer error data collection are recommended.

## 7.5 ESTIMATED OBSERVER ERROR FOR DERIVED DIMENSIONS

Observer error for derived dimensions obviously has no place in correcting problems of measurement technique since these dimensions are not calculated until the survey is completed. However, because the observer error data are useful in assessing statistical significance tests or in analyzing or developing sizing systems and laying out workstations, it is helpful to know the magnitude of the observer error of these dimensions, even after the fact.

Since direct calculation of observer error for the derived dimensions was not generally possible, an alternative strategy was employed. It consisted of estimating observer error using the observer error of the component dimensions. Most of the derived dimensions are calculated by adding or subtracting values of other dimensions. For these dimensions, the observer error is estimated as less than or equal to the sum of the MADs of all component dimensions. Note that addition is used whether the component dimensions are added or subtracted to create the derived dimension. For Clavicle Link, which is created by dividing Biacromial Breadth by two, the observer error is estimated by dividing the observer error of Biacromial Breadth by two.

A model derivation, showing how the observer error for derived dimensions can be estimated using the MAD of component dimensions is shown below for two types of calculation (Gordon et al., 1989). The first is a derived dimension created by

subtraction. The same demonstration could be used for dimensions created by addition alone, by two subtractions, or by a combination of additions and subtractions. The second shows how the observer error for Clavicle Link can be calculated from the MAD of Biacromial Breadth.

Let  $z$  be the calculated dimension and  $x$  and  $y$  be the measured dimensions.

$$z = x - y \quad MAD(z) = ?$$

$$MAD(z) = MAD(x - y)$$

$$= \frac{\sum_{i=1}^n |(x_{1i} - y_{1i}) - (x_{2i} - y_{2i})|}{n}$$

where  $x_{1i}$ ,  $x_{2i}$ ,  $y_{1i}$ ,  $y_{2i}$  ( $i = 1 \dots n$ ), are the measurements for the  $i$ th individual and  $x_{1i}$ ,  $y_{1i}$  are measurements for observer 1.

$$= \frac{\sum_{i=1}^n |(x_{1i} - x_{2i}) - (y_{1i} - y_{2i})|}{n}$$

$$\leq \frac{\sum_{i=1}^n |(x_{1i} - x_{2i})| + \sum_{i=1}^n |(y_{1i} - y_{2i})|}{n}$$

$$\leq \frac{\sum_{i=1}^n |(x_{1i} - x_{2i})|}{n} + \frac{\sum_{i=1}^n |(y_{1i} - y_{2i})|}{n}$$

$$\leq MAD(x) + MAD(y)$$

$$\therefore MAD(z) \leq MAD(x) + MAD(y)$$

Let  $r$  be the calculated dimension and  $w$  be the measured dimension.

$$r = \frac{w}{2} \quad MAD(r) = ?$$

$$MAD(r) = MAD\left(\frac{w}{2}\right)$$

$$= \frac{\sum_{i=1}^n \left| \left( \frac{w_{1i}}{2} - \frac{w_{2i}}{2} \right) \right|}{n}$$

$$= \frac{1}{2} \frac{\sum_{i=1}^n |w_{1i} - w_{2i}|}{n}$$

$$= \frac{1}{2} MAD(w)$$

$$\therefore MAD(r) = \frac{1}{2} MAD(w)$$

The estimated observer errors for all derived dimensions are shown in Table 39. These values can be used for the same purposes as observer errors of measured dimensions, although the user should keep in mind that the derived dimension measurements are estimated rather than measured values.

TABLE 39

Estimated Observer Error for Derived Dimensions  
 (values in mm)

| Derived Dimension                       | Males | Females |
|-----------------------------------------|-------|---------|
| Abdominal Link                          | 5.2   | 5.4     |
| Acromial Height, Sitting                | 9.4   | 9.3     |
| Acromion-Axilla Length                  | 7.8   | 8.2     |
| Arm Length                              | 11.7  | 10.9    |
| Axilla-Waist Length (Omphalion)         | 7.8   | 8.8     |
| Calf Link                               | 2.7   | 2.9     |
| Cervicale Height, Sitting               | 8.6   | 8.9     |
| Chest Height, Sitting                   | 10.7  | 11.8    |
| Chest-Waist Drop (Omphalion)            | 14.1  | 14.3    |
| Clavicle Link                           | 2.0   | 2.0     |
| Crotch Length, Anterior (Omphalion)     | 20.2  | 15.5    |
| Dactylion Height                        | 8.1   | 7.4     |
| Dactylion Reach from Wall               | 8.6   | 11.0    |
| Elbow Rest Height, Standing             | 11.3  | 11.4    |
| Elbow-Wrist Length                      | 4.0   | 3.9     |
| Eye Height                              | 9.7   | 10.2    |
| Functional Grip Reach                   | 8.6   | 11.0    |
| Index Finger Reach                      | 8.6   | 11.0    |
| Neck-Buttock Length                     | 5.2   | 5.4     |
| Neck Link                               | 7.7   | 7.9     |
| Neck-Scye Length                        | 7.0   | 7.8     |
| Pelvic Link                             | 5.1   | 5.6     |
| Rise (Omphalion)                        | 9.8   | 9.9     |
| Shoulder-Waist Length (Omphalion)       | 7.2   | 7.5     |
| Sleeve Inseam                           | 10.6  | 10.6    |
| Suprasternale Height, Sitting           | 9.3   | 9.2     |
| Suprasternale-Tenth Rib Length          | 6.1   | 5.7     |
| Suprasternale-Waist Length (Omphalion)  | 7.1   | 7.4     |
| Thigh Link                              | 4.1   | 4.2     |
| Thorax Link                             | 5.4   | 5.4     |
| Tragion Height                          | 4.9   | 4.9     |
| Tragion Height, Sitting                 | 4.5   | 5.2     |
| Vertical Grip Reach                     | 13.5  | 15.9    |
| Vertical Grip Reach Down                | 10.1  | 9.2     |
| Vertical Grip Reach, Sitting            | 7.7   | 10.1    |
| Vertical Index Fingertip Reach          | 13.5  | 15.9    |
| Vertical Index Fingertip Reach, Sitting | 7.7   | 10.1    |
| Vertical Thumbtip Reach, Sitting        | 7.7   | 10.1    |
| Waist Back, Vertical (Omphalion)        | 6.4   | 7.1     |
| Waist-Buttock Drop (Omphalion)          | 11.6  | 10.7    |
| Waist-Waist (Omphalion) Over Shoulder   | 25.4  | 19.2    |

## 7.6 TECHNICAL ERROR OF MEASUREMENT AND RELIABILITY COEFFICIENT

There are other methods for analyzing observer data. Two commonly seen in the literature are the technical error of measurement (TEM) and the reliability coefficient (R). Technical error of measurement expresses error in terms of the unit of measurement using the following formula:

$$TEM = \sqrt{\frac{\sum D^2}{2N}}$$

where  $D$  is the difference between the first and second measurements and  $N$  is the number of individuals measured. As can be seen from the formula, the technical error is basically a way of summarizing differences between two measurements over a series of participants (Ulijaszek and Lourie, 1994).

The reliability coefficient (R) reveals how much of the variation between participants in the measured population is free of measurement error (Ulijaszek and Lourie, 1994). R is calculated as follows:

$$R = 1 - \left\{ \frac{(TEM)^2}{(SD)^2} \right\}$$

where SD is the standard deviation of the measured values. Since R is dimensionless, it can be used to make comparisons between variables that have different magnitudes (Gordon and Bradtmiller, 1992).

Due to the high correlation between TEM and MAD (Utermohle et al., 1983), using both methods is potentially redundant (Gordon and Bradtmiller, 1992); however due to the ubiquitous use of TEM and R in the literature, it may be helpful to some readers to include both of the statistics that are included in this report for comparative purposes. Tables 40 through 50 report TEM and R for the dimensions measured in ANSUR II. In general, the relative magnitude of TEM, and inversely, R, corresponds to that of the MAD seen in the previous tables and varies with dimension type in the same way.

TABLE 40

TEM and R for Standing Heights  
 (values in mm)

| Dimension                         | Males |       | Females |       |
|-----------------------------------|-------|-------|---------|-------|
|                                   | TEM   | R (%) | TEM     | R (%) |
| Acromial Height                   | 3.53  | 99.6  | 3.34    | 99.6  |
| Axilla Height                     | 3.89  | 99.5  | 4.22    | 99.3  |
| Buttock Height                    | 2.57  | 99.7  | 2.11    | 99.8  |
| Cervicale Height                  | 2.68  | 99.8  | 2.81    | 99.7  |
| Chest Height                      | 4.67  | 99.3  | 5.73    | 98.8  |
| Crotch Height                     | 5.87  | 98.8  | 5.27    | 98.6  |
| Iliocristale Height               | 2.47  | 99.7  | 3.12    | 99.5  |
| Knee Height, Midpatella           | 2.91  | 98.9  | 1.98    | 99.4  |
| Lateral Femoral Epicondyle Height | 1.72  | 99.6  | 1.71    | 99.6  |
| Lateral Malleolus Height          | 0.95  | 97.0  | 1.11    | 94.9  |
| Stature                           | 3.02  | 99.8  | 2.75    | 99.8  |
| Suprasternale Height              | 3.22  | 99.7  | 3.06    | 99.6  |
| Tenth Rib Height                  | 2.44  | 99.8  | 2.38    | 99.7  |
| Tibial Height                     | 1.96  | 99.4  | 2.09    | 99.3  |
| Trochanterion Height              | 2.39  | 99.8  | 2.60    | 99.7  |
| Waist Height (Omphalion)          | 3.38  | 99.5  | 3.79    | 99.3  |
| Wrist Height                      | 5.91  | 97.8  | 5.52    | 97.4  |

TABLE 41

TEM and R for Sitting Heights  
 (values in mm)

| Dimension                   | Males |       | Females |       |
|-----------------------------|-------|-------|---------|-------|
|                             | TEM   | R (%) | TEM     | R (%) |
| Elbow Rest Height           | 5.65  | 95.9  | 5.48    | 94.9  |
| Eye Height, Sitting         | 4.11  | 98.4  | 4.12    | 98.2  |
| Knee Height, Sitting        | 1.74  | 99.6  | 1.98    | 99.4  |
| Popliteal Height            | 2.12  | 99.2  | 2.53    | 98.8  |
| Sitting Height              | 2.99  | 99.3  | 2.98    | 99.2  |
| Thigh Clearance             | 1.66  | 98.1  | 1.65    | 98.1  |
| Waist Front Length, Sitting | 5.20  | 95.7  | 5.23    | 94.2  |

TABLE 42

TEM and R for Lengths  
 (values in mm)

| Dimension                            | Males |       | Females |       |
|--------------------------------------|-------|-------|---------|-------|
|                                      | TEM   | R (%) | TEM     | R (%) |
| Acromion-Radiale Length              | 2.43  | 97.8  | 2.47    | 97.5  |
| Buttock-Knee Length                  | 5.74  | 96.0  | 4.72    | 97.6  |
| Buttock-Popliteal Length             | 6.73  | 93.8  | 5.62    | 96.0  |
| Crotch Length (Omphalion)            | 10.43 | 94.0  | 7.47    | 96.4  |
| Crotch Length, Posterior (Omphalion) | 8.07  | 91.8  | 6.51    | 93.0  |
| Forearm-Center of Grip Length        | 3.75  | 94.7  | 4.31    | 92.9  |
| Forearm-Hand Length                  | 2.15  | 99.0  | 2.10    | 99.0  |
| Functional Leg Length                | 8.89  | 97.0  | 13.46   | 93.3  |
| Interscye I                          | 5.85  | 96.4  | 6.32    | 94.7  |
| Interscye II                         | 5.41  | 95.9  | 5.78    | 94.4  |
| Radiale-Styilion Length              | 3.13  | 95.1  | 3.21    | 94.7  |
| Shoulder-Elbow Length                | 2.50  | 97.8  | 2.47    | 97.6  |
| Shoulder Length                      | 2.23  | 93.9  | 2.29    | 94.6  |
| Sleeve Length: Spine-Wrist           | 5.76  | 97.4  | 3.84    | 98.7  |
| Sleeve Outseam                       | 3.60  | 98.4  | 3.39    | 98.5  |
| Waist Back Length (Omphalion)        | 3.04  | 98.5  | 2.87    | 98.6  |

TABLE 43

TEM and R for Breadths  
 (values in mm)

| Dimension               | Males |       | Females |       |
|-------------------------|-------|-------|---------|-------|
|                         | TEM   | R (%) | TEM     | R (%) |
| Biacromial Breadth      | 3.34  | 96.6  | 4.47    | 93.5  |
| Bicristal Breadth       | 3.98  | 94.3  | 5.52    | 90.8  |
| Bideltoid Breadth       | 4.40  | 96.7  | 4.64    | 96.2  |
| Bimalleolar Breadth     | 1.18  | 91.5  | 0.97    | 92.7  |
| Chest Breadth           | 4.72  | 91.5  | 4.31    | 93.3  |
| Forearm-Forearm Breadth | 8.95  | 94.4  | 10.91   | 89.8  |
| Hip Breadth             | 2.23  | 98.8  | 2.99    | 98.1  |
| Hip Breadth, Sitting    | 3.70  | 97.6  | 4.30    | 98.0  |
| Waist Breadth           | 3.28  | 98.5  | 3.23    | 97.6  |

TABLE 44

TEM and R for Depths and Weight  
 (values in mm and kg)

| Dimension                          | Males |       | Females |       |
|------------------------------------|-------|-------|---------|-------|
|                                    | TEM   | R (%) | TEM     | R (%) |
| Abdominal Extension Depth, Sitting | 4.28  | 97.2  | 4.66    | 96.7  |
| Buttock Depth                      | 4.41  | 95.4  | 4.40    | 94.6  |
| Chest Depth                        | 3.17  | 97.4  | 3.48    | 97.3  |
| Waist Depth                        | 3.74  | 97.3  | 3.23    | 97.6  |
| Weight                             | 0.28  | 99.9  | 0.08    | 100.0 |

TABLE 45

TEM and R for Large Circumferences  
 (values in mm)

| Dimension                          | Males |       | Females |       |
|------------------------------------|-------|-------|---------|-------|
|                                    | TEM   | R (%) | TEM     | R (%) |
| Buttock Circumference              | 5.41  | 99.2  | 4.25    | 99.5  |
| Chest Circumference                | 8.09  | 98.6  | 7.55    | 98.5  |
| Shoulder Circumference             | 5.91  | 98.9  | 5.55    | 98.4  |
| Vertical Trunk Circumference (USA) | 16.23 | 95.7  | 10.57   | 97.2  |
| Waist Circumference (Omphalion)    | 6.21  | 99.5  | 6.28    | 99.3  |

TABLE 46

TEM and R for Small Circumferences  
 (values in mm)

| Dimension                     | Males |       | Females |       |
|-------------------------------|-------|-------|---------|-------|
|                               | TEM   | R (%) | TEM     | R (%) |
| Ankle Circumference           | 1.86  | 98.2  | 2.15    | 98.0  |
| Biceps Circumference, Flexed  | 3.75  | 98.5  | 5.93    | 93.3  |
| Calf Circumference            | 1.78  | 99.6  | 1.61    | 99.7  |
| Forearm Circumference, Flexed | 3.44  | 97.0  | 3.55    | 93.7  |
| Heel-Ankle Circumference      | 1.85  | 98.5  | 1.91    | 98.8  |
| Lower Thigh Circumference     | 2.07  | 99.9  | 3.70    | 98.8  |
| Neck Circumference            | 2.78  | 98.2  | 3.48    | 94.6  |
| Neck Circumference, Base      | 3.50  | 97.6  | 4.05    | 93.5  |
| Thigh Circumference           | 4.65  | 99.1  | 3.96    | 99.2  |
| Wrist Circumference           | 1.88  | 95.3  | 1.95    | 91.2  |

TABLE 47

TEM and R for Head Dimensions  
 (values in mm)

| Dimension                   | Males |       | Females |       |
|-----------------------------|-------|-------|---------|-------|
|                             | TEM   | R (%) | TEM     | R (%) |
| Bitragion Chin Arc          | 2.61  | 96.1  | 2.88    | 96.3  |
| Bitragion Submandibular Arc | 3.22  | 95.4  | 3.92    | 93.2  |
| Bizygomatic Breadth         | 1.05  | 97.0  | 1.35    | 95.5  |
| Ear Breadth                 | 1.13  | 86.1  | 1.11    | 83.1  |
| Ear Length                  | 1.27  | 91.0  | 1.10    | 93.3  |
| Ear Protrusion              | 0.92  | 89.4  | 1.11    | 80.2  |
| Head Breadth                | 0.88  | 97.2  | 1.07    | 96.4  |
| Head Circumference          | 1.62  | 98.9  | 2.59    | 98.4  |
| Head Length                 | 1.02  | 97.7  | 1.70    | 94.3  |
| Interpupillary Breadth      | 0.82  | 93.7  | 0.93    | 93.6  |
| Menton-Sellion Length       | 1.65  | 93.1  | 1.66    | 93.2  |
| Tragion-Top of Head         | 1.67  | 92.7  | 1.78    | 92.4  |

TABLE 48

TEM and R for Hand Dimensions  
 (values in mm)

| Dimension          | Males |       | Females |       |
|--------------------|-------|-------|---------|-------|
|                    | TEM   | R (%) | TEM     | R (%) |
| Hand Breadth       | 1.09  | 94.2  | 1.13    | 91.3  |
| Hand Circumference | 1.48  | 97.9  | 1.51    | 97.1  |
| Hand Length        | 1.40  | 97.7  | 1.44    | 97.9  |
| Palm Length        | 1.27  | 96.0  | 1.31    | 95.3  |

TABLE 49

TEM and R for Foot Dimensions  
 (values in mm)

| Dimension                  | Males |       | Females |       |
|----------------------------|-------|-------|---------|-------|
|                            | TEM   | R (%) | TEM     | R (%) |
| Ball of Foot Circumference | 1.65  | 98.2  | 1.75    | 97.8  |
| Ball of Foot Length        | 1.21  | 98.8  | 1.12    | 98.7  |
| Foot Breadth, Horizontal   | 1.13  | 95.0  | 1.21    | 93.8  |
| Foot Length                | 1.05  | 99.3  | 1.10    | 99.2  |
| Heel Breadth               | 1.10  | 95.6  | 1.10    | 95.9  |

TABLE 50

TEM and R for Reach Dimensions  
 (values in mm)

| Dimension                         | Males |       | Females |       |
|-----------------------------------|-------|-------|---------|-------|
|                                   | TEM   | R (%) | TEM     | R (%) |
| Overhead Fingertip Reach, Sitting | 7.78  | 98.3  | 9.50    | 97.4  |
| Span                              | 7.47  | 99.1  | 11.28   | 97.9  |
| Thumbtip Reach                    | 8.72  | 95.4  | 10.28   | 93.2  |

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## CHAPTER VIII

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## INDEX\*

|                                    | <u>Page</u> |
|------------------------------------|-------------|
| ABDOMINAL EXTENSION DEPTH, SITTING | 46          |
| Abdominal Link                     | 234         |
| Abdominal point, anterior landmark | 20          |
| ACROMIAL HEIGHT                    | 48          |
| Acromial Height, Sitting           | 236         |
| Acromion landmark                  | 20          |
| Acromion-Axilla Length             | 238         |
| ACROMION-RADIALE LENGTH            | 50          |
| Acropodion landmark                | 20          |
| ANKLE CIRCUMFERENCE                | 52          |
| Anthropometer                      | 11          |
| Arm Length                         | 240         |
| AXILLA HEIGHT                      | 54          |
| Axillary fold, posterior landmark  | 20          |
| Axilla-Waist Length (Omphalion)    | 242         |
| BALL OF FOOT CIRCUMFERENCE         | 56          |
| BALL OF FOOT LENGTH                | 58          |
| Beam caliper                       | 11          |

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\* This is an index of landmarks, dimensions, and measuring instruments. The page number refers to where the entry is most fully described. Measured dimensions appear in the Index as ALL CAPS. Derived dimensions appear in the Index as Title Case. Landmarks appear in the Index in Sentence case and have the word "landmark" in the title. Instruments also appear in Sentence case.

|                                   | <u>Page</u> |
|-----------------------------------|-------------|
| BIACROMIAL BREADTH                | 60          |
| BICEPS CIRCUMFERENCE, FLEXED      | 62          |
| Biceps point landmark             | 20          |
| BICRISTAL BREADTH                 | 64          |
| BIDELTOID BREADTH                 | 66          |
| BIMALLEOLAR BREADTH               | 68          |
| BITRAGON CHIN ARC                 | 70          |
| BITRAGON SUBMANDIBULAR ARC        | 72          |
| BIZYGOMATIC BREADTH               | 74          |
| BUTTOCK CIRCUMFERENCE             | 76          |
| BUTTOCK DEPTH                     | 78          |
| BUTTOCK HEIGHT                    | 80          |
| BUTTOCK-KNEE LENGTH               | 82          |
| Buttock point, posterior landmark | 20          |
| BUTTOCK-POPLITEAL LENGTH          | 84          |
| CALF CIRCUMFERENCE                | 86          |
| Calf Link                         | 244         |
| Center of pupil landmark          | 20          |
| Cervicale Height, Sitting         | 246         |
| Cervicale landmark                | 20          |
| CERVICALE HEIGHT                  | 88          |
| CHEST BREADTH                     | 90          |

|                                              | <u>Page</u> |
|----------------------------------------------|-------------|
| CHEST CIRCUMFERENCE                          | 92          |
| CHEST DEPTH                                  | 94          |
| CHEST HEIGHT                                 | 96          |
| Chest Height, Sitting                        | 248         |
| Chest point, anterior landmark               | 21          |
| Chest-Waist Drop (Omphalion)                 | 250         |
| Chin landmark                                | 21          |
| Clavicle Link                                | 252         |
| Clavicle landmark                            | 21          |
| CROTCH HEIGHT                                | 98          |
| Crotch landmark                              | 21          |
| Crotch Length, Anterior (Omphalion)          | 254         |
| CROTCH LENGTH (OMPHALION)                    | 100         |
| CROTCH LENGTH, POSTERIOR (OMPHALION)         | 102         |
| Dactylion Height                             | 256         |
| Dactylion Reach from Wall                    | 258         |
| Dactylion III landmark                       | 21          |
| Deltoid point landmark                       | 21          |
| Digit III, base landmark                     | 21          |
| Dorsal juncture of the foot and leg landmark | 21          |
| Ear, bottom landmark                         | 22          |
| EAR BREADTH                                  | 104         |

|                                               | <u>Page</u> |
|-----------------------------------------------|-------------|
| EAR LENGTH                                    | 106         |
| Ear point landmark                            | 22          |
| EAR PROTRUSION                                | 108         |
| Ear, top landmark                             | 22          |
| Ectocanthus landmark                          | 22          |
| Ectoorbitale landmark                         | 22          |
| Elbow crease landmark                         | 22          |
| ELBOW REST HEIGHT                             | 110         |
| Elbow Rest Height, Standing                   | 260         |
| Elbow-Wrist Length                            | 262         |
| Euryon landmark                               | 22          |
| Eye Height                                    | 264         |
| EYE HEIGHT, SITTING                           | 112         |
| Fifth metatarsophalangeal protrusion landmark | 22          |
| First metatarsophalangeal protrusion landmark | 23          |
| FOOT BREADTH, HORIZONTAL                      | 114         |
| FOOT LENGTH                                   | 116         |
| Foot scanner                                  | 18          |
| FOREARM-CENTER OF GRIP LENGTH                 | 118         |
| FOREARM CIRCUMFERENCE, FLEXED                 | 120         |
| FOREARM-FOREARM BREADTH                       | 122         |
| FOREARM-HAND LENGTH                           | 124         |

|                                           | <u>Page</u> |
|-------------------------------------------|-------------|
| Frontotemporale landmark                  | 23          |
| Functional Grip Reach                     | 266         |
| FUNCTIONAL LEG LENGTH                     | 126         |
| Glabella landmark                         | 23          |
| Gluteal furrow point landmark             | 23          |
| Gonion landmark                           | 23          |
| HAND BREADTH                              | 128         |
| HAND CIRCUMFERENCE                        | 130         |
| HAND LENGTH                               | 132         |
| HEAD BREADTH                              | 134         |
| HEAD CIRCUMFERENCE                        | 136         |
| HEAD LENGTH                               | 138         |
| Head scanner (PX)                         | 17          |
| HEEL-ANKLE CIRCUMFERENCE                  | 140         |
| HEEL BREADTH                              | 142         |
| Heel point, lateral, and medial landmarks | 23          |
| HIP BREADTH                               | 144         |
| HIP BREADTH, SITTING                      | 146         |
| Holtain caliper                           | 11          |
| ILIOCRISTALE HEIGHT                       | 148         |
| Iliocristale landmark                     | 23          |

|                                                            | <u>Page</u> |
|------------------------------------------------------------|-------------|
| Index Finger Reach                                         | 268         |
| Infraorbitale landmark (see Orbitale landmark)             | 26          |
| Infrathyroid landmark                                      | 23          |
| Inner thigh landmark                                       | 24          |
| INTERPUPILLARY BREADTH                                     | 150         |
| INTERSCYE I                                                | 152         |
| INTERSCYE II                                               | 154         |
| KNEE HEIGHT, MIDPATELLA                                    | 156         |
| KNEE HEIGHT, SITTING                                       | 158         |
| Knee point, anterior landmark                              | 24          |
| Landmark transfer rod                                      | 16          |
| LATERAL FEMORAL EPICONDYLE HEIGHT                          | 160         |
| Lateral femoral epicondyle, sitting and standing landmarks | 24          |
| LATERAL MALLEOLUS HEIGHT                                   | 162         |
| Lateral malleolus landmark                                 | 24          |
| LOWER THIGH CIRCUMFERENCE                                  | 164         |
| Medial malleolus landmark                                  | 24          |
| Menton landmark                                            | 24          |
| MENTON-SELLION LENGTH                                      | 166         |
| Metacarpale II landmark                                    | 24          |
| Metacarpale V landmark                                     | 25          |
| Midpatella landmark                                        | 25          |

|                                                                       | <u>Page</u> |
|-----------------------------------------------------------------------|-------------|
| Midshoulder landmark                                                  | 25          |
| Midspine landmark                                                     | 25          |
| Modified beam caliper with dowel                                      | 15          |
| Modified Brannock Device®                                             | 13          |
| Modified height gauge                                                 | 14          |
| Modified steel tape                                                   | 15          |
| Neck-Buttock Length                                                   | 270         |
| NECK CIRCUMFERENCE                                                    | 168         |
| NECK CIRCUMFERENCE, BASE                                              | 170         |
| Neck, anterior and lateral landmarks                                  | 25          |
| Neck Link                                                             | 272         |
| Neck-Scye Length                                                      | 274         |
| Olecranon, bottom, center and rear landmarks                          | 25          |
| Opisthocranion landmark                                               | 26          |
| Orbitale landmark                                                     | 26          |
| Otobasion, superior landmark                                          | 26          |
| OVERHEAD FINGERTIP REACH, SITTING                                     | 172         |
| PALM LENGTH                                                           | 174         |
| Pelvic Link                                                           | 276         |
| Poech sliding caliper                                                 | 12          |
| Popliteal fossa at the dorsal juncture of the calf and thigh landmark | 26          |
| POPLITEAL HEIGHT                                                      | 176         |

|                                   | <u>Page</u> |
|-----------------------------------|-------------|
| Pternion landmark                 | 26          |
| Pupillometer                      | 13          |
| Radiale landmark                  | 26          |
| RADIALE-STYLION LENGTH            | 178         |
| Rise (Omphalion)                  | 278         |
| Scale                             | 12          |
| Scye landmarks                    | 27          |
| Scye marking aid                  | 16          |
| Sellion landmark                  | 28          |
| SHOULDER CIRCUMFERENCE            | 180         |
| SHOULDER-ELBOW LENGTH             | 182         |
| SHOULDER LENGTH                   | 184         |
| Shoulder-Waist Length (Omphalion) | 280         |
| SITTING HEIGHT                    | 186         |
| Sleeve Inseam                     | 282         |
| SLEEVE LENGTH: SPINE-WRIST        | 188         |
| SLEEVE OUTSEAM                    | 190         |
| Sliding caliper                   | 11          |
| SPAN                              | 192         |
| Spreading caliper                 | 11          |
| STATURE                           | 194         |
| Steel tape                        | 12          |

|                                        | <u>Page</u> |
|----------------------------------------|-------------|
| Stylian, dorsal and ventral landmarks  | 28          |
| Submandibular landmark                 | 28          |
| Suprapatella landmark                  | 28          |
| SUPRASTERNALE HEIGHT                   | 196         |
| Suprasternale Height, Sitting          | 284         |
| Suprasternale landmark                 | 28          |
| Suprasternale-Tenth Rib Length         | 286         |
| Suprasternale-Waist Length (Omphalion) | 288         |
| TENTH RIB HEIGHT                       | 198         |
| Tenth rib landmark                     | 28          |
| THIGH CIRCUMFERENCE                    | 200         |
| THIGH CLEARANCE                        | 202         |
| Thigh Link                             | 290         |
| Thigh point, top landmark              | 28          |
| Thorax Link                            | 292         |
| Thumbtip landmark                      | 28          |
| THUMB TIP REACH                        | 204         |
| TIBIAL HEIGHT                          | 206         |
| Tibiale landmark                       | 29          |
| Top of head (vertex) landmark          | 29          |
| Tragion Height                         | 294         |
| Tragion Height, Sitting                | 296         |

|                                                     | <u>Page</u> |
|-----------------------------------------------------|-------------|
| Tragion landmark                                    | 29          |
| TRAGION-TOP OF HEAD                                 | 208         |
| Trapezius landmark                                  | 29          |
| Trochanter landmark                                 | 29          |
| TROCHANTERION HEIGHT                                | 210         |
| Trochanterion landmark                              | 29          |
| Vertical Grip Reach                                 | 298         |
| Vertical Grip Reach Down                            | 300         |
| Vertical Grip Reach, Sitting                        | 302         |
| Vertical Index Fingertip Reach                      | 304         |
| Vertical Index Fingertip Reach, Sitting             | 306         |
| Vertical Thumbtip Reach, Sitting                    | 308         |
| VERTICAL TRUNK CIRCUMFERENCE (USA)                  | 212         |
| WAIST BACK LENGTH (OMPHALION)                       | 214         |
| Waist Back, Vertical (Omphalion)                    | 310         |
| WAIST BREADTH                                       | 216         |
| Waist-Buttock Drop (Omphalion)                      | 312         |
| WAIST CIRCUMFERENCE (OMPHALION)                     | 218         |
| WAIST DEPTH                                         | 220         |
| WAIST FRONT LENGTH, SITTING                         | 222         |
| WAIST HEIGHT (OMPHALION)                            | 224         |
| Waist (omphalion), anterior and posterior landmarks | 29          |

|                                       | <u>Page</u> |
|---------------------------------------|-------------|
| Waist-Waist (Omphalion) Over Shoulder | 314         |
| Wall chart                            | 14          |
| WEIGHT                                | 226         |
| Whole-body scanner (WBX)              | 17          |
| WRIST CIRCUMFERENCE                   | 228         |
| WRIST HEIGHT                          | 230         |
| Zygion landmark                       | 29          |
| Zygofrontale landmark                 | 30          |

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## APPENDIX A

### APPLICATIONS FOR MEASURED AND DERIVED DIMENSIONS

Most of the measured and derived dimensions for which data are reported in this volume serve multiple design and sizing uses. Some, chiefly head, hand, and foot variables, are needed for the design of a particular class of item to be worn on that part of the body. All the dimensions serve at least one of the seven use categories described below:

Describing Overall Body Size and Proportions: These are dimensions of overall body size and proportions. They are required to determine the anthropometric differences or similarities between populations. They are also used for selecting samples of participants that are anthropometrically representative of a particular population for studies in which body size is of significance (e.g., the evaluation of the workstation layouts for a new armored vehicle). Further, these dimensions are commonly used in anthropometric studies world-wide, and their definitions are generally agreed upon. This means that international population comparisons using these dimensions are valid.

Clothing and Personal Protection Design, Sizing, and Issue: These dimensions are useful for the design and sizing of Army uniforms, utility garments, and personal protective equipment (e.g., body armor, respirators, chemical defense clothing). In this context, “personal protection” also includes boots, gloves, helmets, goggles, and various special purpose items.

Workstation Design: Dimensions in this group are central to the design and layout of single- and multi-person workstations occupied by military personnel. They are also of paramount importance in the design and layout of workstations of weapon systems, particularly those, like tanks, in which space is at a premium. Body clearance dimensions dictate, for example, the size of escape hatches and limited-size passageways that must be designed to allow quick and safe passage of an individual. In the field or in a depot, the performance of maintenance activities is also greatly enhanced if personnel have ready physical and visual access to maintenance and inspection ports, and have the reach capabilities to perform necessary service, repair, or replacement activities, often conducted under adverse conditions.

Occupational Selection: These dimensions are used to screen candidates for anthropometric incompatibility when job assignments are being made. The physical constraints inherent in some occupations, e.g. the dimensions of a helicopter cockpit, preclude individuals of certain sizes and proportions from safely carrying out those missions.

Digital Human Models: These dimensions are needed for developing digital human models used to assess the body’s reaction to hazardous environments, and for

two- and three-dimensional models used in the design and evaluation of Army crewstations and workstations. Digital models are increasingly used in the design process for seated and standing workstations, as well as group modeling for battlefield scenarios.

3-D Scan Validation: The dimensions in this group are those required to create and refine automated scan data extraction algorithms. As scanners are more frequently used as a substitute for actual anthropometric data collection, it becomes more critical than ever to assure users of the data that the measurements arising from 3-D scans are equivalent to those taken with tapes and calipers. As data extraction applications are continuously improving, this is a foreseeable goal. In the interim, however, it is necessary to collect traditional (tape & caliper) dimensions that can be used to test the validity of these applications and the assumptions and the algorithms that underlie them.

International Standards for Ergonomic Design: These dimensions are useful for comparing data sets between nations, and are measured according to the protocol in ISO 7250-1, as well as other international standards. Further, these dimensions form part of a minimum set of dimensions recommended for collection any time humans are measured. The inclusion of these dimensions ensures that the U.S. is using internationally recognized "Best Practices" in its survey design.

Table A-1 lists all the measured and derived dimensions in the ANSUR II survey and designates the use or uses each may serve.

TABLE A-1

Applications for Measured and Derived Dimensions \*

| Measured or Derived Dimension        | Describing Overall Body Size and Proportions | Clothing and Personal Protection Design, Sizing, and Issue | Workstation Design | Occupational Selection | Digital Human Models | 3-D Scan Validation | International Standards for Ergonomic Design |
|--------------------------------------|----------------------------------------------|------------------------------------------------------------|--------------------|------------------------|----------------------|---------------------|----------------------------------------------|
| 1 Abdominal Extension Depth, Sitting |                                              |                                                            | ✓                  | ✓                      |                      |                     | ✓                                            |
| D1 Abdominal Link                    |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 2 Acromial Height                    |                                              | ✓                                                          |                    |                        | ✓                    | ✓                   | ✓                                            |
| D2 Acromial Height, Sitting          |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| D3 Acromion-Axilla Length            |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 3 Acromion-Radiale Length            | ✓                                            |                                                            |                    |                        | ✓                    | ✓                   | ✓                                            |
| 4 Ankle Circumference                | ✓                                            | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| D4 Arm Length                        | ✓                                            |                                                            |                    |                        |                      |                     |                                              |
| 5 Axilla Height                      |                                              | ✓                                                          |                    |                        | ✓                    |                     | ✓                                            |
| D5 Axilla-Waist Length (Omphalion)   |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 6 Ball Of Foot Circumference         |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 7 Ball Of Foot Length                |                                              | ✓                                                          |                    |                        | ✓                    |                     | ✓                                            |
| 8 Biacromial Breadth                 | ✓                                            | ✓                                                          | ✓                  |                        | ✓                    | ✓                   | ✓                                            |
| 9 Biceps Circumference Flexed        | ✓                                            | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 10 Bicristal Breadth                 |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 11 Bideloid Breadth                  | ✓                                            |                                                            | ✓                  | ✓                      | ✓                    | ✓                   | ✓                                            |
| 12 Bimalleolar Breadth               | ✓                                            |                                                            |                    |                        | ✓                    |                     |                                              |
| 13 Bitragion Chin Arc                |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 14 Bitragion Submandibular Arc       |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 15 Bizygomatic Breadth               | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    | ✓                   |                                              |
| 16 Buttock Circumference             | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    | ✓                   | ✓                                            |
| 17 Buttock Depth                     |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| 18 Buttock Height                    | ✓                                            | ✓                                                          |                    |                        | ✓                    | ✓                   |                                              |
| 19 Buttock-Knee Length               |                                              |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 20 Buttock-Popliteal Length          |                                              |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 21 Calf Circumference                | ✓                                            | ✓                                                          |                    |                        | ✓                    | ✓                   | ✓                                            |
| D6 Calf Link                         |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 22 Cervicale Height                  | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    | ✓                   | ✓                                            |
| D7 Cervicale Height, Sitting         |                                              |                                                            |                    |                        |                      |                     |                                              |

\* After Clauser et al., 1986

| Measured or Derived Dimension          | Describing Overall Body Size and Proportions | Clothing and Personal Protection Design, Sizing, and Issue | Workstation Design | Occupational Selection | Digital Human Models | 3-D Scan Validation | International Standards for Ergonomic Design |
|----------------------------------------|----------------------------------------------|------------------------------------------------------------|--------------------|------------------------|----------------------|---------------------|----------------------------------------------|
| 23 Chest Breadth                       | ✓                                            | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 24 Chest Circumference                 | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    | ✓                   | ✓                                            |
| 25 Chest Depth                         | ✓                                            |                                                            | ✓                  |                        | ✓                    |                     | ✓                                            |
| 26 Chest Height                        |                                              | ✓                                                          |                    |                        | ✓                    | ✓                   |                                              |
| D8 Chest Height, Sitting               |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| D9 Chest-Waist Drop (Omphalion)        |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| D10 Clavicle Link                      |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 27 Crotch Height                       | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    |                     | ✓                                            |
| D11 Crotch Length Anterior (Omphalion) |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 28 Crotch Length Omphalion             |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 29 Crotch Length Posterior Omphalion   |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| D12 Dactylion Height                   |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| D13 Dactylion Reach From Wall          |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| 30 Ear Breadth                         | ✓                                            | ✓                                                          |                    |                        |                      | ✓                   |                                              |
| 31 Ear Length                          | ✓                                            | ✓                                                          |                    |                        |                      | ✓                   |                                              |
| 32 Ear Protrusion                      |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 33 Elbow Rest Height                   |                                              |                                                            | ✓                  |                        | ✓                    |                     | ✓                                            |
| D14 Elbow Rest Height, Standing        |                                              |                                                            | ✓                  |                        | ✓                    |                     | ✓                                            |
| D15 Elbow-Wrist Length                 |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| D16 Eye Height                         |                                              |                                                            | ✓                  |                        | ✓                    |                     | ✓                                            |
| 34 Eye Height, Sitting                 | ✓                                            |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 35 Foot Breadth Horizontal             | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    |                     | ✓                                            |
| 36 Foot Length                         | ✓                                            | ✓                                                          | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 38 Forearm Circumference Flexed        |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 37 Forearm-Center Of Grip Length       |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 39 Forearm-Forearm Breadth             |                                              |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 40 Forearm-Hand Length                 | ✓                                            |                                                            | ✓                  |                        | ✓                    |                     | ✓                                            |
| D17 Functional Grip Reach              |                                              |                                                            | ✓                  |                        | ✓                    |                     | ✓                                            |
| 41 Functional Leg Length               |                                              |                                                            |                    | ✓                      | ✓                    |                     |                                              |
| 42 Hand Breadth                        | ✓                                            | ✓                                                          | ✓                  |                        | ✓                    |                     | ✓                                            |
| 43 Hand Circumference                  | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    |                     | ✓                                            |
| 44 Hand Length                         | ✓                                            | ✓                                                          | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 45 Head Breadth                        | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    |                     | ✓                                            |
| 46 Head Circumference                  | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    |                     | ✓                                            |
| 47 Head Length                         | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    |                     | ✓                                            |

| Measured or Derived Dimension        | Describing Overall Body Size and Proportions | Clothing and Personal Protection Design, Sizing, and Issue | Workstation Design | Occupational Selection | Digital Human Models | 3-D Scan Validation | International Standards for Ergonomic Design |
|--------------------------------------|----------------------------------------------|------------------------------------------------------------|--------------------|------------------------|----------------------|---------------------|----------------------------------------------|
| 48 Heel Ankle Circumference          |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 49 Heel Breadth                      | ✓                                            | ✓                                                          |                    |                        |                      |                     |                                              |
| 50 Hip Breadth                       | ✓                                            |                                                            | ✓                  |                        | ✓                    | ✓                   | ✓                                            |
| 51 Hip Breadth, Sitting              | ✓                                            |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 52 Iliocristale Height               |                                              | ✓                                                          |                    |                        | ✓                    | ✓                   |                                              |
| D18 Index Finger Reach               |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| 53 Interpupillary Breadth            |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 54 Interscye I                       |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 55 Interscye II                      |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 56 Knee Height Midpatella            |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 57 Knee Height, Sitting              | ✓                                            |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 58 Lateral Femoral Epicondyle Height | ✓                                            |                                                            |                    |                        | ✓                    |                     |                                              |
| 59 Lateral Malleolus Height          |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 60 Lower Thigh Circumference         |                                              | ✓                                                          |                    | ✓                      | ✓                    | ✓                   |                                              |
| 61 Menton-Sellion Length             | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    |                     |                                              |
| D19 Neck-Buttock Length              |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 62 Neck Circumference                | ✓                                            | ✓                                                          |                    |                        | ✓                    | ✓                   | ✓                                            |
| 63 Neck Circumference Base           |                                              | ✓                                                          |                    | ✓                      | ✓                    | ✓                   | ✓                                            |
| D20 Neck Link                        |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| D21 Neck-Scye Length                 |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 64 Overhead Fingertip Reach, Sitting |                                              |                                                            | ✓                  | ✓                      | ✓                    |                     |                                              |
| 65 Palm Length                       |                                              | ✓                                                          |                    |                        | ✓                    |                     | ✓                                            |
| D22 Pelvic Link                      |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 66 Popliteal Height                  |                                              |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 67 Radiale-Stylelion Length          | ✓                                            |                                                            |                    |                        | ✓                    | ✓                   | ✓                                            |
| D23 Rise (Omphalion)                 |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 68 Shoulder Circumference            | ✓                                            | ✓                                                          |                    |                        | ✓                    | ✓                   |                                              |
| 69 Shoulder-Elbow Length             |                                              |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 70 Shoulder Length                   |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| D24 Shoulder-Waist Length (Omph)     |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 71 Sitting Height                    | ✓                                            |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| D25 Sleeve Inseam                    |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 72 Sleeve Length Spine-Wrist         |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 73 Sleeve Outseam                    | ✓                                            | ✓                                                          |                    | ✓                      |                      |                     | ✓                                            |
| 74 Span                              | ✓                                            |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |

| Measured or Derived Dimension               | Describing Overall Body Size and Proportions | Clothing and Personal Protection Design, Sizing, and Issue | Workstation Design | Occupational Selection | Digital Human Models | 3-D Scan Validation | International Standards for Ergonomic Design |
|---------------------------------------------|----------------------------------------------|------------------------------------------------------------|--------------------|------------------------|----------------------|---------------------|----------------------------------------------|
| 75 Stature                                  | ✓                                            | ✓                                                          | ✓                  | ✓                      | ✓                    | ✓                   | ✓                                            |
| 76 Suprasternale Height                     | ✓                                            |                                                            |                    |                        | ✓                    |                     |                                              |
| D26 Suprasternale Height, Sitting           |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| D27 Suprasternale-Tenth Rib Length          |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| D28 Suprasternale-Waist (Omph) Length       |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 77 Tenth Rib Height                         |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 78 Thigh Circumference                      | ✓                                            | ✓                                                          |                    | ✓                      | ✓                    | ✓                   | ✓                                            |
| 79 Thigh Clearance                          |                                              |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| D29 Thigh Link                              |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| D30 Thorax Link                             |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 80 Thumbtip Reach                           | ✓                                            |                                                            | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 81 Tibial Height                            |                                              |                                                            |                    |                        | ✓                    |                     | ✓                                            |
| D31 Tragon Height                           |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| D32 Tragon Height, Sitting                  |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 82 Tragon-Top Of Head                       | ✓                                            | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| 83 Trochanterion Height                     | ✓                                            |                                                            |                    |                        | ✓                    |                     | ✓                                            |
| D33 Vertical Grip Reach                     |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| D34 Vertical Grip Reach Down                |                                              |                                                            | ✓                  |                        | ✓                    |                     | ✓                                            |
| D35 Vertical Grip Reach, Sitting            |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| D36 Vertical Index Fingertip Reach          |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| D37 Vertical Index Fingertip Reach, Sitting |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| D38 Vertical Thumbtip Reach, Sitting        |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |
| 84 Vertical Trunk Circumference (USA)       |                                              | ✓                                                          |                    | ✓                      | ✓                    |                     | ✓                                            |
| 85 Waist Back Length Omphalion              |                                              | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| D39 Waist Back, Vertical (Omphalion)        |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 86 Waist Breadth                            | ✓                                            |                                                            |                    |                        | ✓                    |                     |                                              |
| 87 Waist Circumference Omphalion            | ✓                                            | ✓                                                          |                    |                        | ✓                    | ✓                   | ✓                                            |
| 88 Waist Depth                              |                                              |                                                            |                    |                        | ✓                    |                     |                                              |
| 89 Waist Front Length, Sitting              |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 90 Waist Height Omphalion                   | ✓                                            | ✓                                                          |                    |                        | ✓                    |                     |                                              |
| D40 Waist-Buttock Drop (Omphalion)          |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| D41 Waist-Waist (Omph) Over Shoulder        |                                              | ✓                                                          |                    |                        |                      |                     |                                              |
| 91 Weight                                   | ✓                                            | ✓                                                          | ✓                  | ✓                      | ✓                    |                     | ✓                                            |
| 92 Wrist Circumference                      | ✓                                            | ✓                                                          |                    |                        | ✓                    |                     | ✓                                            |
| 93 Wrist Height                             |                                              |                                                            | ✓                  |                        | ✓                    |                     |                                              |

## APPENDIX B

### SAMPLING STRATEGY FOR THE ANSUR II DATABASE

Claire C. Gordon, Ph.D.

This appendix describes the methods used to establish minimum sampling requirements for the ANSUR II databases, including component/sex/age/race sample cell targets, and it also discusses the sample acquisition strategy used to meet these requirements.

#### B.1 DETERMINING MINIMUM SAMPLE SIZES

Design criteria for Total Army acquisition requirements must address anthropometric variation in all Total Army components: Active Duty Army, Army Reserve, and Army National Guard. In addition, since small but significant differences between Active Duty Army and Army National Guard components were found in a pilot study (Gordon et. al, 2008) and because uniforms and equipment are often purchased separately for the two components when they are not deploying together, it is important to have samples sufficient to describe and compare the Active/Guard components separately. Anthropometric sizing and design methods require that male and female data be treated separately in most initial statistical analyses, so power analyses for both men and women were conducted to ensure sufficient sample sizes to accurately describe design requirements for each sex whenever appropriate.

An approach similar to that used in the 1988 ANSUR survey was used to establish minimum sample sizes for the ANSUR II databases. This approach involves identification of the statistical parameters and tests commonly required of engineering databases, definition of the desired confidence and precision of those parameter estimates and tests, and estimation of the sample sizes required to achieve the desired level of confidence and precision. A “worst case” scenario—the most difficult (in terms of sample size required) statistic for the most variable body dimension—is used to set the minimum sample size for the database as a whole to ensure that the minimum requirements for all other less demanding statistical tests and less variable body dimensions are automatically met. For most engineering databases, the most challenging parameter estimates are the 5<sup>th</sup> and 95<sup>th</sup> percentiles, which are commonly used to establish accommodation boundaries in military design and sizing requirements. Statistical estimation of means is also commonly done as part of statistical approaches to design in order to center sizing systems at the densest part of the user distribution. In general, the sample sizes needed to obtain a given level of precision and confidence in statistics at the tails of body size distributions are far larger than those needed to estimate the center of the distribution.

Equation 1 is a simplified expression of the minimum sample size required for estimation of 5<sup>th</sup>/95<sup>th</sup> percentiles with 95% confidence and a precision of 1% of the mean value (Sokal & Rohlf, 2011; ISO 15535:2012). Equation 2 gives the minimum

sample sizes needed to estimate mean values with 95% confidence and a 1% precision (Sokal & Rohlf, 2011; ISO 15535:2012; Zar, 2010).

$$\text{Equation 1: } n \geq (1.96 \cdot CV)^2 \cdot (1.534)^2$$

$$\text{Equation 2: } n \geq (1.96 \cdot CV)^2$$

where  $n$  = minimum sample size, and  $CV$  = Coefficient of Variation = (Standard Deviation/Mean) \* 100.

As can be seen above, minimum sample sizes for 5<sup>th</sup>/95<sup>th</sup> percentiles are larger than those needed for the same precision/confidence in means by a factor of approximately  $1.534^2 = 2.4$ . Knowing average values precisely, however, is not sufficient to design military systems that must accommodate a broad range of body sizes and shapes. Design envelopes such as those used in military requirements documents require relatively precise estimates at the tails of the body size distributions. For this reason, the 5<sup>th</sup>/95<sup>th</sup> percentile requirements (Equation 1) usually set minimum sample sizes for reference engineering database; such minimums will be sufficient for defining accommodation envelopes and more than sufficient for other statistical applications.

In addition, because potential differences between male and female Soldiers and between Active Duty and National Guard Soldiers were of interest in this study, statistical tests of mean differences were also an important power consideration for ANSUR II sampling plans. Equation 3 is a simplified version of the minimum sample size needed to conduct a two-sided t-test between means to detect a statistically significant difference of  $\delta$  units or larger at the .05 level with 90% power in large samples (Zar, 2010).

$$\text{Equation 3: } n \geq (2 \cdot SD^2 / \delta^2) \cdot (1.96 + 1.282)^2$$

Where  $n$  = minimum sample size,  $SD$  = Standard Deviation of pooled population, and  $\delta$  = magnitude of smallest difference to be detected. For practical purposes, differences smaller in magnitude than differences in repeated measurements of the same subjects are not important, so  $\delta$  was set at 12 mm for Waist Circumference and 14 mm for Chest Circumference; twice the mean absolute differences reported in the ANSUR 1988 survey (Gordon et al., 1989).

Note that a different minimum sample size for each body dimension in an anthropometric survey could theoretically be derived because the means and variances for most dimensions are different. However, because correlations between body dimensions are so important in multivariate modeling and anthropometric sizing and design, it is impractical to have different sample sizes for different body dimensions. Ideally all dimensions should be measured on all survey participants, even though body dimensions with lower CVs theoretically require smaller sample sizes to obtain reliable percentile estimates. Again, a worst case approach is taken by choosing those critical

body dimensions with the highest CVs to establish minimum sample sizes, knowing that the results will be more than sufficient for less variable body dimensions.

Previous military surveys have shown that of the most commonly used body dimensions, the two with the largest CVs (therefore requiring the largest sample sizes for precise parameter estimates) are Waist Circumference and Chest Circumference. Table B-1 presents estimates of Army Waist and Chest Circumference means, standard deviations, and CVs from two sources: the 1988 ANSUR survey (Gordon et al., 1989) and the 2007 ANSUR II pilot study (Gordon et al., 2008; Paquette et al., 2009). As can be seen in Table B-1, Army Waist and Chest Circumferences were more variable in the 2007 pilot study than in the 1988 ANSUR survey, so standard deviations and coefficients of variation from the 2007 pilot study were used for the ANSUR II power analyses.

TABLE B-1

| Waist and Chest Circumference Statistics from Previous Army Surveys |                |        |       |                 |      |         |        |      |
|---------------------------------------------------------------------|----------------|--------|-------|-----------------|------|---------|--------|------|
| Males                                                               |                |        |       |                 |      |         |        |      |
| Waist Circumference                                                 | 1988           |        |       |                 | 2007 |         |        |      |
|                                                                     | n              | Mean   | SD    | CV <sup>3</sup> | n    | Mean    | SD     | CV   |
| Active Duty                                                         | 1774           | 862.42 | 86.40 | 10.4            | 1475 | 921.93  | 106.83 | 11.6 |
| Reserve                                                             | Not applicable |        |       |                 | 771  | 944.01  | 105.48 | 11.2 |
| National Guard                                                      |                |        |       |                 | 565  | 962.38  | 117.73 | 12.2 |
| Chest Circumference                                                 | 1988           |        |       |                 | 2007 |         |        |      |
|                                                                     | n              | Mean   | SD    | CV              | n    | Mean    | SD     | CV   |
| Active Duty                                                         | 1774           | 991.37 | 69.06 | 7.0             | 1475 | 1037.05 | 91.41  | 8.8  |
| Reserve                                                             | Not applicable |        |       |                 | 771  | 1052.00 | 91.20  | 8.7  |
| National Guard                                                      |                |        |       |                 | 565  | 1059.77 | 94.25  | 8.9  |
| Females                                                             |                |        |       |                 |      |         |        |      |
| Waist Circumference                                                 | 1988           |        |       |                 | 2007 |         |        |      |
|                                                                     | n              | Mean   | SD    | CV              | n    | Mean    | SD     | CV   |
| Active Duty                                                         | 2208           | 791.88 | 82.71 | 10.4            | 287  | 854.48  | 106.54 | 12.5 |
| Reserve                                                             | Not applicable |        |       |                 | 246  | 857.12  | 111.03 | 13.0 |
| National Guard                                                      |                |        |       |                 | 118  | 841.82  | 101.25 | 12.0 |
| Chest Circumference                                                 | 1988           |        |       |                 | 2007 |         |        |      |
|                                                                     | n              | Mean   | SD    | CV              | n    | Mean    | SD     | CV   |
| Active Duty                                                         | 2208           | 907.08 | 63.52 | 8.9             | 287  | 961.62  | 88.01  | 9.2  |
| Reserve                                                             | Not applicable |        |       |                 | 246  | 957.78  | 91.29  | 9.5  |
| National Guard                                                      |                |        |       |                 | 118  | 940.84  | 83.82  | 8.9  |

<sup>3</sup> Note that CV values are reported to the nearest .1 unit to improve table clarity, but were carried to 13 decimal places for the power calculations reported in Table B-2.

When CVs from Table B-1 are inserted into power equations (1, 2) above, the following results (Table B-2) were obtained.

TABLE B-2

Minimum Sample Sizes for ANSUR II Parameter Estimates

| Waist Circumference |          | Males |          | Females |          |
|---------------------|----------|-------|----------|---------|----------|
|                     |          | Mean  | 5th/95th | Mean    | 5th/95th |
| Active Duty         | $n \geq$ | 516   | 1214     | 597     | 1405     |
| Reserve             | $n \geq$ | 480   | 1129     | 645     | 1517     |
| National Guard      | $n \geq$ | 575   | 1353     | 556     | 1308     |
| Chest Circumference |          | Males |          | Females |          |
|                     |          | Mean  | 5th/95th | Mean    | 5th/95th |
| Active Duty         | $n \geq$ | 298   | 702      | 322     | 757      |
| Reserve             | $n \geq$ | 289   | 679      | 349     | 821      |
| National Guard      | $n \geq$ | 304   | 715      | 305     | 718      |

As expected, the sample requirements for precise estimates of the mean are substantially lower than those needed to determine 5<sup>th</sup>/95<sup>th</sup> percentiles with the same confidence and precision. In addition, there are substantial differences in the sample sizes needed for parameter estimates of Waist Circumference and Chest Circumference due to the larger CVs for Waist Circumference. Unfortunately, Waist Circumference is a very important measurement for clothing and protective equipment design, and so it cannot be ignored.

Table B-3 summarizes the pooled variance estimates for Active Duty and National Guard Waist and Chest Circumferences and presents the results when these are inserted in Equation 3 to establish minimum sample sizes needed to detect differences between Active Duty and National Guard of at least twice the magnitude of observer error at the .05 level with 90% power.

TABLE B-3

Minimum Sample Sizes for ANSUR II Active Duty and National Guard T-Tests

| Dimension           | Males      |          | Females    |          |
|---------------------|------------|----------|------------|----------|
|                     | Pooled SD* | $n \geq$ | Pooled SD* | $n \geq$ |
| Waist Circumference | 111.41     | 1812     | 105.06     | 1611     |
| Chest Circumference | 92.74      | 922      | 87.22      | 816      |

\*Pooled Active/Guard standard deviations are from the 2007 pilot study database.

Because comparisons of male and female body dimensions are common in the design process, Table B-4 repeats the power analysis above using pooled variance estimates for Waist and Chest Circumferences of Total Army males and females. These results indicate that Total Army databases should be greater than or equal to 1947 subjects each in order to detect male-female differences of at least twice the magnitude of observer error at the .05 level with 90% power.

TABLE B-4

Minimum Sample Sizes for ANSUR II Male and Female T-Tests

| Dimension           | Total Army |       |
|---------------------|------------|-------|
|                     | Pooled SD* | n ≥   |
| Waist Circumference | 115.48     | 1,947 |
| Chest Circumference | 98.83      | 1,048 |

\*Pooled male/female standard deviations are from the 2007 pilot study database.

The results of these power analyses indicated that ANSUR II representative databases for male/female, Active/Reserve/Guard subgroups should have at least 1,947 subjects each. For survey planning purposes, these targets were rounded up to 2,000 each, and initial survey project plans and cost estimates were based on 2 (sex) by 3 (component) by 2,000 participants each for a total survey of approximately 12,000 soldiers.

Later, as plans for accessing ANSUR II participants were being developed, it became apparent that Reserve troops were so geographically dispersed that sampling large numbers of them would be logistically impossible. Thus in September of 2010 a decision was made to measure Reserve soldiers whenever they were serving with units participating in ANSUR II, but not to target them specifically for stand-alone databases. As funding had already been secured for a sample of 12,000, measuring days originally planned for Reserve soldiers were redistributed. These additional measuring days for Active/Guard soldiers proved extremely important because 1) they provided a cushion against unexpected subject acquisition problems that might have threatened access to representative samples of the required minimum size; and 2) they enabled oversampling of minority groups as was done in ANSUR 1988 to ensure that subgroup samples were large enough to determine whether/when racial/ethnic minorities might be at risk for unintentional disaccommodation in Army-wide engineering design criteria (Walker, 1993).

## B.2 ESTABLISHING REPRESENTATIVE SAMPLING TARGETS

Simply measuring the minimum number of soldiers called for in a power analysis does not ensure that the soldiers measured are *representative* of the target population of users. Previous anthropometric research has demonstrated that most anthropometric variation is explained by age, sex, and population affiliation (Bradt Miller et al., 1985; ISO 15535:2012). A stratified sampling strategy based on component, sex, age, and racial/ethnic group was thus used to guide subject acquisition in ANSUR II so that the resulting samples would be demographically and anthropometrically representative of the Army. Defense Manpower Data Center census counts from 31 March 2010 (DMDC, 2010: DRS12650\_1003) were used to establish the age and racial/ethnic frequencies needed to match Army distributions (Table B-5), and these proportions were then used to distribute the sample sizes established through power analysis to set minimum targets for each sample cell (Table B-6).

TABLE B-5

Demographic Distributions of Army Personnel (DMDC, 2010) (values in percent)

| Active Duty Males      |       |       |          |       |                 |                  |       |
|------------------------|-------|-------|----------|-------|-----------------|------------------|-------|
| Ages                   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |
| ≤20                    | 7.17  | 1.45  | 1.19     | 0.21  | 0.10            | 0.08             | 0.02  |
| 21-25                  | 22.06 | 4.17  | 3.45     | 0.86  | 0.25            | 0.24             | 0.16  |
| 26-30                  | 14.90 | 3.81  | 2.66     | 0.72  | 0.16            | 0.23             | 0.41  |
| 31-40                  | 15.55 | 5.76  | 2.82     | 0.78  | 0.17            | 0.26             | 0.98  |
| ≥41                    | 5.70  | 2.14  | 0.78     | 0.23  | 0.06            | 0.06             | 0.40  |
| Active Duty Females    |       |       |          |       |                 |                  |       |
| Ages                   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |
| ≤20                    | 5.83  | 3.37  | 1.72     | 0.31  | 0.19            | 0.23             | 0.05  |
| 21-25                  | 14.98 | 9.82  | 4.44     | 1.08  | 0.42            | 0.57             | 0.33  |
| 26-30                  | 9.93  | 7.96  | 2.84     | 1.02  | 0.27            | 0.37             | 0.69  |
| 31-40                  | 8.60  | 10.71 | 2.43     | 1.09  | 0.23            | 0.31             | 1.04  |
| ≥41                    | 3.55  | 4.12  | 0.65     | 0.32  | 0.07            | 0.07             | 0.38  |
| National Guard Males   |       |       |          |       |                 |                  |       |
| Ages                   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |
| ≤20                    | 10.10 | 1.49  | 0.94     | 0.26  | 0.08            | 0.03             | 0.07  |
| 21-25                  | 19.84 | 2.62  | 1.79     | 0.58  | 0.19            | 0.06             | 0.31  |
| 26-30                  | 14.25 | 1.77  | 1.35     | 0.41  | 0.12            | 0.09             | 0.32  |
| 31-40                  | 17.73 | 2.57  | 1.99     | 0.44  | 0.16            | 0.12             | 0.44  |
| ≥41                    | 14.64 | 2.79  | 1.72     | 0.23  | 0.12            | 0.10             | 0.28  |
| National Guard Females |       |       |          |       |                 |                  |       |
| Ages                   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |
| ≤20                    | 12.51 | 4.37  | 1.75     | 0.42  | 0.21            | 0.06             | 0.13  |
| 21-25                  | 19.34 | 6.60  | 2.76     | 0.78  | 0.29            | 0.11             | 0.54  |
| 26-30                  | 11.74 | 4.28  | 1.69     | 0.45  | 0.17            | 0.12             | 0.37  |
| 31-40                  | 10.66 | 4.66  | 1.65     | 0.46  | 0.22            | 0.14             | 0.39  |
| ≥41                    | 7.89  | 3.52  | 1.04     | 0.20  | 0.17            | 0.09             | 0.21  |

TABLE B-6

ANSUR II Representative Sample Requirements for n=2000<sup>4</sup> Subgroups

| Active Duty Males      |       |       |          |       |                 |                  |       |
|------------------------|-------|-------|----------|-------|-----------------|------------------|-------|
| Ages                   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |
| ≤20                    | 143   | 29    | 24       | 4     | 2               | 2                | 0     |
| 21-25                  | 441   | 83    | 69       | 17    | 5               | 5                | 3     |
| 26-30                  | 298   | 76    | 53       | 14    | 3               | 5                | 8     |
| 31-40                  | 311   | 115   | 57       | 16    | 4               | 5                | 20    |
| ≥41                    | 114   | 43    | 16       | 5     | 1               | 1                | 8     |
| Active Duty Females    |       |       |          |       |                 |                  |       |
| Ages                   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |
| ≤20                    | 117   | 67    | 34       | 6     | 4               | 5                | 1     |
| 21-25                  | 300   | 196   | 89       | 22    | 8               | 11               | 7     |
| 26-30                  | 199   | 159   | 57       | 21    | 5               | 7                | 14    |
| 31-40                  | 172   | 214   | 49       | 22    | 5               | 6                | 21    |
| ≥41                    | 71    | 82    | 13       | 6     | 2               | 1                | 8     |
| National Guard Males   |       |       |          |       |                 |                  |       |
| Ages                   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |
| ≤20                    | 202   | 30    | 19       | 5     | 2               | 1                | 1     |
| 21-25                  | 397   | 53    | 36       | 12    | 4               | 1                | 6     |
| 26-30                  | 285   | 35    | 27       | 8     | 2               | 2                | 6     |
| 31-40                  | 355   | 51    | 40       | 9     | 3               | 2                | 9     |
| ≥41                    | 293   | 56    | 35       | 5     | 3               | 2                | 6     |
| National Guard Females |       |       |          |       |                 |                  |       |
| Ages                   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |
| ≤20                    | 250   | 87    | 35       | 9     | 4               | 1                | 3     |
| 21-25                  | 387   | 132   | 55       | 16    | 6               | 2                | 11    |
| 26-30                  | 235   | 86    | 34       | 9     | 4               | 2                | 7     |
| 31-40                  | 213   | 93    | 33       | 9     | 5               | 3                | 8     |
| ≥41                    | 158   | 70    | 21       | 4     | 3               | 2                | 4     |

As mentioned previously, when it became apparent that creating an independent subsample of Reserve Soldiers was not feasible, the Reserve sample was redistributed to set sampling targets greater than the minimum required for representative samples of sufficient power and to oversample racial/ethnic minority groups so that they could be

<sup>4</sup> Note that cell entries have been rounded to the nearest whole person so the sum of rounded cell entries may not exactly equal 2000.

described separately when appropriate for design. Table B-7 shows the result of interactive calculations in Microsoft Excel to maximize representative database sizes while also maximizing the ability to represent and compare racial/ethnic minority groups.

TABLE B-7

ANSUR II Sampling Targets

| ACTIVE DUTY MALES      | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |      |
|------------------------|-------|-------|----------|-------|-----------------|------------------|-------|------|
| <=20                   | 148   | 59    | 88       | 31    | 11              | 9                | 7     |      |
| 25                     | 455   | 168   | 253      | 122   | 27              | 28               | 22    |      |
| 30                     | 308   | 154   | 195      | 102   | 17              | 26               | 21    |      |
| 40                     | 321   | 233   | 207      | 112   | 19              | 30               | 24    |      |
| >=41                   | 118   | 86    | 57       | 33    | 6               | 7                | 6     |      |
| Total                  | 1350  | 700   | 800      | 400   | 80              | 100              | 80    | 3510 |
|                        |       |       |          |       |                 |                  |       |      |
| ACTIVE DUTY FEMALES    | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |      |
| <=20                   | 122   | 75    | 100      | 24    | 8               | 7                | 15    |      |
| 25                     | 315   | 218   | 257      | 85    | 18              | 19               | 37    |      |
| 30                     | 209   | 177   | 165      | 80    | 11              | 12               | 24    |      |
| 40                     | 180   | 238   | 141      | 86    | 10              | 10               | 20    |      |
| >=41                   | 74    | 92    | 37       | 25    | 3               | 2                | 4     |      |
| Total                  | 900   | 800   | 700      | 300   | 50              | 50               | 100   | 2900 |
|                        |       |       |          |       |                 |                  |       |      |
| NATIONAL GUARD MALES   | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |      |
| <=20                   | 203   | 56    | 49       | 10    | 4               | 1                | 3     |      |
| 25                     | 399   | 98    | 92       | 23    | 9               | 2                | 8     |      |
| 30                     | 287   | 66    | 69       | 16    | 5               | 3                | 11    |      |
| 40                     | 357   | 96    | 102      | 17    | 7               | 5                | 15    |      |
| >=41                   | 294   | 104   | 88       | 9     | 5               | 4                | 13    |      |
| Total                  | 1540  | 420   | 400      | 75    | 30              | 15               | 50    | 2530 |
|                        |       |       |          |       |                 |                  |       |      |
| NATIONAL GUARD FEMALES | White | Black | Hispanic | Asian | Native American | Pacific Islander | Other |      |
| <=20                   | 252   | 131   | 79       | 15    | 6               | 2                | 6     |      |
| 25                     | 389   | 197   | 124      | 27    | 8               | 4                | 10    |      |
| 30                     | 236   | 128   | 76       | 15    | 5               | 5                | 12    |      |
| 40                     | 214   | 139   | 74       | 16    | 6               | 5                | 13    |      |
| >=41                   | 159   | 105   | 47       | 7     | 5               | 4                | 9     |      |
| Total                  | 1250  | 700   | 400      | 80    | 30              | 20               | 50    | 2530 |

Note that the targets for each subgroup in Table B-7 total 11,470, not the 12,000 participants used to establish ANSUR II plans. The remaining 530 subjects were expected to be Reservists mixed in with Active/Guard units and/or sampling losses due to unforeseen logistical difficulties.

Note also that the sampling targets of Active Duty databases were increased more than those of National Guard and that the male Active Duty database was increased more than the female Active Duty database. These decisions were the result of the following practical considerations:

1) Active Duty personnel are easier to access than National Guard because Active Duty are concentrated at large Army posts. During the time of this study National Guard personnel were deploying or returning from deployment at only a few locations. They were not concentrated in large numbers at other times except for training events, which cannot support an anthropometric survey without adversely impacting military objectives.

2) There are relatively few (<16%) female Soldiers, and they are most concentrated at TRADOC (Training & Doctrine Command) schools. They are generally not widely available at large Army posts with combat divisions.

3) Large screening formations wherein minorities are most effectively oversampled are not logistically possible in training or deployment scenarios.

### B.3 SAMPLING ACQUISITION PLANNING

Deriving sampling targets from statistical power equations and user-population census data is a relatively easy process compared to the logistical challenge of executing a sampling strategy in the field. Accessing anthropometric survey participants in military settings requires coordination with liaison personnel from measuring sites and units, and implementation of a participant selection process that does not bias the sample and its resulting anthropometric distributions. Potential sources of bias in military samples include limited geographic and operational representation at measuring sites and participating military units, biases in unit availability that increase the probability of sampling personnel from noncombat occupational groups and units, and an age/rank participation bias that makes representative sampling of older age groups extremely challenging.

ANSUR II procedures addressed potential sample acquisition biases in several ways:

1) Measuring sites were chosen to sample a cross section of Combat Divisions and geographic locations.

2) Units at measuring sites were sampled according to military function to ensure a cross section of combat, combat support, and combat service support occupational groups.

3) Whenever possible whole units were assembled for subject screening or screened virtually (using unit rosters) so that survey participants could be randomly selected from within sex/age/racial-ethnic sampling strata.

This approach (which was also used in ANSUR 1988) required a very high level of military commitment to the project. ANSUR II was executed under an HQDA Executive Order (EXORD) that was coordinated through the Army G-3 and G-4 offices well over nine months in advance of data collection. It was drafted and coordinated with subordinate commands six months in advance of data collection, and finalized four months in advance. This approach allowed the NSRDEC project team to brief General Officers whose commands were impacted by the study and to work directly with their tasking offices who ultimately selected the survey measuring sites and dates.

Unfortunately an HQDA EXORD is no guarantee of timely and enthusiastic local cooperation for any anthropometric survey. Thus, a full time military liaison team was assigned to support ANSUR II execution. An O-5 liaison officer (LTC Richard Hall) was assigned from the project's inception to partner with the ANSUR II Project Manager (Cynthia Blackwell). Full time O-3 (CPT Christopher Simone) and E-8 (MSG Philip Harting) liaisons were present in the field every day with the measuring team to coordinate survey requirements with local chains of command at each measuring site and to troubleshoot sample acquisition on a daily basis, ensuring a steady flow of survey participants so that the measuring team was fully occupied every day. Full time assignment of a military liaison team enabled top-down briefings and courtesy calls to selected units that minimized misunderstandings and tasking conflicts. The presence of military liaisons on site also enabled immediate troubleshooting that minimized sampling losses when participating units or individuals went missing.

Daily tracking of sample acquisition by an Army civilian scientist serving as Field Supervisor (Joseph Parham) was another key element that ensured ANSUR II sampling strategies could be successfully executed in the field. The Field Supervisor ensured that racial/ethnic data collected from ANSUR II participants were accurate, and he maintained component and sex-specific race by age spreadsheets showing the number required and the number measured for each component/sex/age/race sample cell. Real time sample acquisition tracking enabled daily adjustment of sampling fractions so that sample cells were filled gradually from multiple sites and units, and these spreadsheets were crucial to the measuring site and unit trade-off decisions that were made near the end of the survey to meet sampling requirements.

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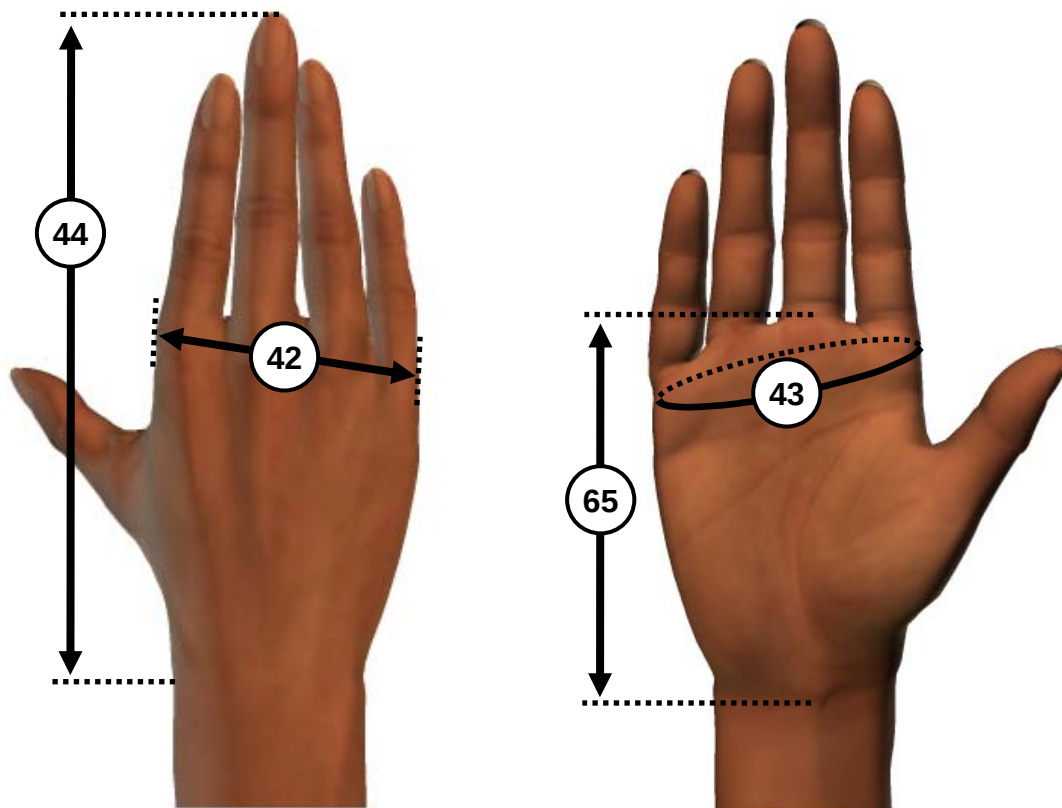
Zar JH (2010) *Biostatistical Analysis, 5<sup>th</sup> Edition*. Prentice Hall: Englewood Cliffs, NJ.

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\* The references for this appendix are included here for ease of use, but are also included in the main References section.

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## APPENDIX C VISUAL INDEX OF BODY MEASUREMENTS

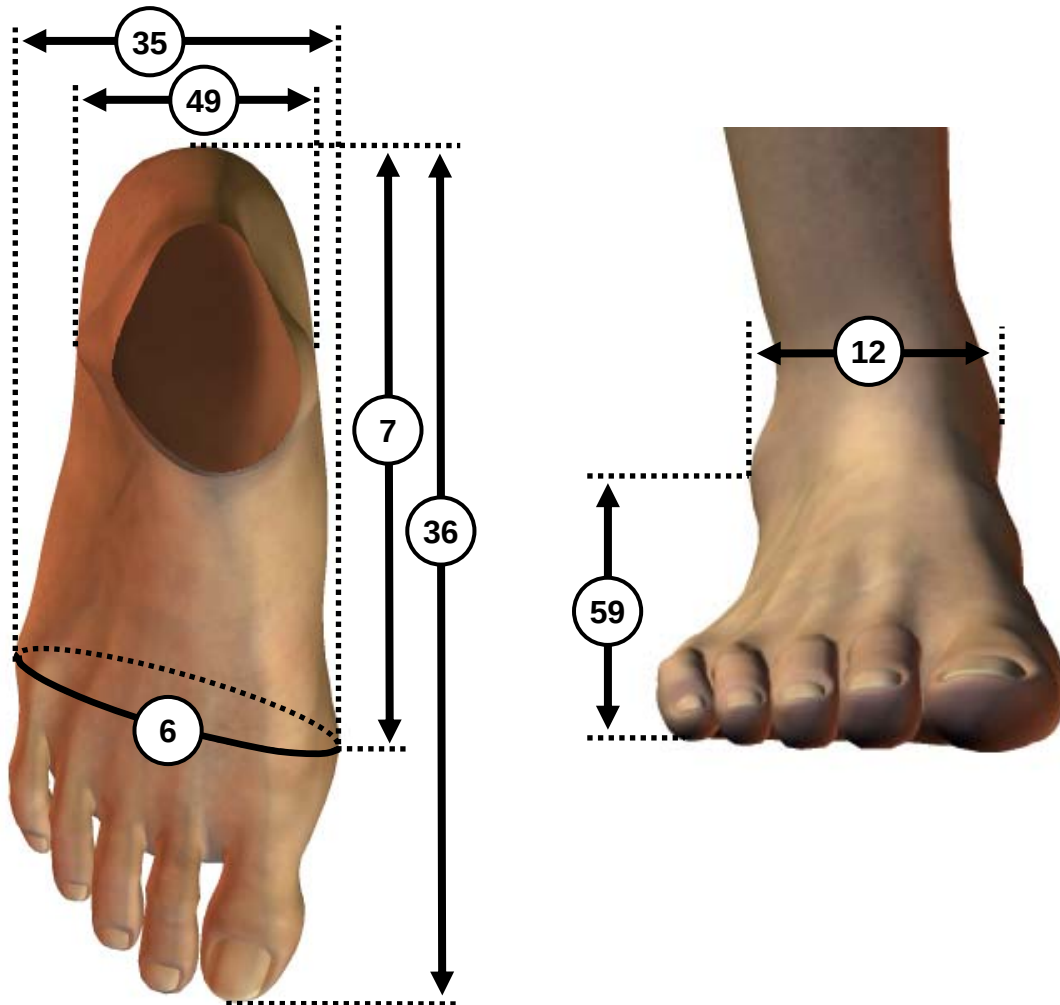


(42) HAND BREADTH

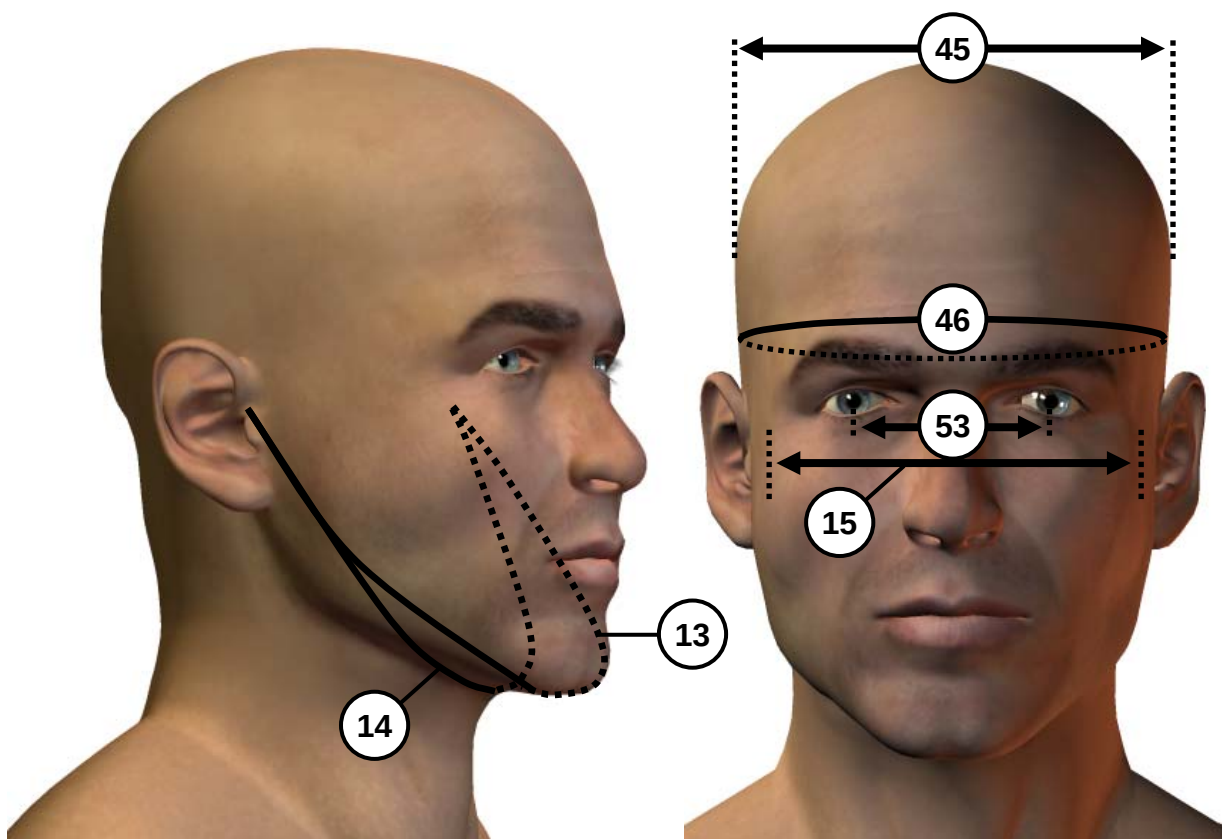
(43) HAND CIRCUMFERENCE

(44) HAND LENGTH

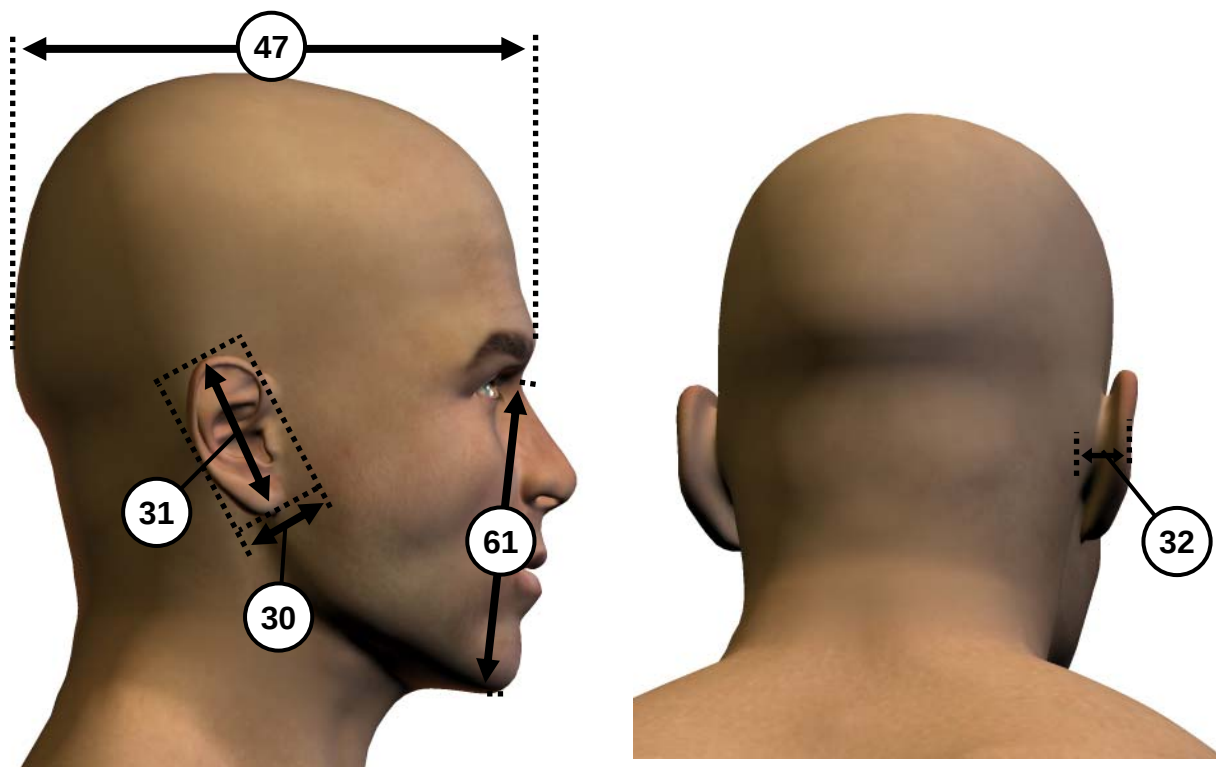
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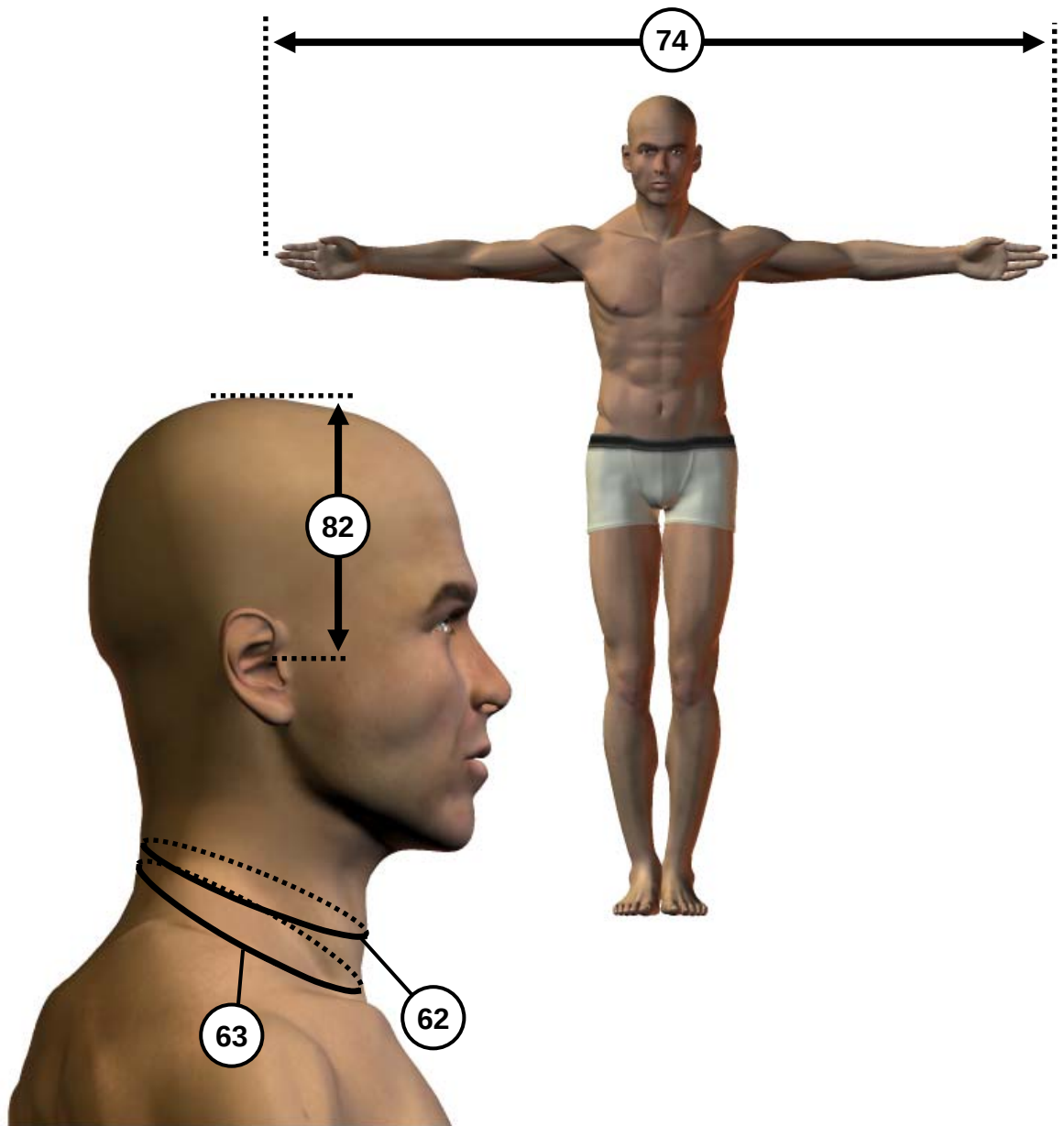
- (6) BALL OF FOOT CIRCUMFERENCE
- (7) BALL OF FOOT LENGTH
- (12) BIMALLEOLAR BREADTH
- (35) FOOT BREADTH, HORIZONTAL
- (36) FOOT LENGTH
- (49) HEEL BREADTH
- (59) LATERAL MALLEOLUS HEIGHT



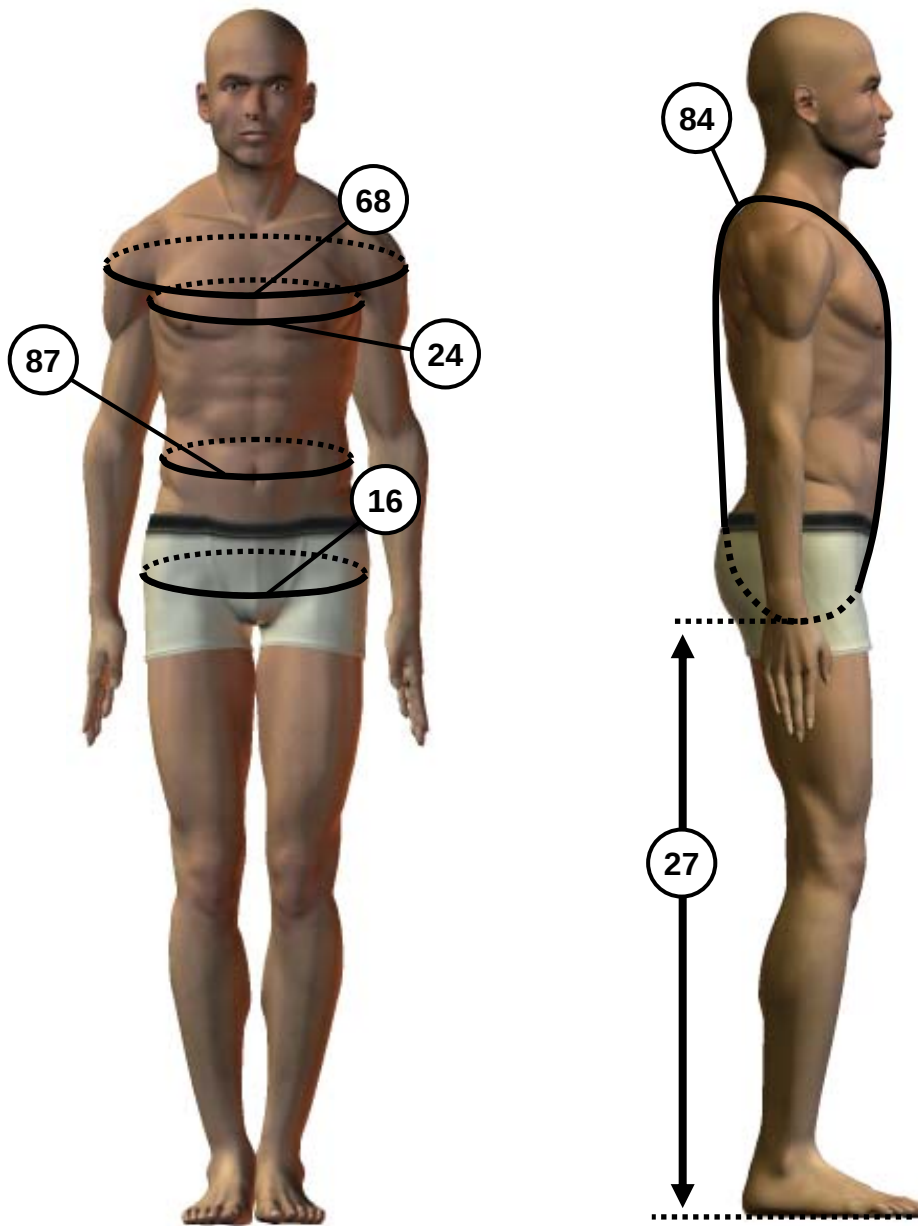
- (13) BITRACION CHIN ARC
- (14) BITRACION SUBMANDIBULAR ARC
- (15) BIZYGOMATIC BREADTH
- (45) HEAD BREADTH
- (46) HEAD CIRCUMFERENCE
- (53) INTERPUPILLARY BREADTH



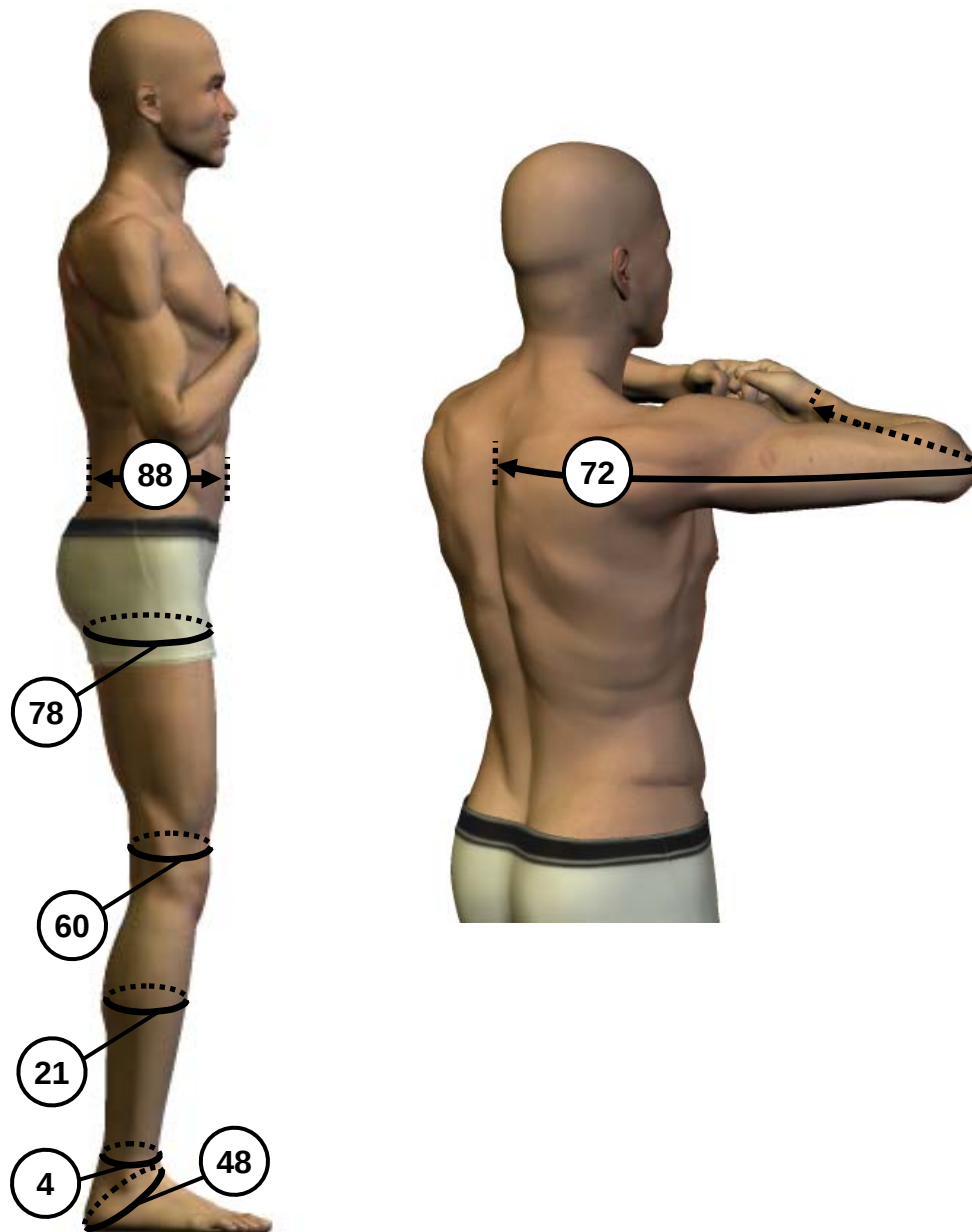
- (30) EAR BREADTH
- (31) EAR LENGTH
- (32) EAR PROTRUSION
- (47) HEAD LENGTH
- (61) MENTON-SELLION LENGTH



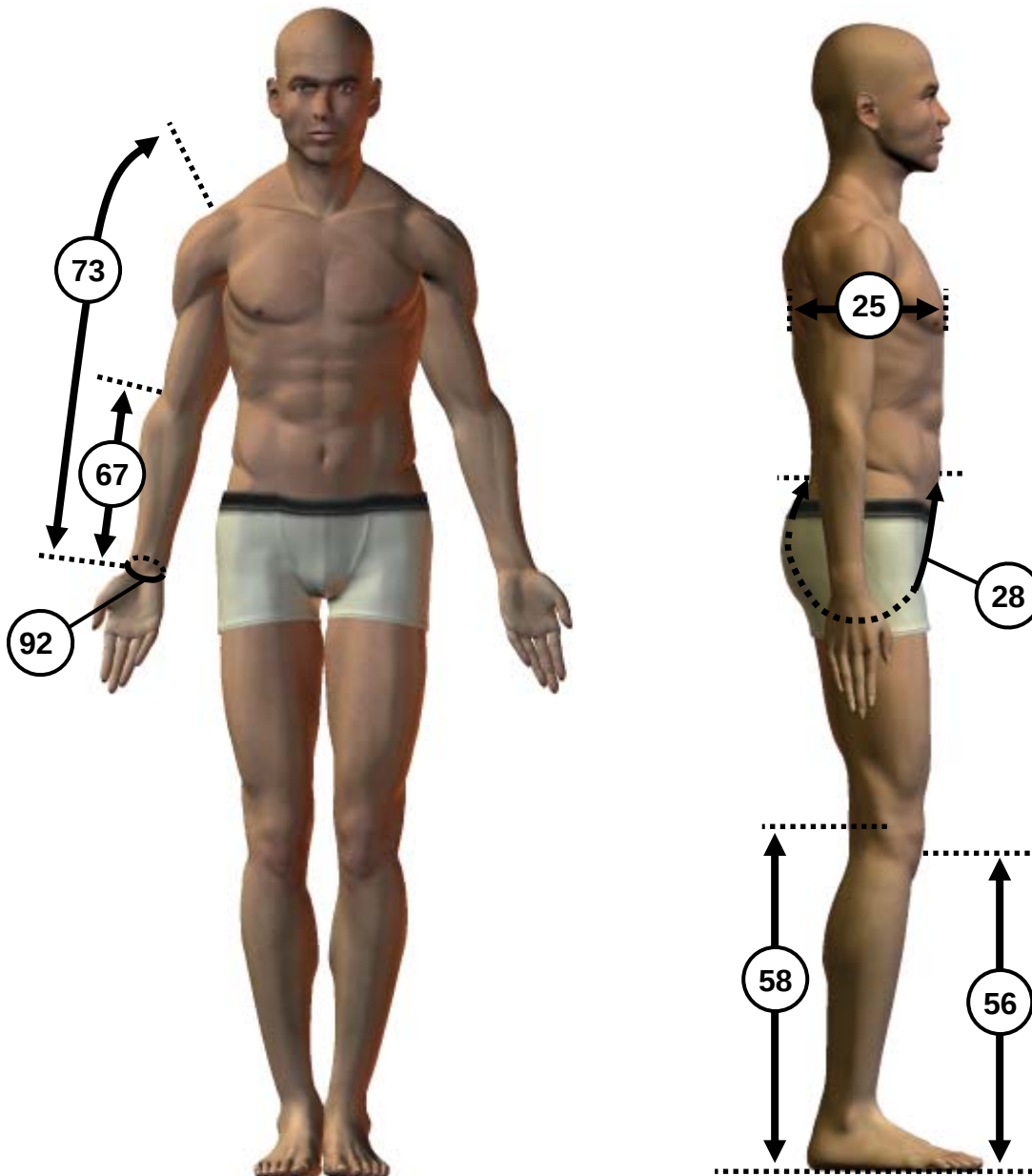
- (62) NECK CIRCUMFERENCE
- (63) NECK CIRCUMFERENCE, BASE
- (74) SPAN
- (82) TRAGION-TOP OF HEAD



- (16) BUTTOCK CIRCUMFERENCE
- (24) CHEST CIRCUMFERENCE
- (27) CROTCH HEIGHT
- (68) SHOULDER CIRCUMFERENCE
- (84) VERTICAL TRUNK CIRCUMFERENCE (USA)
- (87) WAIST CIRCUMFERENCE (OMPHALION)



- (4) ANKLE CIRCUMFERENCE
- (21) CALF CIRCUMFERENCE
- (48) HEEL-ANKLE CIRCUMFERENCE
- (60) LOWER THIGH CIRCUMFERENCE
- (72) SLEEVE LENGTH: SPINE-WRIST
- (78) THIGH CIRCUMFERENCE
- (88) WAIST DEPTH



(25) CHEST DEPTH

(28) CROTCH LENGTH (OMPHALION)

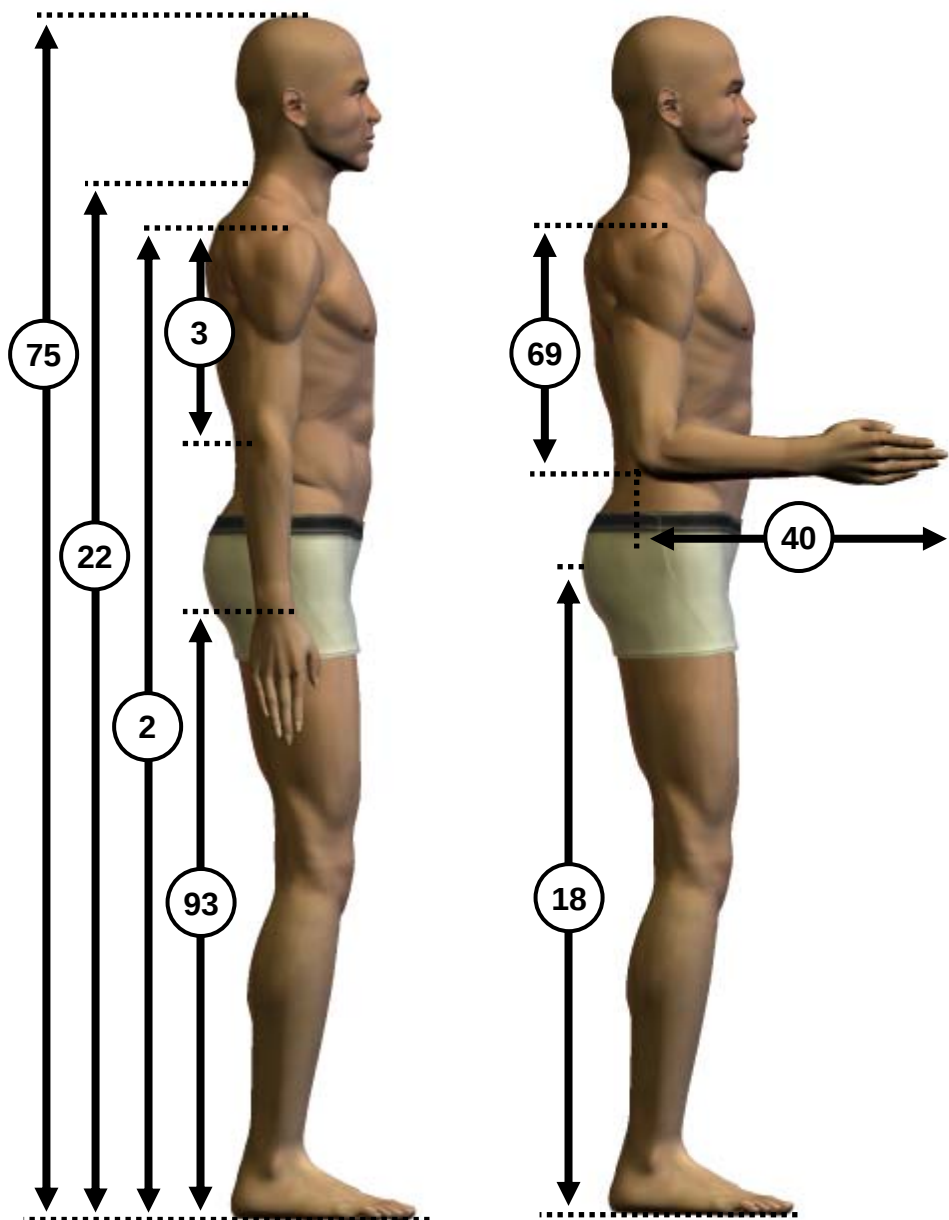
(56) KNEE HEIGHT, MIDPATELLA

(58) LATERAL FEMORAL EPICONDYLE HEIGHT

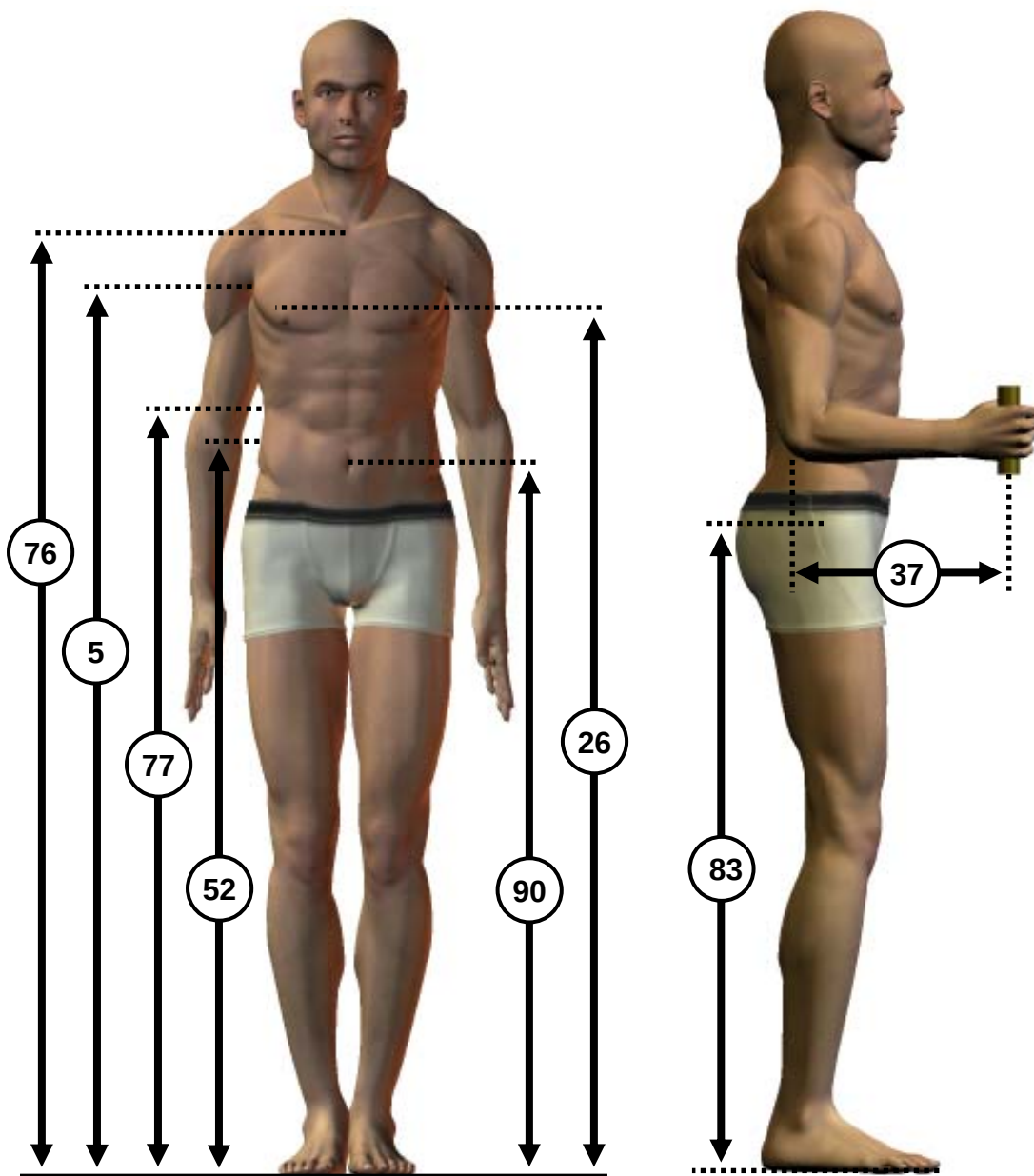
(67) RADIALE-STYLION LENGTH

(73) SLEEVE OUTSEAM

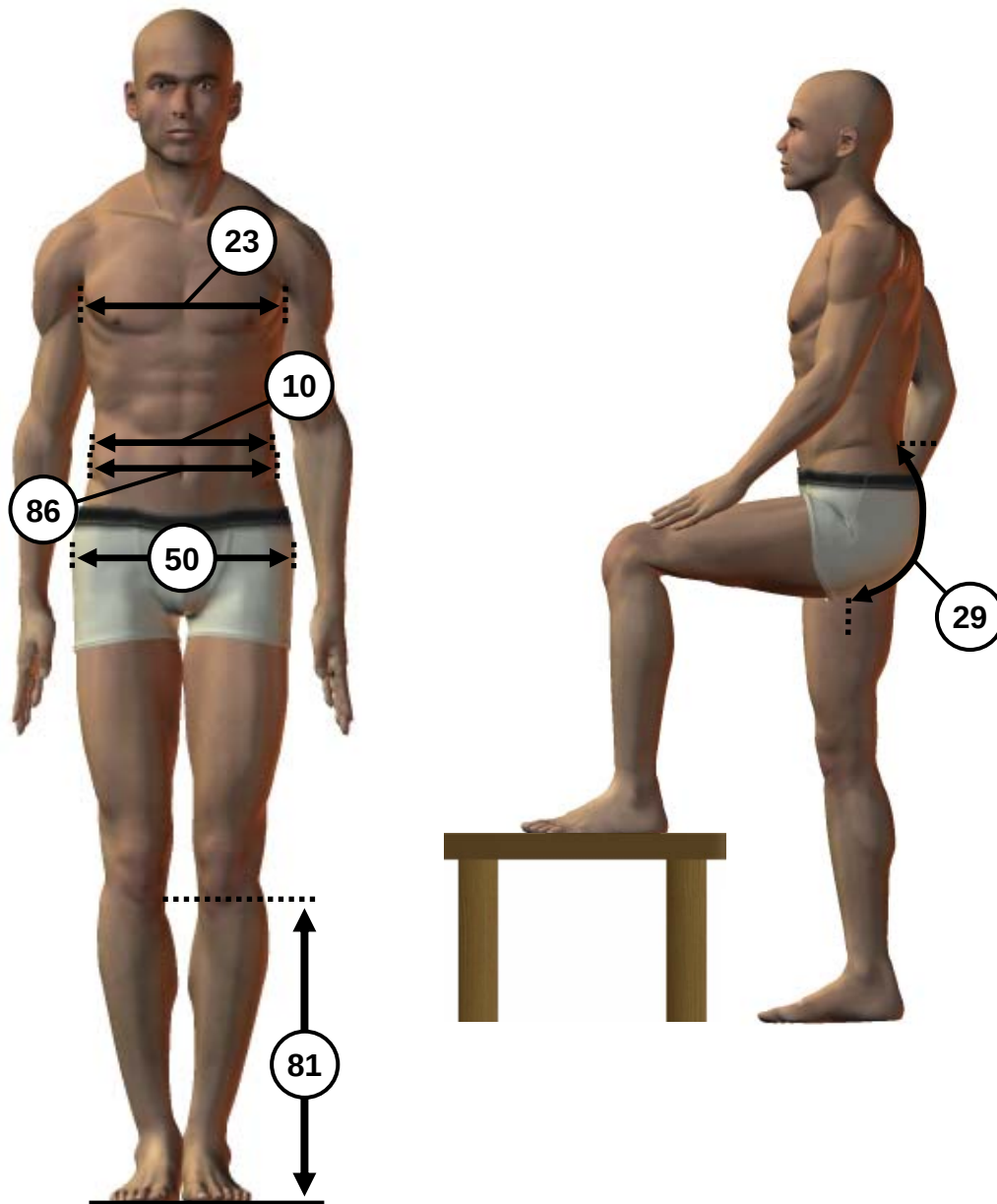
(92) WRIST CIRCUMFERENCE



- (2) ACROMIAL HEIGHT
- (3) ACROMION-RADIALE LENGTH
- (18) BUTTOCK HEIGHT
- (22) CERVICALE HEIGHT
- (40) FOREARM-HAND LENGTH
- (69) SHOULDER-ELBOW LENGTH
- (75) STATURE
- (93) WRIST HEIGHT



- (5) AXILLA HEIGHT
- (26) CHEST HEIGHT
- (37) FOREARM-CENTER OF GRIP LENGTH
- (52) ILIOCRISTALE HEIGHT
- (76) SUPRASTERNALE HEIGHT
- (77) TENTH RIB HEIGHT
- (83) TROCHANTERION HEIGHT
- (90) WAIST HEIGHT (OMPHALION)



(10) BICRISTAL BREADTH

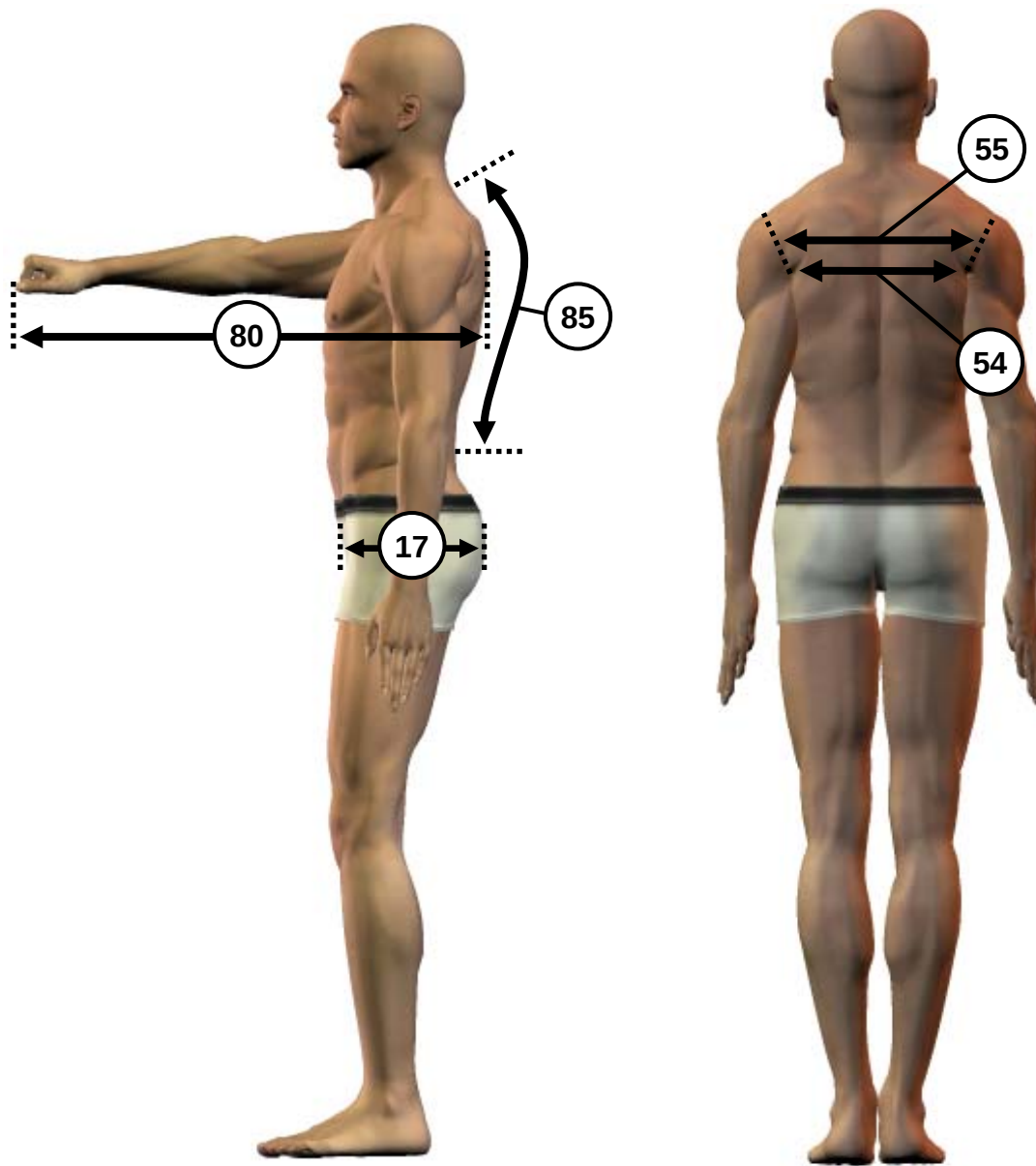
(23) CHEST BREADTH

(29) CROTCH LENGTH, POSTERIOR (OMPHALION)

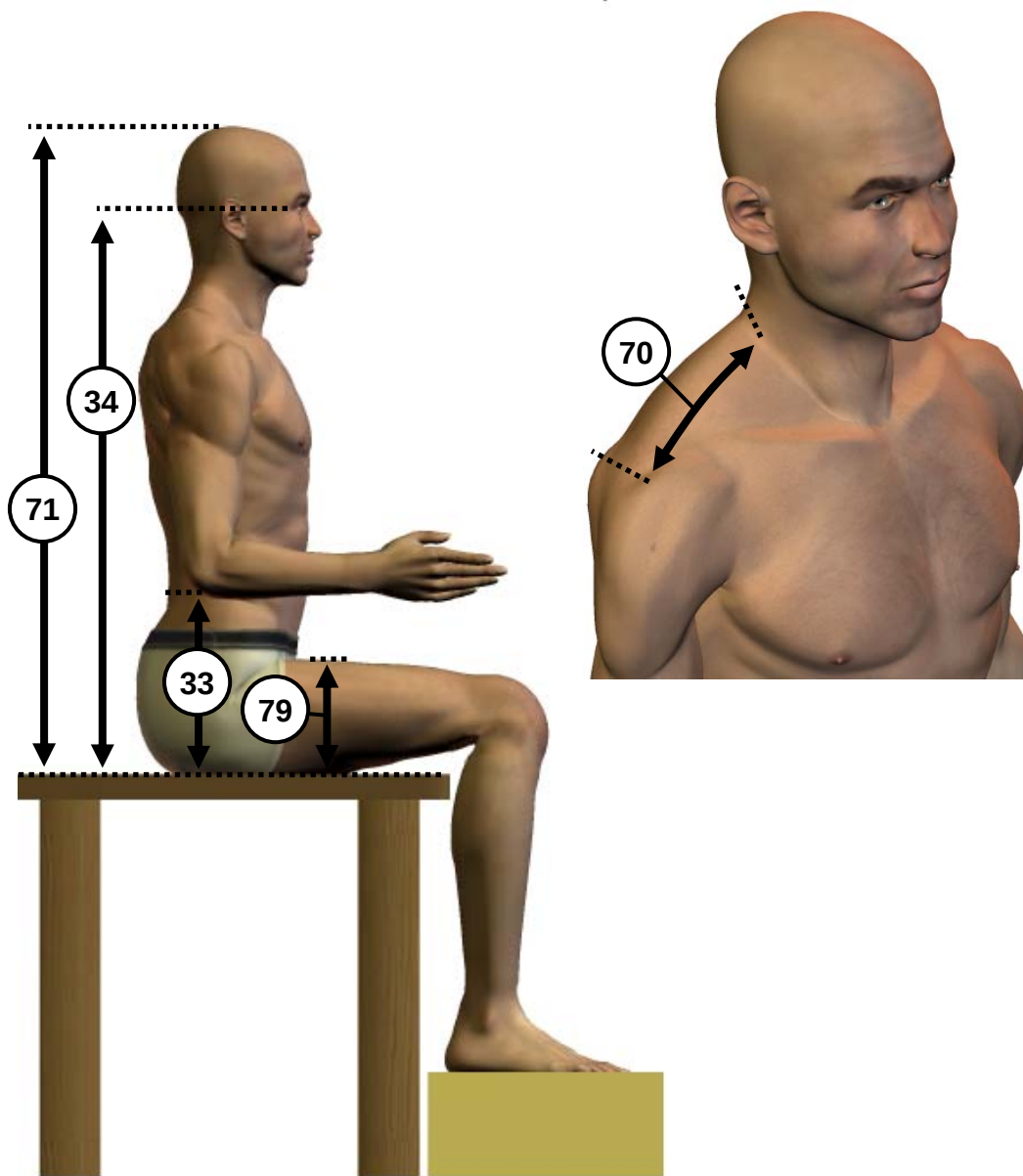
(50) HIP BREADTH

(81) TIBIAL HEIGHT

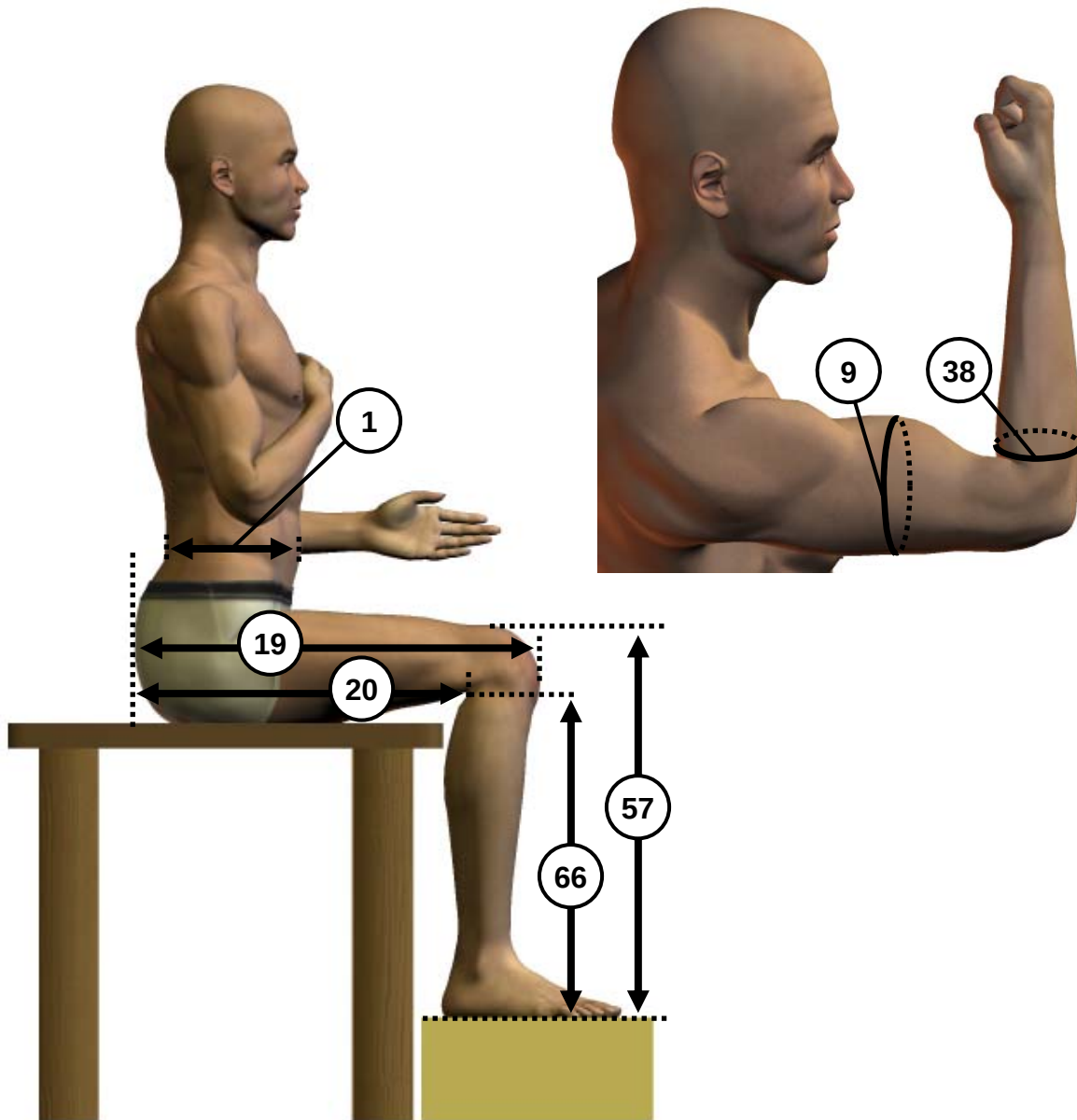
(86) WAIST BREADTH



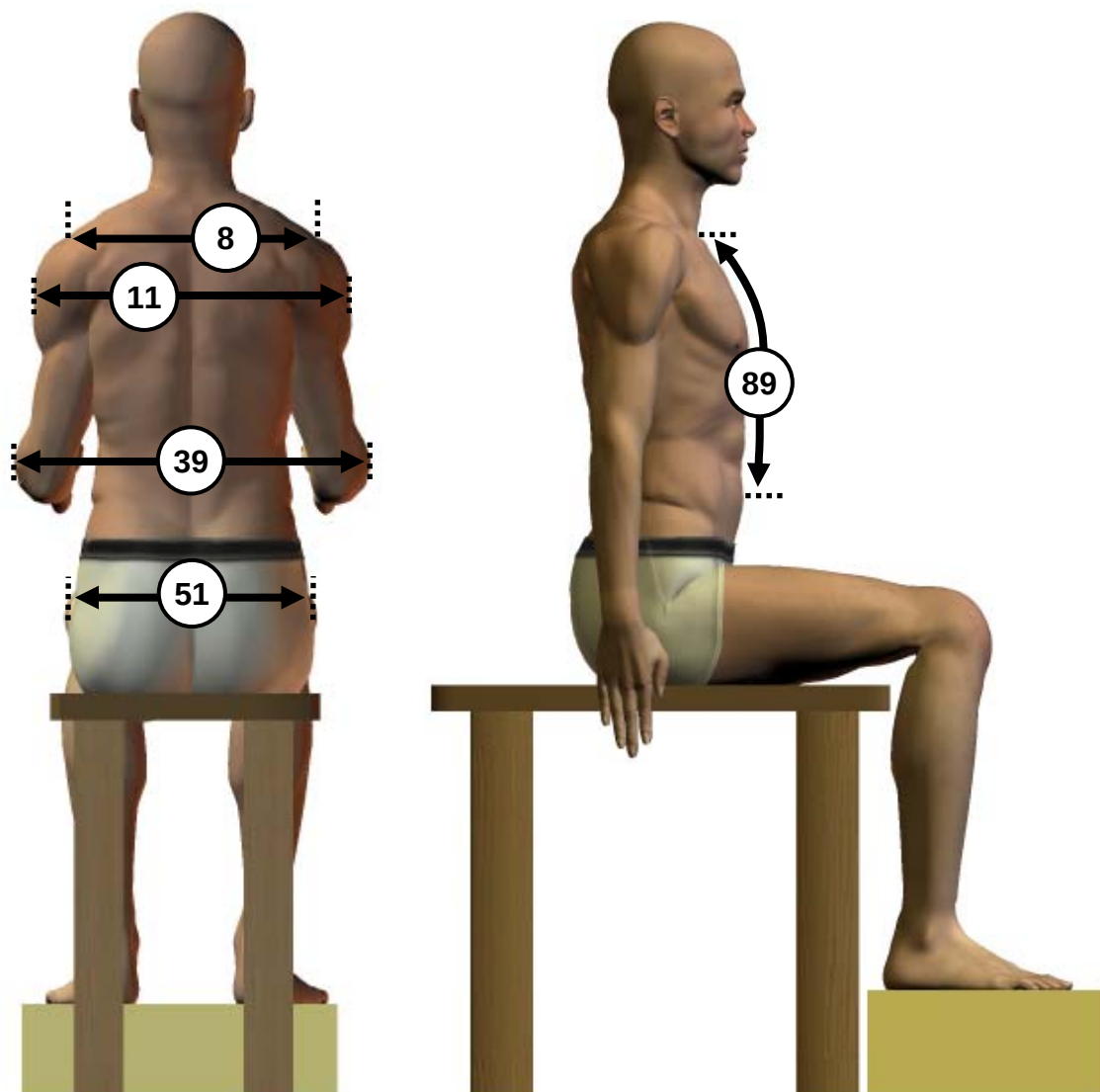
- (17) BUTTOCK DEPTH
- (54) INTERSCYE I
- (55) INTERSCYE II
- (80) THUMBTIP REACH
- (85) WAIST BACK LENGTH (OMPHALION)



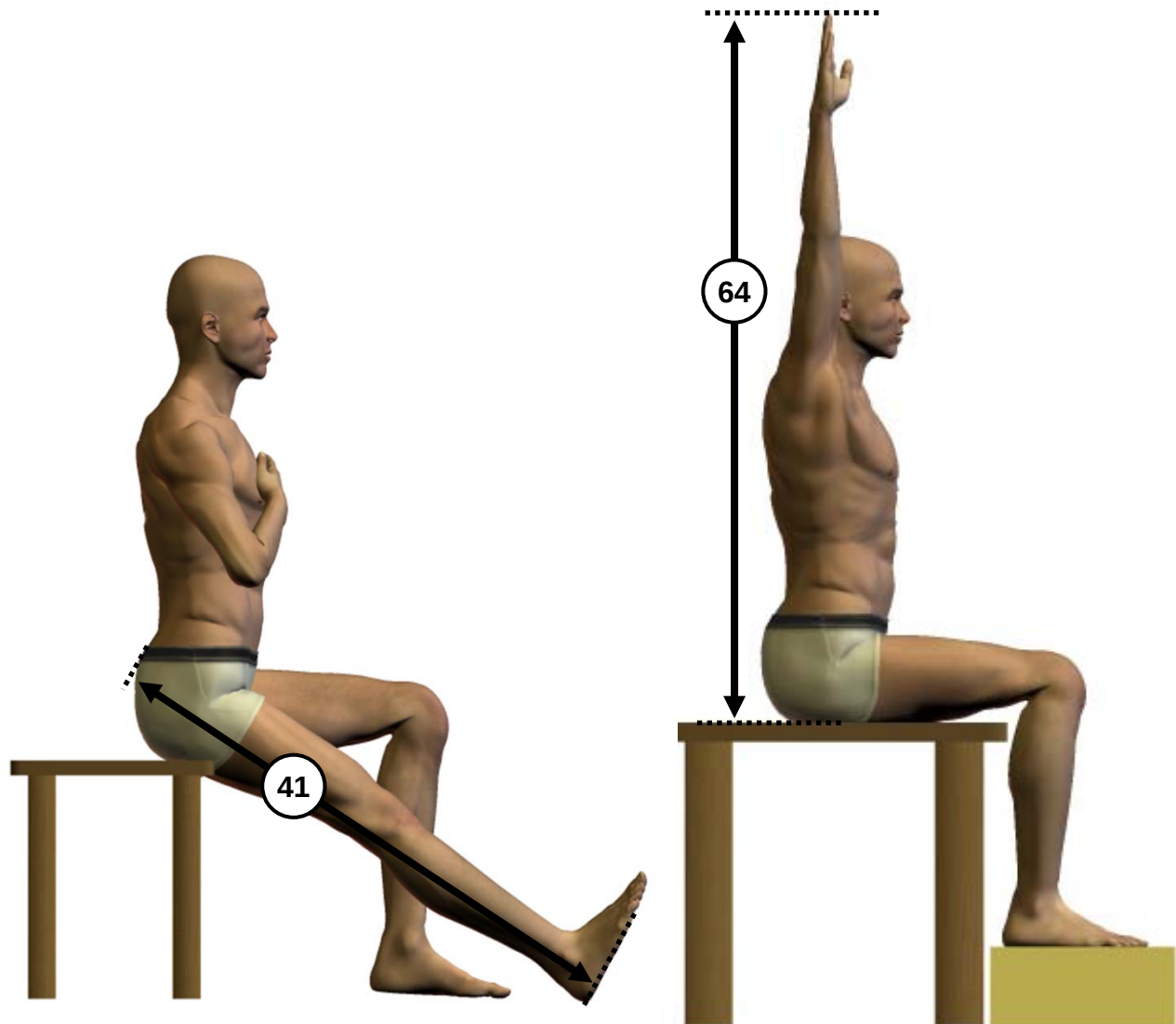
- (33) ELBOW REST HEIGHT
- (34) EYE HEIGHT, SITTING
- (70) SHOULDER LENGTH
- (71) SITTING HEIGHT
- (79) THIGH CLEARANCE



- (1) ABDOMINAL EXTENSION DEPTH, SITTING
- (9) BICEPS CIRCUMFERENCE, FLEXED
- (19) BUTTOCK-KNEE LENGTH
- (20) BUTTOCK-POPLITEAL LENGTH
- (38) FOREARM CIRCUMFERENCE, FLEXED
- (57) KNEE HEIGHT, SITTING
- (66) POPLITEAL HEIGHT



- (8) BIACROMIAL BREADTH
- (11) BIDELOID BREADTH
- (39) FOREARM-FOREARM BREADTH
- (51) HIP BREADTH, SITTING
- (89) WAIST FRONT LENGTH, SITTING

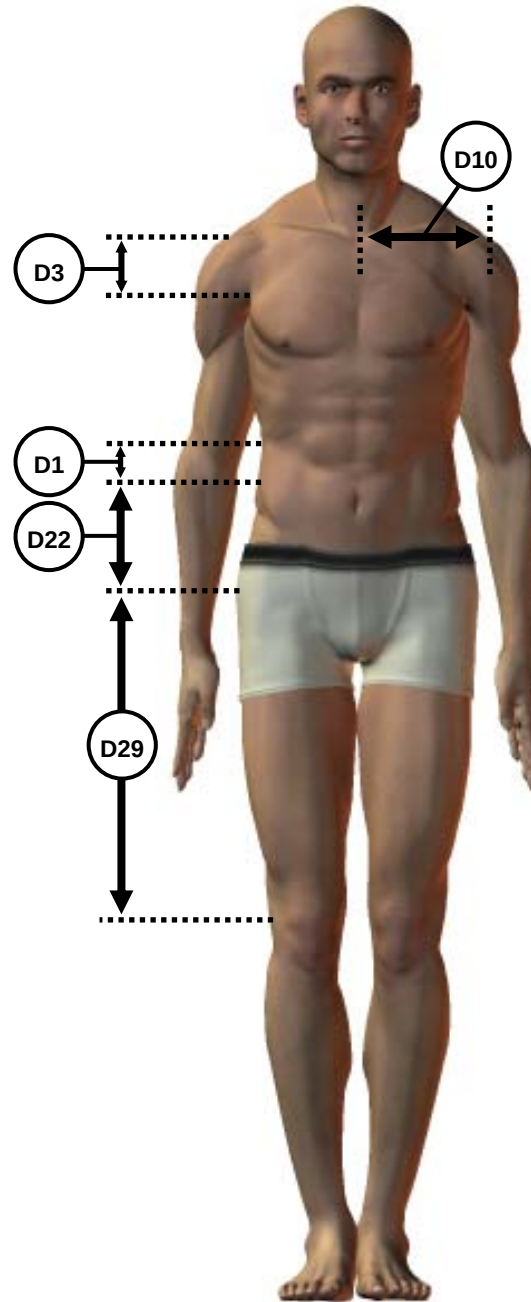


(41) FUNCTIONAL LEG LENGTH

(64) OVERHEAD FINGERTIP REACH, SITTING

## APPENDIX D

### VISUAL INDEX OF DERIVED DIMENSIONS



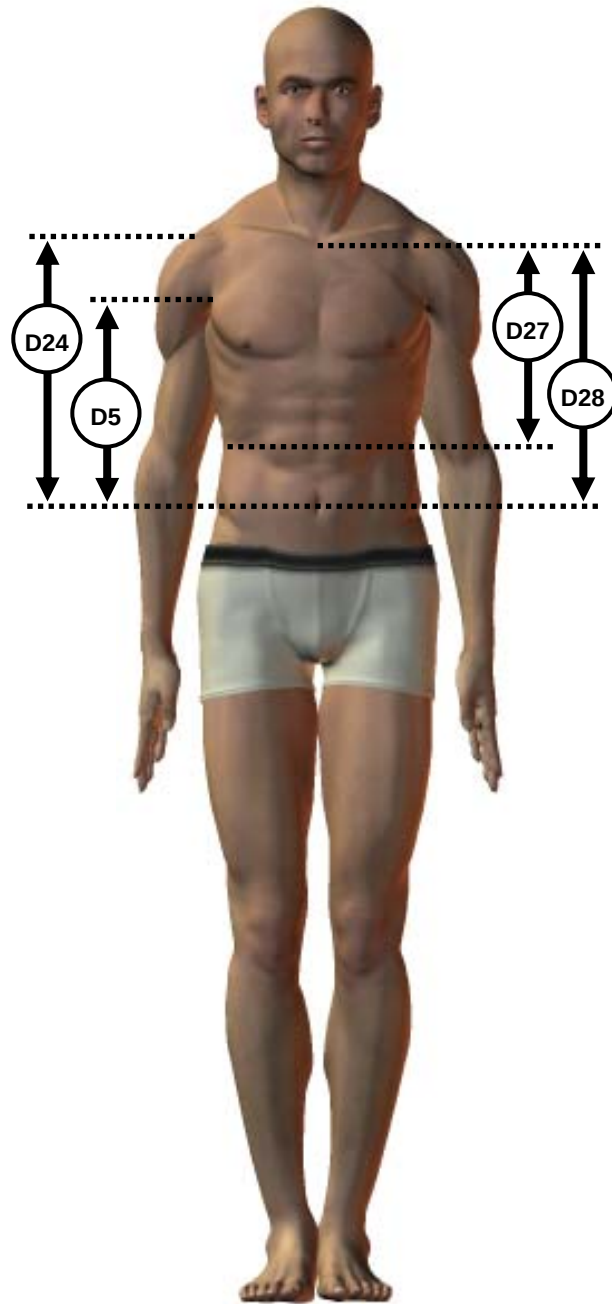
(D1) ABDOMINAL LINK

(D3) ACROMION-AXILLA LENGTH

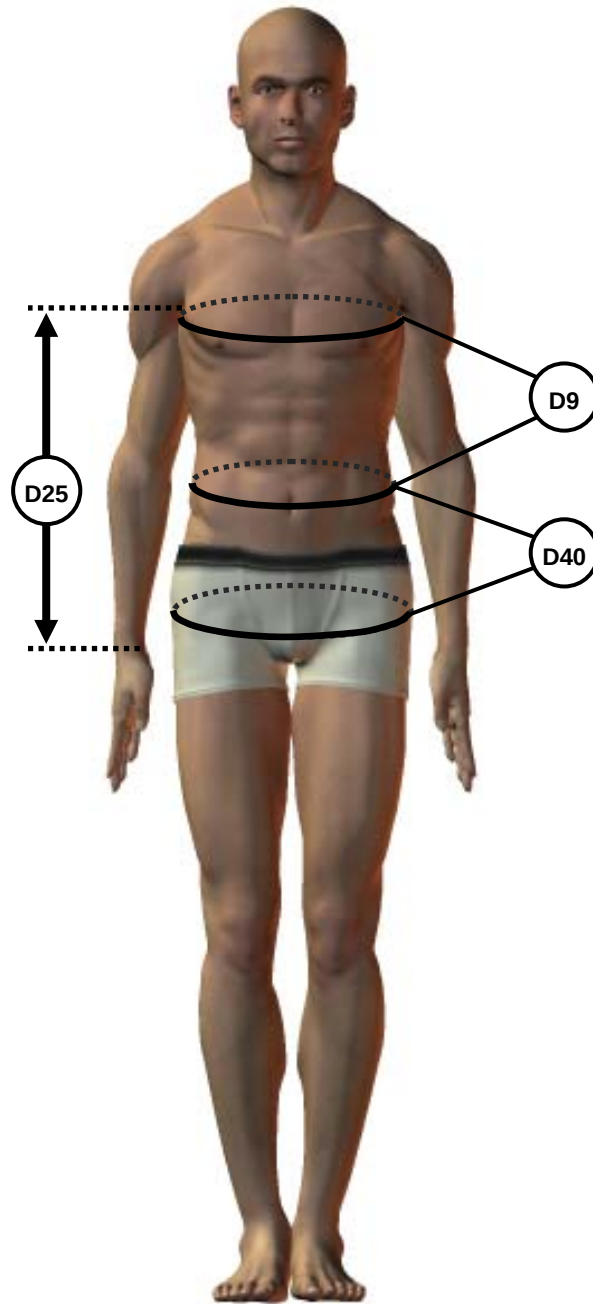
(D10) CLAVICLE LINK

(D22) PELVIC LINK

(D29) THIGH LINK



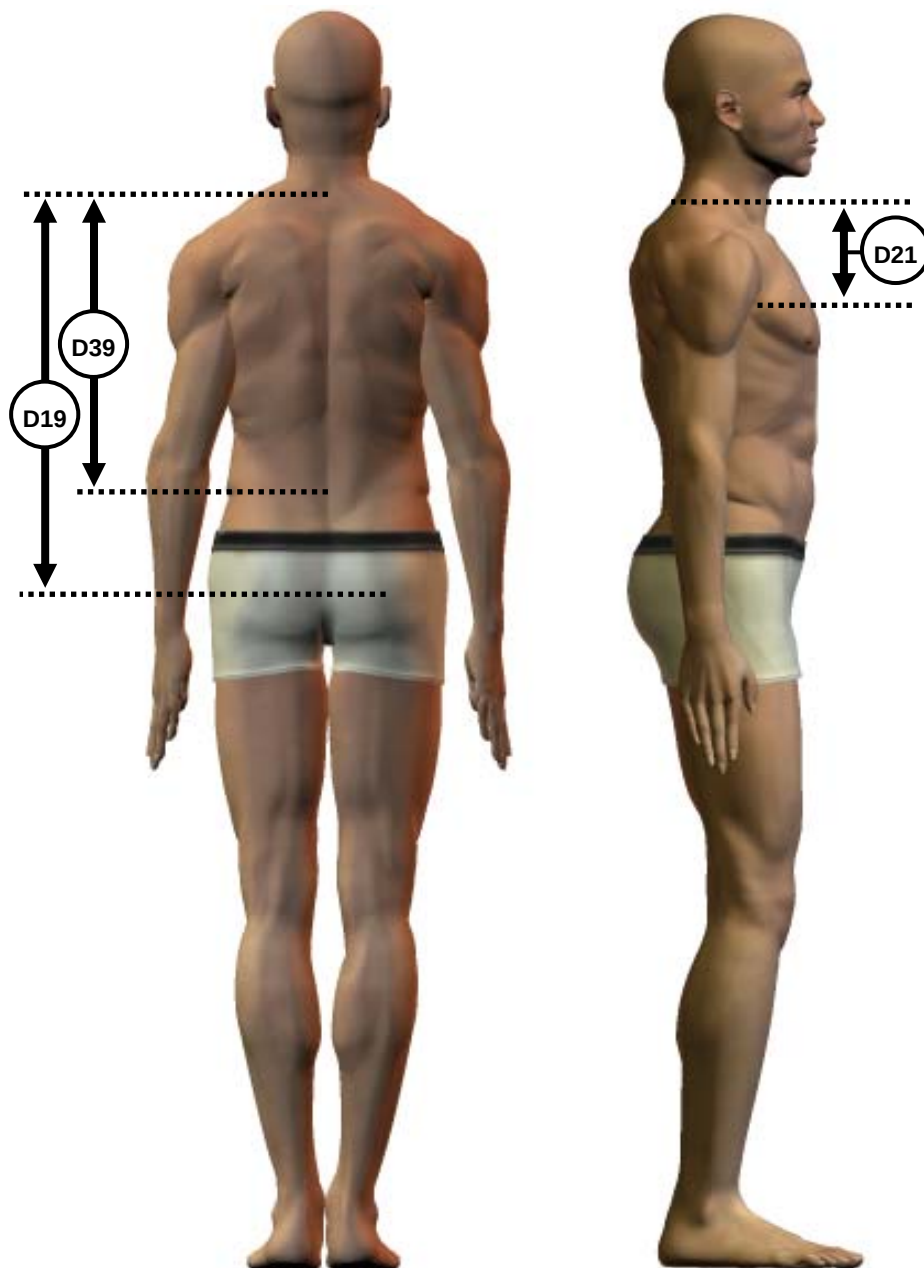
- (D5) AXILLA-WAIST LENGTH (OMPHALION)
- (D24) SHOULDER-WAIST LENGTH (OMPHALION)
- (D27) SUPRASTERNALE-TENTH RIB LENGTH
- (D28) SUPRASTERNALE-WAIST LENGTH (OMPHALION)



(D9) CHEST-WAIST DROP (OMPHALION)

(D25) SLEEVE INSEAM

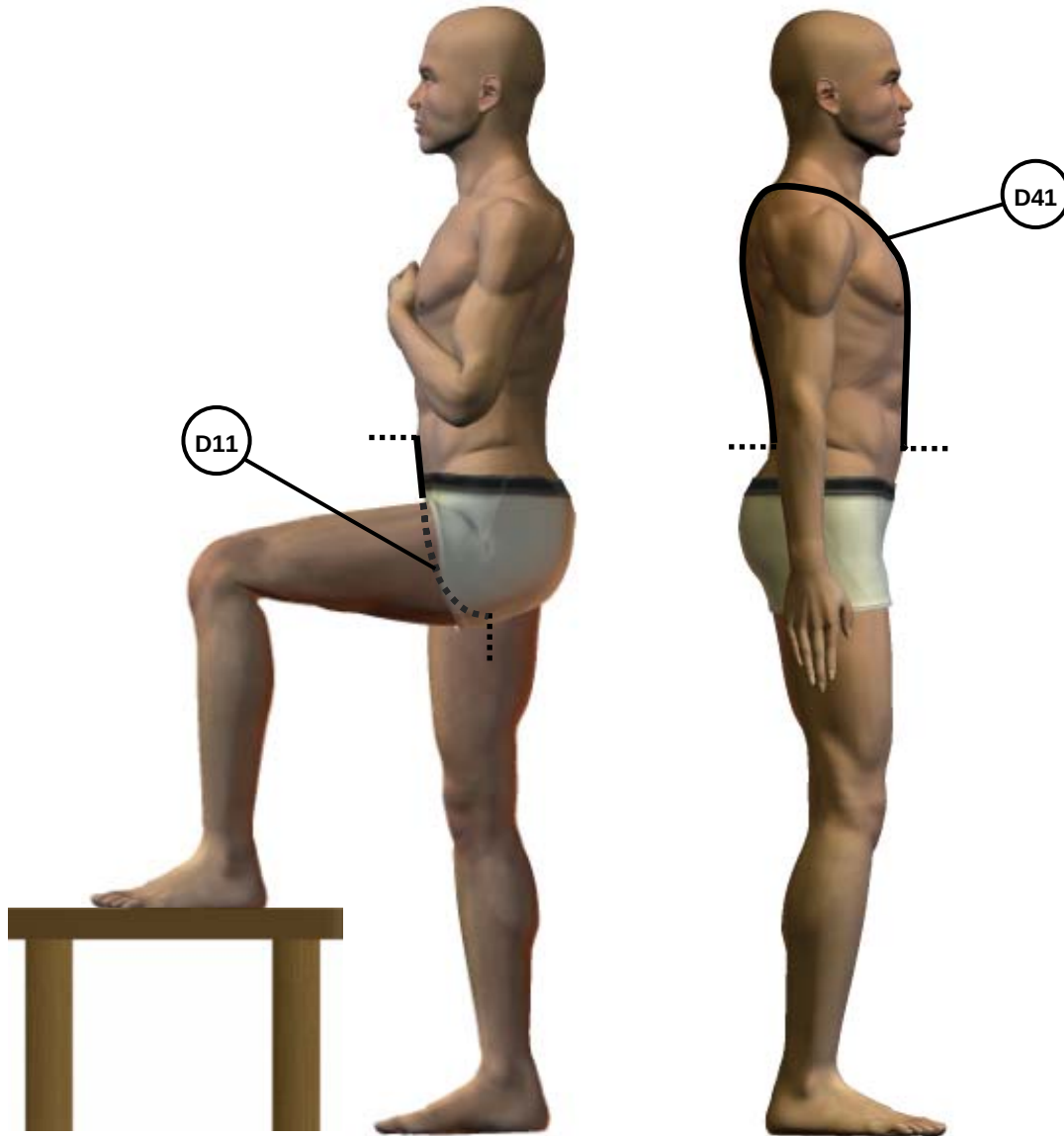
(D40) WAIST-BUTTOCK DROP (OMPHALION)



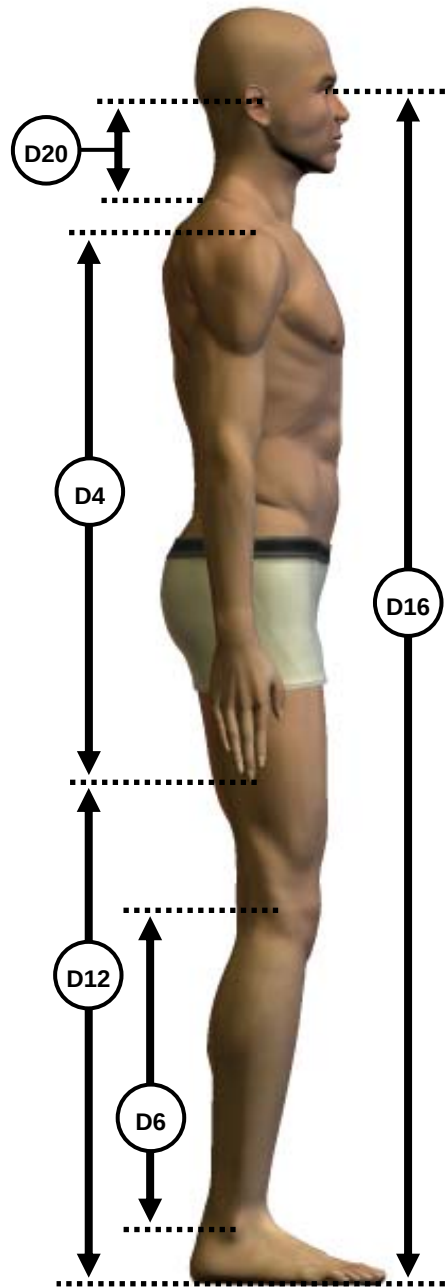
(D19) NECK-BUTTOCK LENGTH

(D21) NECK-SCYE LENGTH

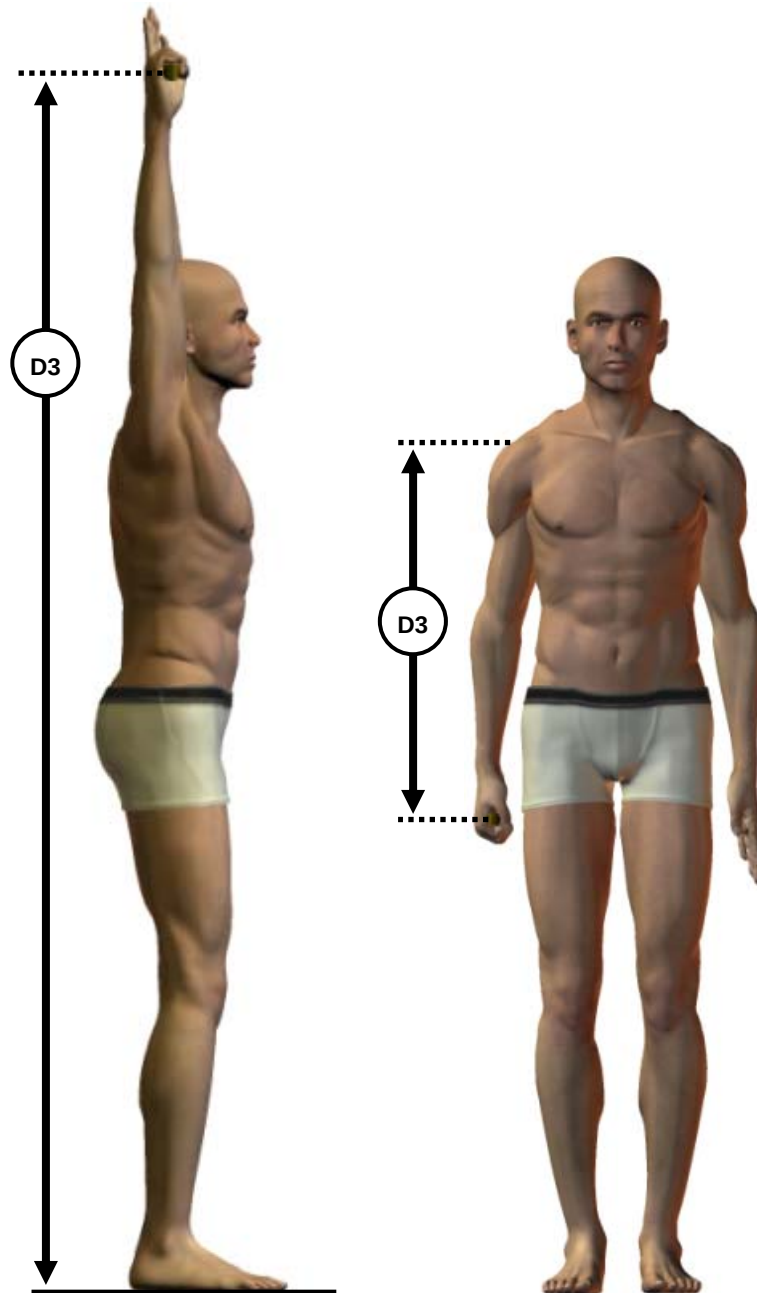
(D39) WAIST BACK, VERTICAL (OMPHALION)



(D11) CROTCH LENGTH, ANTERIOR (OMPHALION)  
(D41) WAIST-WAIST (OMPHALION) OVER SHOULDER

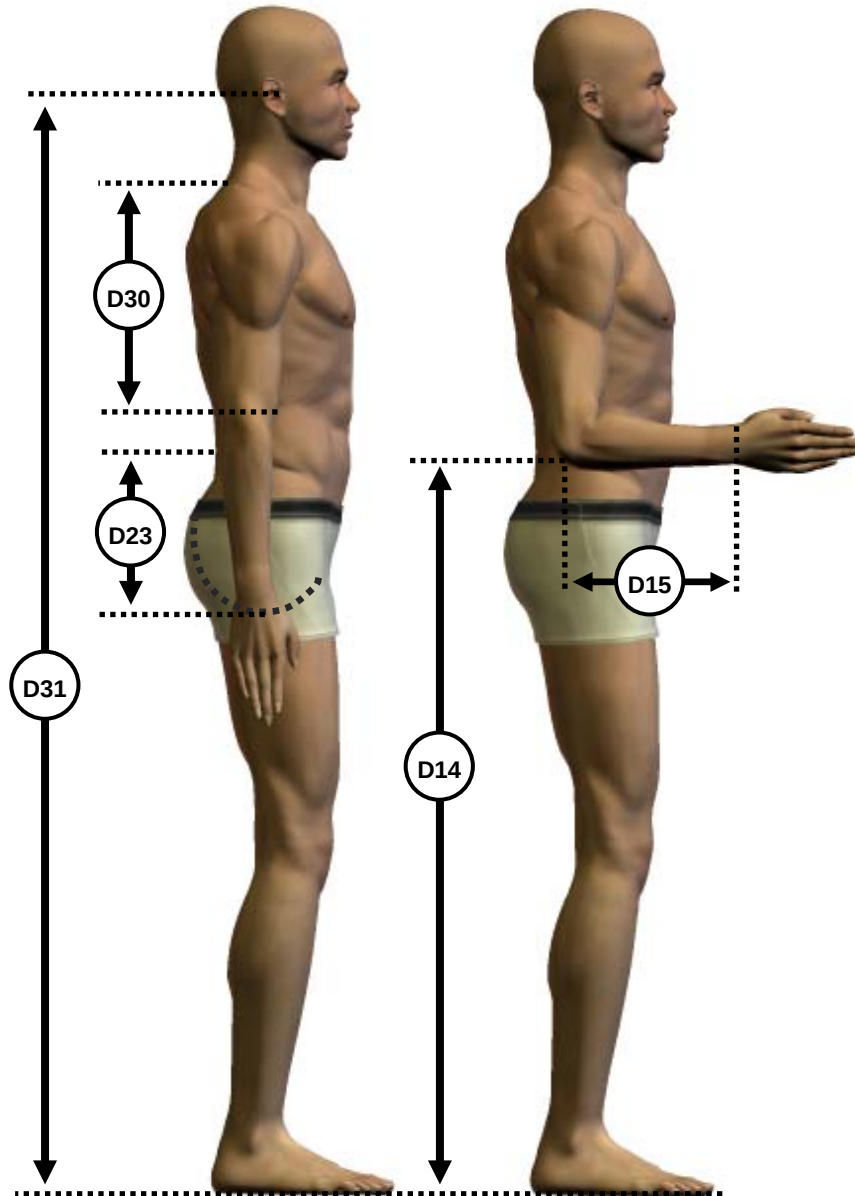


- (D4) ARM LENGTH
- (D6) CALF LINK
- (D12) DACTYLION HEIGHT
- (D16) EYE HEIGHT
- (D20) NECK LINK



(D33) VERTICAL GRIP REACH

(D34) VERTICAL GRIP REACH DOWN



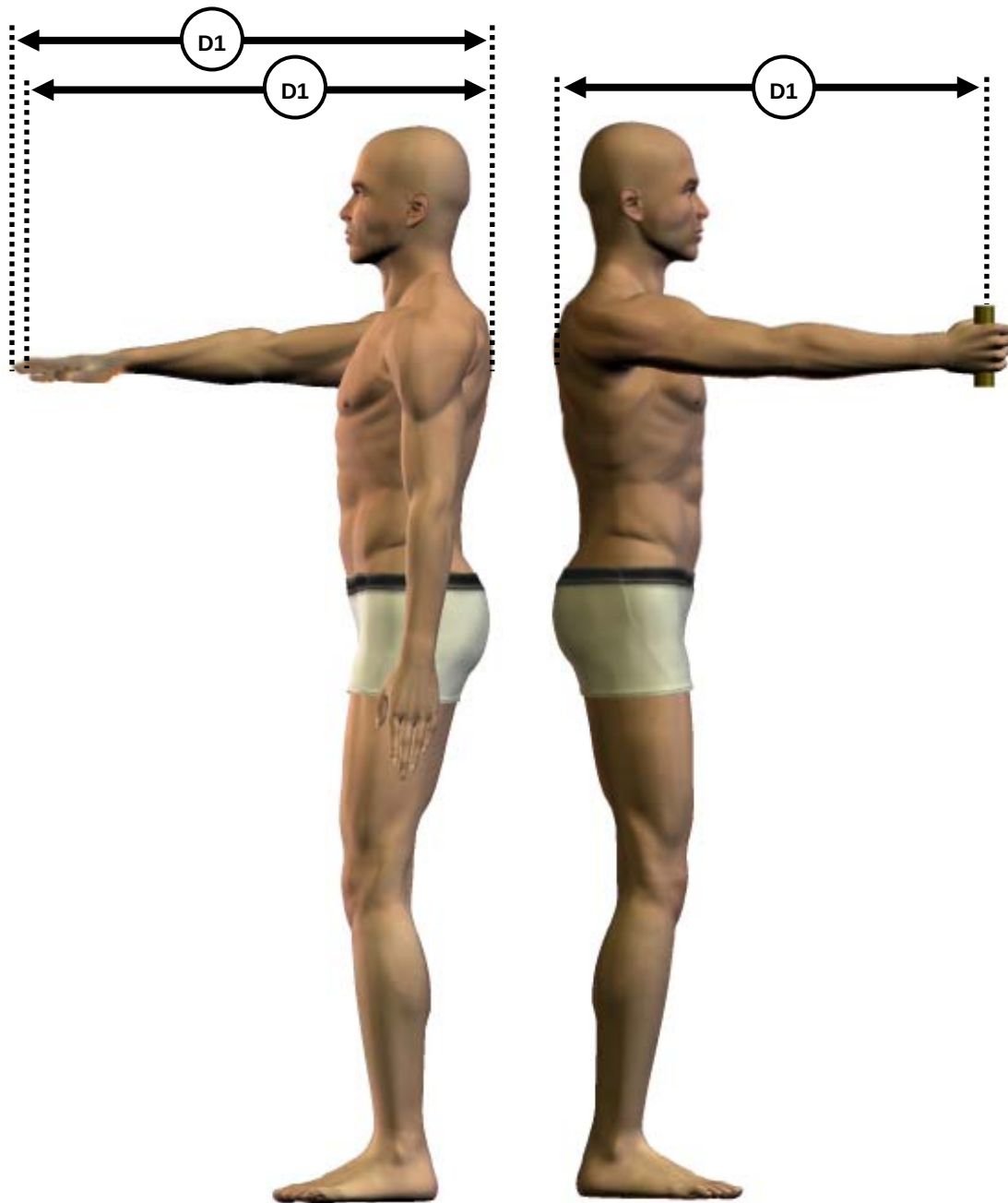
(D14) ELBOW REST HEIGHT, STANDING

(D15) ELBOW-WRIST LENGTH

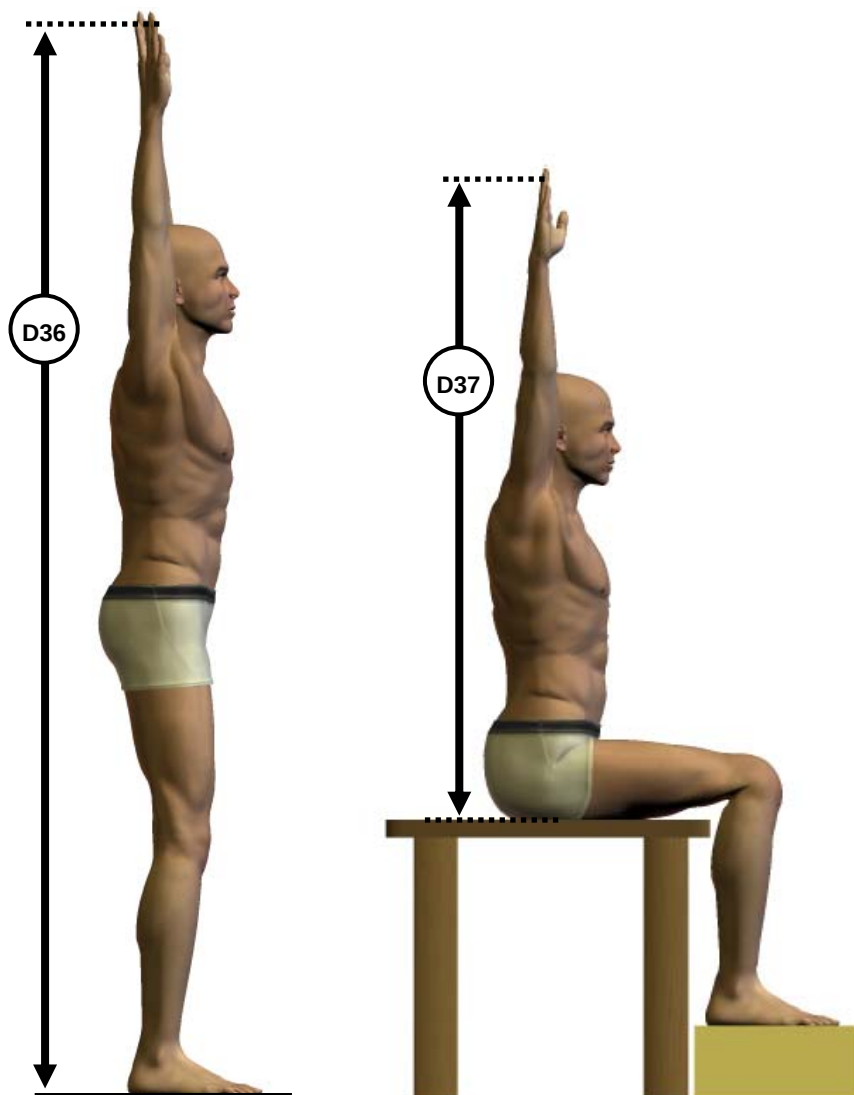
(D23) RISE (OMPHALION)

(D30) THORAX LINK

(D31) TRAGION HEIGHT

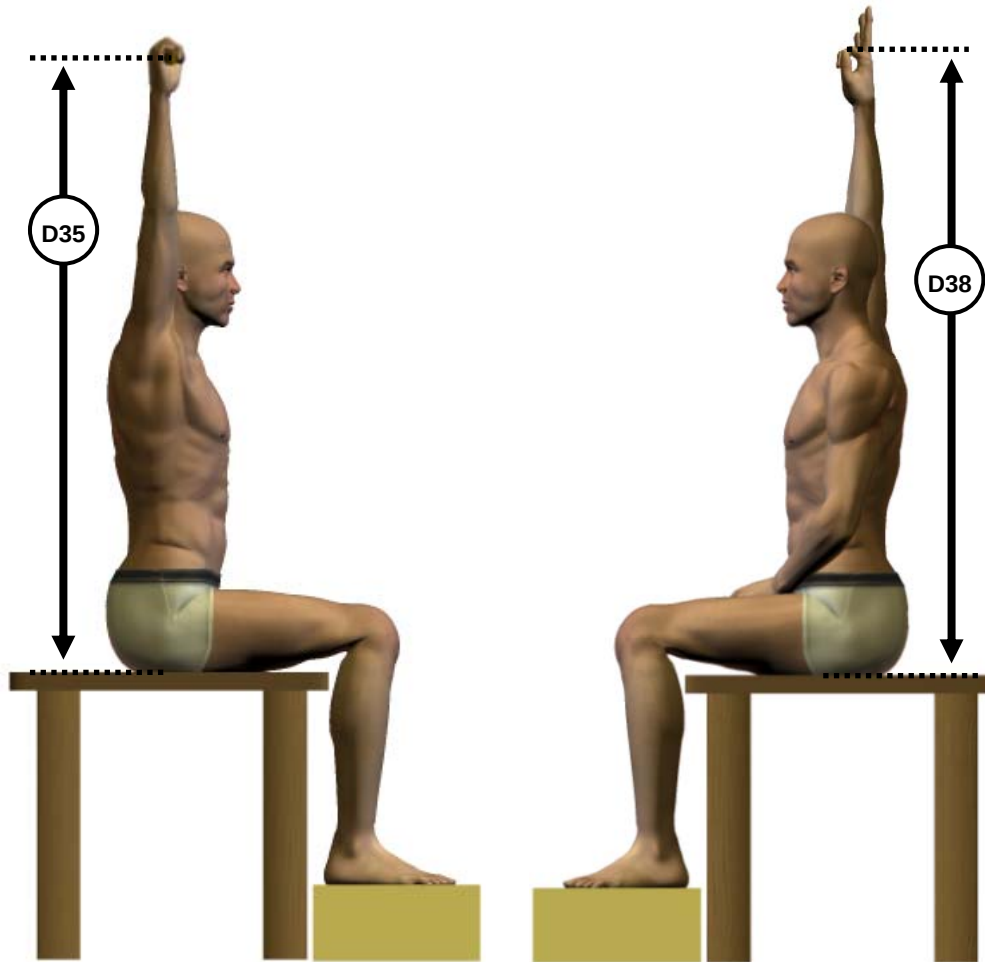


- (D13) DACTYLION REACH FROM WALL
- (D17) FUNCTIONAL GRIP REACH
- (D18) INDEX FINGER REACH



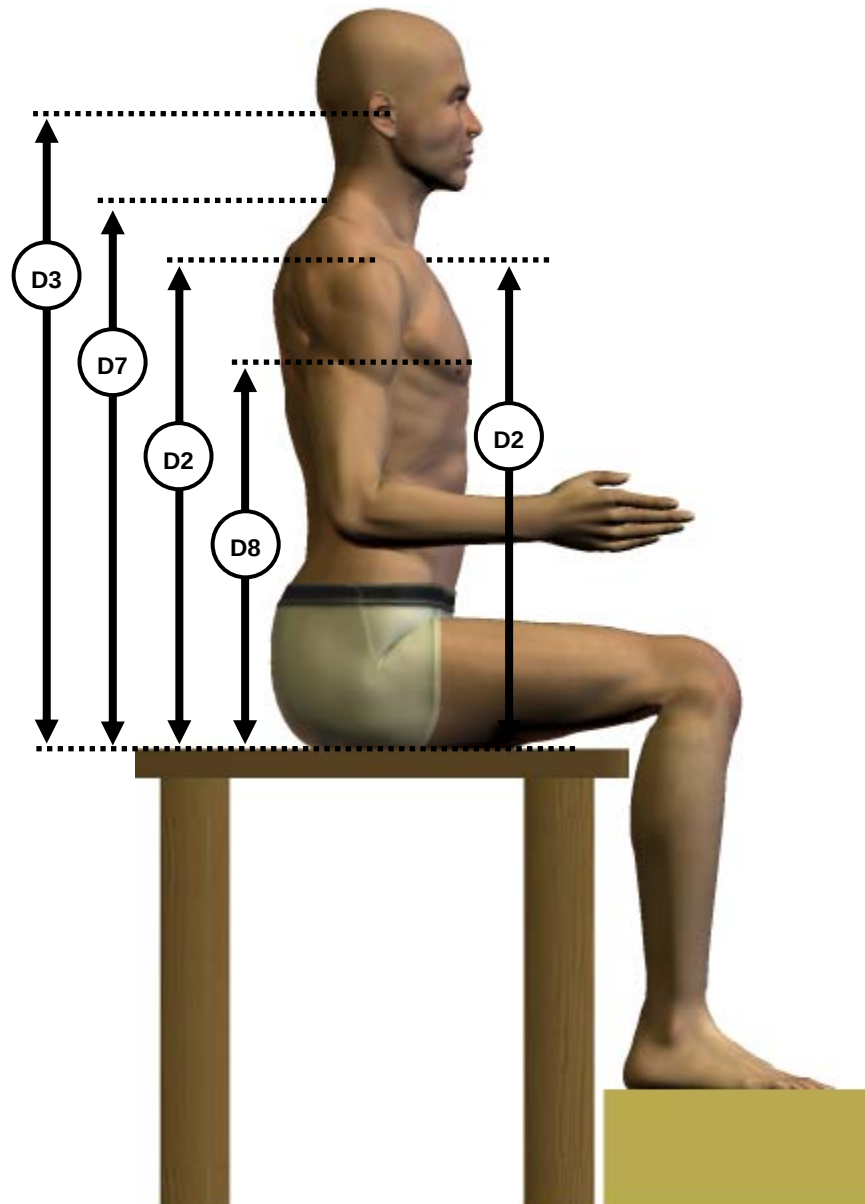
(D36) VERTICAL INDEX FINGERTIP REACH

(D37) VERTICAL INDEX FINGERTIP REACH, SITTING



(D35) VERTICAL GRIP REACH, SITTING

(D38) VERTICAL THUMB TIP REACH, SITTING



- (D2) ACROMIAL HEIGHT, SITTING
- (D7) CERVICALE HEIGHT, SITTING
- (D8) CHEST HEIGHT, SITTING
- (D26) SUPRASTERNALE HEIGHT, SITTING
- (D32) TRAGION HEIGHT, SITTING

## APPENDIX E

### STATISTICAL MEASURES

The statistical measures used in this report to summarize the survey data are univariate statistics selected to provide potential users with a maximum of useful information. They are also the statistics used in other anthropometric reports prepared by the U.S. Army as well as other military services.

The statistics provided for each variable are the following:

1. The arithmetic mean ( $\bar{x}$ ). This is the arithmetic average and is computed as the sum of the values divided by the number of values:

$$\bar{x} = \frac{\sum X}{N}$$

where  $X$  is the individual measurement and  $N$  is the sample size.

2. The standard error of the mean ( $Se_{\bar{x}}$ ). This is a standard deviation type of statistic and is an estimate of the sampling error of the mean. It is computed as:

$$Se_{\bar{x}} = \frac{SD}{\sqrt{N}}$$

where  $SD$  is the standard deviation for that variable and  $N$  is the sample size.

3. The standard deviation ( $SD$ ). This is a measure of variability and is computed as:

$$SD = \sqrt{\frac{\sum (X - \bar{x})^2}{N}}$$

where  $X$  is the individual measurement,  $\bar{x}$  is the mean value for that measurement, and  $N$  is the sample size.

4. The standard error of the SD ( $Se_{SD}$ ). This is another measure of variability and is an estimate of the sampling error of the SD. It is computed as:

$$Se_{SD} = \frac{SD}{\sqrt{2N}}$$

where  $SD$  is the standard deviation of the variable of interest and  $N$  is the sample size.

5. Minimum. The smallest observed value for a particular variable.
6. Maximum. The largest observed value for a particular variable.
7. N. The number of subjects measured for a particular variable.
8. Skewness ( $\beta_1$ ). A dimensionless statistic that is an indicator of whether a set of data is symmetrically distributed. It is computed as:

$$\beta_1 = \frac{\sum (X - \bar{x})^3}{N \times SD^3}$$

where  $X$  is the individual measurement,  $\bar{x}$  is the mean of that measurement,  $N$  is the sample size, and  $SD$  is the standard deviation of the measurement. In a normal distribution the value of  $\beta_1$  is 0.

9. Kurtosis ( $\beta_2$ ). A dimensionless statistic that indicates the level of agreement between a normal distribution and the actual distribution of the data.

$$\beta_2 = \frac{\sum (X - \bar{x})^4}{N \times SD^4}$$

where  $X$  is the individual measurement,  $\bar{x}$  is the mean of that measurement,  $N$  is the sample size, and  $SD$  is the standard deviation of the measurement. In a normal distribution the value for  $\beta_2$  is 3. It should be noted that some commercially available statistical packages automatically center kurtosis around 0.

10. The coefficient of variation. A statistic that restates the standard deviation as a percent of the mean and is computed as:

$$CV = 100 \times \frac{SD}{\bar{x}}$$

where  $\bar{x}$  is the mean and  $SD$  is the standard deviation of a measurement.

11. The frequency tables. These tables group the data for a variable into a series of intervals. The intervals used in this output are 1 mm, 2 mm, 2.5 mm, 5 mm, 10 mm, 15 mm, and 20 mm. For each interval, the tables list the start and end point of the interval, the number of participants who fall within the interval (frequency or  $F$ ), the cumulative frequency (Cum $F$ ), and,

the values of F and CumF expressed as a percentage of the total number of measurements for that variable (FPct and CumFPct).

12. The percentiles. This group of statistics represents measures of order or position. These measures can be thought of as being obtained by arranging the data in order from the smallest to the largest and then observing the value of the datum which lies at a specified position in the array. The 99 percentiles—ranging from the first to the 99<sup>th</sup>—are the values at the points which separate consecutive blocks or units of 1% of the data in the ordered array. The first percentile is the value that separates the smallest 1% of the data from the 99% of the data with larger values; the second percentile separates the smallest 2% from the larger 98% and so on. Twenty-five of these percentiles which are believed to be the most useful to designers and engineers have been included for each measurement. When distributions are normally distributed, percentiles can be estimated from the mean and standard deviation. However, these estimates are just that – estimates. Exact percentiles calculated from the data are generally preferable, and that is the approach that has been taken here.

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## APPENDIX F

### DIMENSION-NUMBER CROSS-REFERENCE TABLE

Many users of the ANSUR II database will be familiar with the ANSUR database from 1988-1989. To assist users familiar with ANSUR dimension numbers, a cross-reference table has been provided for the new and old dimension numbers (Table F-1). The table includes all of the measured and derived dimensions in ANSUR and ANSUR II. A blank in the column means that that dimension was not measured in that survey. If a dimension retained the same name but was changed in such a way that it is no longer comparable, then that dimension is listed twice (e.g. Functional Leg Length).

TABLE F-1

Cross Reference of Dimension Numbers from ANSUR II and ANSUR

| ANSUR II Number | Dimension Name                            | ANSUR Number |
|-----------------|-------------------------------------------|--------------|
| 1               | Abdominal Extension Depth, Sitting        | 1            |
| D1              | Abdominal Link                            | D1           |
| 2               | Acromial Height                           | 2            |
| D2              | Acromial Height, Sitting                  | 3            |
| D3              | Acromion-Axilla Length                    | D2           |
| 3               | Acromion-Radiale Length                   | 4            |
| 4               | Ankle Circumference                       | 5            |
| D4              | Arm Length                                | D3           |
| 5               | Axilla Height                             | 6            |
|                 | Axilla-Waist Length (Natural Indentation) | D4           |
| D5              | Axilla-Waist Length (Omphalion)           | D5           |
|                 | Axillary Arm Circumference                | 7            |
| 6               | Ball of Foot Circumference                | 8            |
| 7               | Ball of Foot Length                       | 9            |
| 8               | Biacromial Breadth                        | 10           |
| 9               | Biceps Circumference, Flexed              | 11           |
| 10              | Bicristal Breadth                         |              |
| 11              | Bideltoid Breadth                         | 12           |
| 12              | Bimalleolar Breadth                       | 13           |
|                 | Bispinous Breadth                         | 14           |
| 13              | Bitragion Chin Arc                        | 15           |
|                 | Bitragion Coronal Arc                     | 16           |
|                 | Bitragion Crinion Arc                     | 17           |
|                 | Bitragion Frontal Arc                     | 18           |

TABLE F-1 Continued

| ANSUR II<br>Number | Dimension Name                                | ANSUR<br>Number |
|--------------------|-----------------------------------------------|-----------------|
| 14                 | Bitragion Submandibular Arc                   | 19              |
|                    | Bitragion Subnasale Arc                       | 20              |
| 15                 | Bizygomatic Breadth                           | 21              |
|                    | Bustpoint/The lion-Bustpoint/The lion Breadth | 22              |
| 16                 | Buttock Circumference                         | 23              |
| 17                 | Buttock Depth                                 | 24              |
| 18                 | Buttock Height                                | 25              |
| 19                 | Buttock-Knee Length                           | 26              |
| 20                 | Buttock-Popliteal Length                      | 27              |
| 21                 | Calf Circumference                            | 28              |
|                    | Calf Height                                   | 29              |
| D6                 | Calf Link                                     | D6              |
| 22                 | Cervicale Height                              |                 |
|                    | Cervicale Height                              | 30              |
| D7                 | Cervicale Height, Sitting                     |                 |
|                    | Cervicale Height, Sitting                     | 31              |
| 23                 | Chest Breadth                                 |                 |
|                    | Chest Breadth                                 | 32              |
| 24                 | Chest Circumference                           | 33              |
|                    | Chest Circumference at Scye                   | 34              |
|                    | Chest Circumference below Breast              | 35              |
| 25                 | Chest Depth - Females                         | 36              |
| 25                 | Chest Depth - Males                           |                 |
|                    | Chest Depth - Males                           | 36              |
| 26                 | Chest Height - Males                          |                 |
| 26                 | Chest Height - Females                        | 37              |
|                    | Chest Height - Males                          | 37              |
| D8                 | Chest Height, Sitting - Females               | D7              |
| D8                 | Chest Height, Sitting - Males                 |                 |
|                    | Chest-Waist Drop (Natural Indentation)        | D8              |
| D9                 | Chest-Waist Drop (Omphalion) - Females        | D9              |
| D9                 | Chest-Waist Drop (Omphalion) - Males          |                 |
| D10                | Clavicle Link                                 | D10             |
| 27                 | Crotch Height                                 | 38              |
|                    | Crotch Length (Natural Indentation)           | 39              |

TABLE F-1 Continued

| ANSUR II<br>Number | Dimension Name                                 | ANSUR<br>Number |
|--------------------|------------------------------------------------|-----------------|
| 28                 | Crotch Length (Omphalion)                      | 40              |
|                    | Crotch Length, Anterior (Natural Indentation)  | D11             |
| D11                | Crotch Length, Anterior (Omphalion)            | D12             |
|                    | Crotch Length, Posterior (Natural Indentation) | 41              |
| 29                 | Crotch Length, Posterior (Omphalion)           | 42              |
| D12                | Dactylion Height                               | D13             |
| D13                | Dactylion Reach From Wall                      | D14             |
|                    | Dactylion Reach From Wall, Extended            | D15             |
| 30                 | Ear Breadth                                    | 43              |
| 31                 | Ear Length                                     | 44              |
|                    | Ear Length above Tragion                       | 45              |
| 32                 | Ear Protrusion                                 | 46              |
|                    | Elbow Circumference                            | 47              |
| 33                 | Elbow Rest Height                              | 48              |
| D14                | Elbow Rest Height, Standing                    | D16             |
| D15                | Elbow-Wrist Length                             | D18             |
| D16                | Eye Height                                     | D19             |
| 34                 | Eye Height, Sitting                            | 49              |
|                    | Eye-Tragion Link                               | D20             |
| 35                 | Foot Breadth, Horizontal                       | 50              |
| 36                 | Foot Length                                    | 51              |
| 37                 | Forearm-Center Of Grip Length                  | D17             |
| 38                 | Forearm Circumference, Flexed                  | 52              |
| 39                 | Forearm-Forearm Breadth                        | 53              |
| 40                 | Forearm-Hand Length                            | 54              |
| D17                | Functional Grip Reach                          | D21             |
|                    | Functional Grip Reach, Extended                | D22             |
| 41                 | Functional Leg Length                          |                 |
|                    | Functional Leg Length                          | 55              |
|                    | Gluteal Furrow Height                          | 56              |
| 42                 | Hand Breadth                                   | 57              |
| 43                 | Hand Circumference                             | 58              |
| 44                 | Hand Length                                    | 59              |
| 45                 | Head Breadth - Females                         |                 |
| 45                 | Head Breadth - Males                           | 60              |
| 46                 | Head Circumference - Females                   |                 |

TABLE F-1 Continued

| ANSUR II<br>Number | Dimension Name                     | ANSUR<br>Number |
|--------------------|------------------------------------|-----------------|
| 46                 | Head Circumference - Males         | 61              |
| 47                 | Head Length - Females              |                 |
| 47                 | Head Length - Males                | 62              |
| 48                 | Heel-Ankle Circumference           | 63              |
| 49                 | Heel Breadth                       | 64              |
| 50                 | Hip Breadth                        | 65              |
| 51                 | Hip Breadth, Sitting               | 66              |
| 52                 | Iliocristale Height                | 67              |
| D18                | Index Finger Reach                 | D23             |
|                    | Index Finger Reach, Extended       | D24             |
| 53                 | Interpupillary Breadth             | 68              |
| 54                 | Interscye I                        | 69              |
| 55                 | Interscye II                       | 70              |
|                    | Knee Circumference                 | 71              |
| 56                 | Knee Height, Midpatella            | 72              |
| 57                 | Knee Height, Sitting               | 73              |
| 58                 | Lateral Femoral Epicondyle Height  | 74              |
| 59                 | Lateral Malleolus Height           | 75              |
| 60                 | Lower Thigh Circumference          | 76              |
| 61                 | Menton-Sellion Length              | 77              |
|                    | Midshoulder Height, Sitting        | 78              |
|                    | Neck-Bustpoint/Thelion Length      | 79              |
| D19                | Neck-Buttock Length                | D26             |
|                    | Neck-Gluteal Furrow Length         | D27             |
| 62                 | Neck Circumference                 | 80              |
| 63                 | Neck Circumference Base            | 81              |
|                    | Neck Height, Lateral               | 82              |
| D20                | Neck Link                          | D25             |
| D21                | Neck-Scye Length                   | D28             |
|                    | Overhead Fingertip Reach           | 83              |
|                    | Overhead Fingertip Reach, Extended | 84              |
| 64                 | Overhead Fingertip Reach, Sitting  | 85              |
| 65                 | Palm Length                        |                 |
| D22                | Pelvic Link                        | D29             |
| 66                 | Popliteal Height                   | 86              |
| 67                 | Radiale-Stylian Length             | 87              |

TABLE F-1 Continued

| ANSUR II<br>Number | Dimension Name                              | ANSUR<br>Number |
|--------------------|---------------------------------------------|-----------------|
|                    | Rise (Natural Indentation)                  | D30             |
| D23                | Rise (Omphalion)                            | D31             |
|                    | Scye Circumference                          | 88              |
|                    | Scye Depth                                  | 89              |
| 68                 | Shoulder Circumference                      |                 |
|                    | Shoulder Circumference                      | 90              |
| 69                 | Shoulder-Elbow Length                       | 91              |
| 70                 | Shoulder Length                             | 92              |
|                    | Shoulder Slope                              | D32             |
|                    | Shoulder-Waist Length (Natural Indentation) | D33             |
| D24                | Shoulder-Waist Length (Omphalion)           | D34             |
| 71                 | Sitting Height                              | 93              |
| D25                | Sleeve Inseam                               | D35             |
|                    | Sleeve Length: Spine-Elbow                  | 94              |
|                    | Sleeve Length: Spine-Scye                   | 95              |
| 72                 | Sleeve Length: Spine-Wrist                  | 96              |
| 73                 | Sleeve Outseam                              | 97              |
| 74                 | Span                                        | 98              |
| 75                 | Stature                                     | 99              |
|                    | Strap Length                                | 100             |
| 76                 | Suprasternale Height                        | 101             |
| D26                | Suprasternale Height, Sitting               | D36             |
| D27                | Suprasternale-Tenth Rib Length              |                 |
| D28                | Suprasternale-Waist Length (Omphalion)      |                 |
| 77                 | Tenth Rib Height                            | 102             |
| 78                 | Thigh Circumference                         | 103             |
| 79                 | Thigh Clearance                             | 104             |
| D29                | Thigh Link                                  | D37             |
| D30                | Thorax Link                                 | D38             |
|                    | Thumb Breadth                               | 105             |
| 80                 | Thumbtip Reach                              | 106             |
|                    | Thumbtip Reach, Extended                    | D39             |
| 81                 | Tibial Height                               |                 |
| D31                | Tragion Height                              | D40             |
| D32                | Tragion Height, Sitting                     | D41             |
| 82                 | Tragion-Top Of Head - Females               |                 |

TABLE F-1 Continued

| ANSUR II<br>Number | Dimension Name                              | ANSUR<br>Number |
|--------------------|---------------------------------------------|-----------------|
| 82                 | Tragion-Top of Head - Males                 | H44             |
| 83                 | Trochanterion Height                        | 107             |
| D33                | Vertical Grip Reach                         | D42             |
| D34                | Vertical Grip Reach Down                    | D43             |
|                    | Vertical Grip Reach, Extended               | D44             |
| D35                | Vertical Grip Reach, Sitting                | D45             |
| D36                | Vertical Index Fingertip Reach              | D46             |
|                    | Vertical Index Fingertip Reach Down         | D47             |
|                    | Vertical Index Fingertip Reach, Extended    | D48             |
| D37                | Vertical Index Fingertip Reach, Sitting     | D49             |
|                    | Vertical Thumbtip Reach Down                | D50             |
| D38                | Vertical Thumbtip Reach, Sitting            | D51             |
|                    | Vertical Trunk Circumference (ASCC)         | 108             |
| 84                 | Vertical Trunk Circumference (USA)          | 109             |
|                    | Vertical Wrist Height                       | D52             |
|                    | Vertical Wrist Height, Extended             | D53             |
|                    | Vertical Wrist Height, Sitting              | D54             |
|                    | Waist Back Length (Natural Indentation)     | 110             |
| 85                 | Waist Back Length (Omphalion)               |                 |
|                    | Waist Back Length (Omphalion)               | 111             |
|                    | Waist Back, Vertical (Natural Indentation)  | D55             |
| D39                | Waist Back, Vertical (Omphalion)            |                 |
|                    | Waist Back, Vertical (Omphalion)            | D56             |
| 86                 | Waist Breadth                               | 112             |
|                    | Waist-Buttock Drop (Natural Indentation)    | D57             |
| D40                | Waist-Buttock Drop (Omphalion)              | D58             |
|                    | Waist Circumference (Natural Indentation)   | 113             |
| 87                 | Waist Circumference (Omphalion)             | 114             |
| 88                 | Waist Depth                                 | 115             |
|                    | Waist Front Length (Natural Indentation)    | 116             |
|                    | Waist Front Length (Omphalion)              | 117             |
| 89                 | Waist Front Length, Sitting                 |                 |
|                    | Waist Height (Natural Indentation)          | 118             |
| 90                 | Waist Height (Omphalion)                    | 119             |
|                    | Waist Height, Sitting (Natural Indentation) | 120             |
|                    | Waist Height, Sitting (Omphalion)           | 121             |

TABLE F-1 Continued

| ANSUR II<br>Number | Dimension Name                                       | ANSUR<br>Number |
|--------------------|------------------------------------------------------|-----------------|
|                    | Waist-Hip Length                                     | 122             |
|                    | Waist (Natural Indentation)-Waist (Omphalion) Length | 123             |
|                    | Waist-Waist (Natural Indentation) Over Shoulder      | D59             |
| D41                | Waist-Waist (Omphalion) Over Shoulder                | D60             |
| 91                 | Weight                                               | 124             |
|                    | Wrist-Center of Grip Length                          | 125             |
| 92                 | Wrist Circumference                                  | 126             |
| 93                 | Wrist Height                                         | 127             |
|                    | Wrist Height, Sitting                                | 128             |
|                    | Wrist-Index Finger Length                            | 129             |
|                    | Wrist-Thumbtip Length                                | 130             |
|                    | Wrist-Wall Length                                    | 131             |
|                    | Wrist-Wall Length, Extended                          | 132             |

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## APPENDIX G

### COMPARABILITY OF ANSUR II DIMENSIONS WITH DIMENSIONS OF OTHER LARGE-SCALE SURVEYS

The primary objective of this appendix is to document the comparability of ANSUR II dimensions with like or similarly named dimensions measured in other large-scale anthropometric surveys. Data from surveys are frequently used to compare body size distributions among and between populations (e.g., males and females, occupational groups, racial groups, age categories). A particularly vexing problem in drawing conclusions from such comparisons is whether differences between the data reflect real population differences or are the result of using different techniques to measure what may be described or named as the same dimension. Differences in landmark definitions, subject positioning, instruments, and measuring techniques can and do lead to significantly different results.

It is particularly important that the body-size comparability among U.S. military populations be known. Items of personal-protective equipment, clothing, and weapon systems are sometimes designed to be used by more than one U.S. military service and/or by allied services in other countries. In recent years, design for commonality of use among North Atlantic Treaty Organization (NATO) services has received increased emphasis. This kind of cooperative effort requires knowledge of population distributions of dimensions, which form the basis for sizing, procurement, and issue of protective equipment, and determination of the comparability of persons who may be called upon to use often-restrictive workspaces, as in the case of pilots from one country undergoing training in another nation's aircraft.

Dimensions measured in ANSUR II are compared to like or similarly named dimensions measured in various surveys (Table G-1). The U.S. military surveys compared include Navy aviators (Gifford et al, 1965); Air Force (Churchill et al., 1977); Marine Corps (Donelson and Gordon, 1996); Army in 1966 (White and Churchill, 1971), 1970 (Churchill et al., 1977), and 1988 (Gordon et al., 1989); and female-personnel-only surveys from the Air Force (Clauser et al., 1972) and Army (Churchill et al., 1977). In addition, surveys of the Canadian Forces (McCann et al., 1975) and the Royal Air Force (Bolton et al., 1973), as well as two civilian surveys, the National Health and Nutrition Examination (NHANES) (CDC, 2012), and Civilian American and European Surface Anthropometry Resources (CAESAR) (Blackwell et al., 2002), were compared.

Data from the earlier military surveys serve as the basis for the design of current equipment, clothing, and systems. Many of these, of course, will remain in military inventories for some time. The following means were used to judge the comparability of ANSUR II dimensions to other survey dimensions:

1. published descriptions of the dimensions and how they were measured.
2. published definitions of the landmarks used.
3. examination of summary statistics.

4. a comparability table published in the ANSUR final report (Gordon et al., 1989). Table G-1 presents the authors' judgment about the comparability of the ANSUR II data to data from the other surveys listed. The following codes are used:

C - COMPARABLE – The landmarks and measuring techniques used are of such comparability that differences between data from surveys can be considered to reflect real anthropometric differences between populations.

PC - PROBABLY COMPARABLE – Differences in landmark definitions and/or measuring techniques exist. However the differences are not large enough to exclude these data from most human engineering applications such as the sizing, design, procurement, and issuing of military equipment or assessing the suitability of assigning personnel to restrictive workspaces.

NC - NOT COMPARABLE – Landmark differences and measuring techniques are believed to be different enough so that dimensions so coded should not be used as the basis for answering any population comparison questions.

CU - COMPARABILITY UNKNOWN – Several dimensions that are listed as CU were determined in other surveys by means other than direct measurement. Data from other dimensions coded CU reflect discrepancies for which no explanation is readily apparent.

The comparability between derived dimensions in ANSUR II and like dimensions measured directly in other surveys is, and will remain, unknown without extensive analyses. Therefore, derived dimensions do not appear in this table.

TABLE G-1

ANSUR II Dimensions: Assessment of Comparability with Other Surveys

| Dimension                    | U.S. Navy Aviators 1964<br>(Gifford et al., 1965) | U.S. Army 1966<br>(White and Churchill, 1971) | U.S. Army Aviators 1970<br>(Churchill et al., 1971) | U.S. Air Force 1967<br>(Churchill et al., 1977) | Royal Air Force 1970/1971<br>(Bolton et al., 1973) | Canadian Forces 1974<br>(McCann et al., 1975) | U. S. Air Force Women 1968<br>(Clauser et al., 1972) | U.S. Army Women 1977<br>(Churchill et al., 1977) | U.S. Army 1988<br>(Gordon et al., 1989) | U.S. Marine Corps 1994<br>(Donelson and Gordon, 1996) | NHANES<br>(CDC, 2012) | CAESAR<br>(Blackwell et al., 2002) |
|------------------------------|---------------------------------------------------|-----------------------------------------------|-----------------------------------------------------|-------------------------------------------------|----------------------------------------------------|-----------------------------------------------|------------------------------------------------------|--------------------------------------------------|-----------------------------------------|-------------------------------------------------------|-----------------------|------------------------------------|
| Abdominal Ext Depth, Sit     |                                                   |                                               |                                                     |                                                 | NC                                                 |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Acromial Height              |                                                   | NC                                            | PC                                                  | PC                                              |                                                    |                                               | PC                                                   | PC                                               | C                                       |                                                       |                       |                                    |
| Acromion-Radiale Length      |                                                   |                                               |                                                     | PC                                              |                                                    |                                               | PC                                                   | PC                                               | C                                       |                                                       | PC                    |                                    |
| Ankle Circumference          | C                                                 | C                                             | C                                                   | C                                               | C                                                  |                                               | C                                                    | C                                                | C                                       |                                                       |                       | NC                                 |
| Axilla Height                |                                                   |                                               |                                                     |                                                 | NC                                                 |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Ball of Foot Circumference   |                                                   | PC                                            | C                                                   | C                                               | NC                                                 |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Ball of Foot Length          |                                                   | C                                             | C                                                   | C                                               |                                                    |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Biacromial Breadth           | NC                                                | NC                                            | NC                                                  | NC                                              | NC                                                 | NC                                            | NC                                                   | NC                                               | C                                       |                                                       |                       | NC                                 |
| Biceps Circumference, Flexed | C                                                 | C                                             | C                                                   | C                                               | C                                                  | C                                             | C                                                    | C                                                | C                                       |                                                       |                       |                                    |
| Bicristal Breadth            | PC                                                |                                               |                                                     | PC                                              |                                                    |                                               | PC                                                   |                                                  |                                         |                                                       |                       |                                    |
| Bideltoid Breadth            |                                                   | C                                             | C                                                   | C                                               |                                                    | C                                             | C                                                    | C                                                | C                                       |                                                       |                       | C                                  |
| Bimalleolar Breadth          |                                                   |                                               |                                                     | C                                               |                                                    |                                               |                                                      |                                                  |                                         |                                                       |                       |                                    |
| Bitragion Chin Arc           |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      |                                                  | C                                       |                                                       |                       |                                    |
| Bitragion Submandibular Arc  | C                                                 |                                               |                                                     | C                                               |                                                    |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Bizygomatic Breadth          | PC                                                | C                                             | C                                                   | C                                               |                                                    | C                                             | C                                                    | C                                                | C                                       |                                                       |                       | C                                  |
| Buttock Circumference        | C                                                 | C                                             | C                                                   | C                                               | C                                                  | C                                             | C                                                    | C                                                | C                                       | C                                                     |                       | NC                                 |
| Buttock Depth                | C                                                 |                                               |                                                     | C                                               |                                                    |                                               | C                                                    | C                                                | C                                       |                                                       |                       |                                    |
| Buttock Height               |                                                   |                                               |                                                     | C                                               |                                                    |                                               | C                                                    | C                                                | C                                       |                                                       |                       |                                    |
| Buttock-Knee Length          | NC                                                | NC                                            | NC                                                  | NC                                              | NC                                                 |                                               | NC                                                   | NC                                               | C                                       |                                                       |                       | PC                                 |
| Buttock-Popliteal Length     | NC                                                | NC                                            | NC                                                  | NC                                              |                                                    | NC                                            | NC                                                   | NC                                               | C                                       |                                                       |                       |                                    |
| Calf Circumference           | C                                                 | C                                             | C                                                   | C                                               | C                                                  |                                               | C                                                    | C                                                | C                                       |                                                       | NC                    |                                    |
| Cervicale Height             | NC                                                | NC                                            | NC                                                  | NC                                              |                                                    |                                               | C                                                    | C                                                | PC                                      |                                                       |                       |                                    |
| Chest Breadth                | PC                                                | PC                                            | PC                                                  | PC                                              |                                                    |                                               | PC                                                   | PC                                               | NC                                      |                                                       |                       |                                    |
| Chest Circumference          | PC                                                | PC                                            | PC                                                  | PC                                              | PC                                                 | PC                                            | PC                                                   | PC                                               | C                                       | C                                                     |                       | NC                                 |
| Chest Depth                  | PC                                                | PC                                            | PC                                                  | PC                                              |                                                    |                                               | PC                                                   | PC                                               | PC                                      |                                                       |                       |                                    |
| Chest Height                 | CU                                                |                                               |                                                     | CU                                              |                                                    |                                               | CU                                                   | CU                                               | PC                                      |                                                       |                       |                                    |
| Crotch Height                | PC                                                | PC                                            | PC                                                  | PC                                              | PC                                                 | PC                                            | PC                                                   | PC                                               | C                                       |                                                       |                       | NC                                 |
| Crotch Length (Omphalion)    |                                                   |                                               |                                                     | NC                                              |                                                    |                                               |                                                      |                                                  | C                                       |                                                       |                       | NC                                 |
| Crotch Length, Post. (Omph)  |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      |                                                  | C                                       |                                                       |                       |                                    |
| Ear Breadth                  | C                                                 |                                               |                                                     | C                                               |                                                    |                                               | C                                                    | C                                                | C                                       |                                                       |                       |                                    |
| Ear Length                   | C                                                 |                                               |                                                     | C                                               |                                                    |                                               | C                                                    | C                                                | C                                       |                                                       |                       |                                    |
| Ear Protrusion               |                                                   |                                               |                                                     | NC                                              |                                                    |                                               |                                                      |                                                  | C                                       |                                                       |                       |                                    |
| Elbow Rest Height            | PC                                                |                                               | PC                                                  | PC                                              | PC                                                 |                                               |                                                      |                                                  | C                                       |                                                       |                       | C                                  |
| Eye Height, Sitting          | C                                                 | C                                             | C                                                   | C                                               |                                                    |                                               | C                                                    | C                                                | C                                       |                                                       |                       | C                                  |

TABLE G-1 Continued

| Dimension                     | U.S. Navy Aviators 1964<br>(Gifford et al., 1965) | U.S. Army 1966<br>(White and Churchill, 1971) | U.S. Army Aviators 1970<br>(Churchill et al., 1971) | U.S. Air Force 1967<br>(Churchill et al., 1977) | Royal Air Force 1970/1971<br>(Bolton et al., 1973) | Canadian Forces 1974<br>(McCann et al., 1975) | U. S. Air Force Women 1968<br>(Clauser et al., 1972) | U.S. Army Women 1977<br>(Churchill et al., 1977) | U.S. Army 1988<br>(Gordon et al., 1989) | U.S. Marine Corps 1994<br>(Donelson and Gordon, 1996) | NHANES<br>(CDC, 2012) | CAESAR<br>(Blackwell et al., 2002) |
|-------------------------------|---------------------------------------------------|-----------------------------------------------|-----------------------------------------------------|-------------------------------------------------|----------------------------------------------------|-----------------------------------------------|------------------------------------------------------|--------------------------------------------------|-----------------------------------------|-------------------------------------------------------|-----------------------|------------------------------------|
| Foot Breadth, Horizontal      | C                                                 | C                                             | C                                                   | C                                               | PC                                                 | C                                             | C                                                    | C                                                | C                                       | C                                                     |                       | PC                                 |
| Foot Length                   | C                                                 | C                                             | C                                                   | C                                               | PC                                                 | C                                             | C                                                    | C                                                | C                                       | C                                                     |                       |                                    |
| Forearm-Center of Grip Length |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      | PC                                               | PC                                      |                                                       |                       |                                    |
| Forearm Circ, Flexed          | PC                                                | PC                                            | PC                                                  | C                                               |                                                    |                                               | C                                                    | PC                                               | C                                       |                                                       |                       |                                    |
| Forearm-Forearm Breadth       |                                                   |                                               |                                                     | C                                               |                                                    |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Forearm Hand Length           | C                                                 | C                                             | C                                                   |                                                 | C                                                  |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Functional Leg Length         |                                                   |                                               | NC                                                  |                                                 | NC                                                 |                                               |                                                      | NC                                               | C                                       |                                                       |                       |                                    |
| Hand Breadth                  | C                                                 | C                                             | C                                                   | C                                               |                                                    | C                                             | C                                                    | C                                                | C                                       |                                                       |                       | PC                                 |
| Hand Circumference            | C                                                 | C                                             | C                                                   | C                                               |                                                    |                                               | C                                                    | C                                                | C                                       |                                                       |                       | PC                                 |
| Hand Length                   | PC                                                | PC                                            | PC                                                  | C                                               |                                                    | PC                                            | C                                                    | CU                                               | C                                       |                                                       |                       | PC                                 |
| Head Breadth                  | C                                                 | C                                             | C                                                   | C                                               | C                                                  | C                                             | C                                                    | C                                                | C                                       |                                                       |                       | C                                  |
| Head Circumference            | C                                                 | C                                             | C                                                   | C                                               | NC                                                 | NC                                            | C                                                    | C                                                | C                                       | C                                                     |                       | PC                                 |
| Head Length                   | C                                                 | C                                             | C                                                   | C                                               | C                                                  |                                               | C                                                    | C                                                | C                                       |                                                       |                       | C                                  |
| Heel-Ankle Circumference      |                                                   | C                                             | C                                                   | C                                               | NC                                                 |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Heel Breadth                  |                                                   | CU                                            | NC                                                  |                                                 |                                                    |                                               |                                                      | PC                                               | C                                       |                                                       |                       |                                    |
| Hip Breadth                   | PC                                                | PC                                            | PC                                                  | PC                                              |                                                    |                                               | PC                                                   | PC                                               | C                                       |                                                       |                       | C                                  |
| Hip Breadth, Sitting          | CU                                                | C                                             | NC                                                  | NC                                              |                                                    |                                               | NC                                                   | C                                                | C                                       |                                                       |                       |                                    |
| Iliocristale Height           |                                                   | C                                             |                                                     | PC                                              |                                                    |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |
| Interpupillary Breadth        | NC                                                | NC                                            | NC                                                  | NC                                              |                                                    |                                               |                                                      | NC                                               | C                                       |                                                       |                       |                                    |
| Interscye I                   | C                                                 | C                                             | C                                                   | NC                                              |                                                    |                                               | C                                                    | NC                                               | C                                       |                                                       |                       |                                    |
| Interscye II                  |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      | PC                                               | C                                       |                                                       |                       |                                    |
| Knee Height, Midpatella       |                                                   |                                               |                                                     | PC                                              |                                                    |                                               |                                                      |                                                  | C                                       |                                                       |                       |                                    |
| Knee Height, Sitting          | CU                                                | CU                                            | NC                                                  | C                                               | NC                                                 |                                               |                                                      | NC                                               | C                                       |                                                       |                       | C                                  |
| Lateral Fem Epicondyle Height |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      |                                                  | C                                       |                                                       |                       |                                    |
| Lateral Malleolus Height      |                                                   |                                               |                                                     | PC                                              |                                                    |                                               | CU                                                   |                                                  | C                                       |                                                       |                       |                                    |
| Lower Thigh Circumference     | PC                                                | PC                                            | PC                                                  |                                                 |                                                    |                                               |                                                      |                                                  | C                                       |                                                       |                       |                                    |
| Menton-Sellion Length         |                                                   | C                                             | NC                                                  | C                                               |                                                    | C                                             | NC                                                   | NC                                               | C                                       | C                                                     |                       | C                                  |
| Neck Circumference            | C                                                 | C                                             | C                                                   | NC                                              | C                                                  | NC                                            |                                                      |                                                  | C                                       |                                                       |                       |                                    |
| Neck Circumference, Base      |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      |                                                  | C                                       | NC                                                    | NC                    | NC                                 |
| Overhead Fingertip Reach, Sit |                                                   | NC                                            | C                                                   |                                                 |                                                    |                                               |                                                      | PC                                               | PC                                      |                                                       |                       |                                    |
| Palm Length                   |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      |                                                  | CU                                      |                                                       |                       |                                    |
| Popliteal Height              | NC                                                | NC                                            | NC                                                  | NC                                              |                                                    |                                               | NC                                                   | NC                                               | C                                       |                                                       |                       |                                    |
| Radiale-Stylian Length        |                                                   |                                               |                                                     | C                                               |                                                    |                                               | C                                                    | C                                                | C                                       |                                                       |                       |                                    |
| Shoulder Circumference        | C                                                 | C                                             | C                                                   | C                                               |                                                    |                                               | C                                                    | C                                                | PC                                      |                                                       |                       |                                    |
| Shoulder-Elbow Length         | NC                                                | PC                                            | PC                                                  | NC                                              |                                                    |                                               |                                                      | PC                                               | C                                       |                                                       |                       |                                    |

TABLE G-1 Continued

| Dimension                        | U.S. Navy Aviators 1964<br>(Gifford et al., 1965) | U.S. Army 1966<br>(White and Churchill, 1971) | U.S. Army Aviators 1970<br>(Churchill et al., 1971) | U.S. Air Force 1967<br>(Churchill et al., 1977) | Royal Air Force 1970/1971<br>(Bolton et al., 1973) | Canadian Forces 1974<br>(McCann et al., 1975) | U. S. Air Force Women 1968<br>(Clauser et al., 1972) | U.S. Army Women 1977<br>(Churchill et al., 1977) | U.S. Army 1988<br>(Gordon et al., 1989) | U.S. Marine Corps 1994<br>(Donelson and Gordon, 1996) | NHANES<br>(CDC, 2012) | CAESAR<br>(Blackwell et al., 2002) |
|----------------------------------|---------------------------------------------------|-----------------------------------------------|-----------------------------------------------------|-------------------------------------------------|----------------------------------------------------|-----------------------------------------------|------------------------------------------------------|--------------------------------------------------|-----------------------------------------|-------------------------------------------------------|-----------------------|------------------------------------|
| Shoulder Length                  | NC                                                | NC                                            | NC                                                  | NC                                              |                                                    |                                               | NC                                                   | NC                                               | C                                       |                                                       |                       |                                    |
| Sitting Height                   | C                                                 | C                                             | C                                                   | C                                               | NC                                                 |                                               | C                                                    | C                                                | C                                       | C                                                     |                       | C                                  |
| Sleeve Length: Spine-Wrist       | C                                                 | NC                                            | C                                                   | NC                                              |                                                    | C                                             | PC                                                   |                                                  | C                                       |                                                       |                       | NC                                 |
| Sleeve Outseam                   |                                                   |                                               |                                                     |                                                 |                                                    |                                               | NC                                                   |                                                  |                                         | C                                                     |                       |                                    |
| Span                             |                                                   |                                               |                                                     |                                                 |                                                    | C                                             |                                                      | C                                                |                                         |                                                       |                       |                                    |
| Stature                          | C                                                 | C                                             | C                                                   | C                                               | NC                                                 | C                                             | C                                                    | C                                                | C                                       | C                                                     | PC                    | PC                                 |
| Suprasternale Height             | C                                                 |                                               |                                                     | C                                               |                                                    |                                               | C                                                    | C                                                | C                                       |                                                       |                       |                                    |
| Tenth Rib Height                 |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      |                                                  |                                         |                                                       |                       |                                    |
| Thigh Circumference              | C                                                 | C                                             | C                                                   | C                                               | C                                                  |                                               | C                                                    | C                                                | C                                       |                                                       | NC                    | NC                                 |
| Thigh Clearance                  |                                                   |                                               | NC                                                  | C                                               | CU                                                 |                                               | NC                                                   | PC                                               | C                                       |                                                       |                       |                                    |
| Thumbtip Reach                   | PC                                                | PC                                            | PC                                                  | PC                                              | PC                                                 | PC                                            | PC                                                   | PC                                               | C                                       |                                                       |                       | PC                                 |
| Tibial Height                    |                                                   |                                               |                                                     |                                                 |                                                    |                                               |                                                      |                                                  |                                         |                                                       |                       |                                    |
| Tragion-Top of Head              | PC                                                | PC                                            | PC                                                  | PC                                              | PC                                                 |                                               | PC                                                   | CU                                               | PC                                      |                                                       |                       |                                    |
| Trochanterion Height             |                                                   |                                               |                                                     | C                                               |                                                    |                                               | NC                                                   | C                                                | C                                       |                                                       |                       |                                    |
| Vertical Trunk Circ (USA)        | NC                                                | PC                                            | NC                                                  | NC                                              |                                                    | C                                             | PC                                                   | PC                                               | C                                       |                                                       |                       |                                    |
| Waist Back Length<br>(Omphalion) |                                                   | CU                                            | CU                                                  | CU                                              |                                                    |                                               |                                                      |                                                  | PC                                      |                                                       |                       |                                    |
| Waist Breadth                    | NC                                                |                                               |                                                     | C                                               |                                                    |                                               | NC                                                   | NC                                               | C                                       |                                                       |                       |                                    |
| Waist Circumference (Omph)       |                                                   | C                                             | C                                                   | C                                               |                                                    | C                                             |                                                      |                                                  | C                                       | C                                                     | NC                    |                                    |
| Waist Depth                      | NC                                                |                                               |                                                     | C                                               |                                                    |                                               | NC                                                   | NC                                               | C                                       |                                                       |                       |                                    |
| Waist Front Length, Sitting      |                                                   |                                               |                                                     | NC                                              |                                                    |                                               |                                                      |                                                  |                                         |                                                       |                       |                                    |
| Waist Height (Omphalion)         |                                                   | C                                             | C                                                   | C                                               |                                                    |                                               |                                                      |                                                  | C                                       | C                                                     |                       |                                    |
| Weight                           | C                                                 | C                                             | C                                                   | C                                               | C                                                  | C                                             | C                                                    | C                                                | C                                       | C                                                     | C                     | C                                  |
| Wrist Circumference              | NC                                                | NC                                            | NC                                                  | C                                               | C                                                  |                                               | C                                                    | C                                                | C                                       |                                                       |                       |                                    |
| Wrist Height                     |                                                   |                                               |                                                     | C                                               |                                                    |                                               |                                                      | C                                                | C                                       |                                                       |                       |                                    |

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## APPENDIX H

### DEMOGRAPHIC/BIOGRAPHICAL FORM (Reprint of original)

FOR OFFICIAL USE ONLY WHEN COMPLETED. MAY CONTAIN PRIVACY ACT INFORMATION

#### US Army Anthropometric Survey (ANSUR II)

#### Natick Soldier Research, Development & Engineering Center Biographical Questionnaire

Thank you for helping to update the Army's anthropometric database.

#### INSTRUCTIONS:

Please respond to the questions on the following pages by completely filling in the bubble that corresponds with your answer. Please do not use checkmarks or Xs.

#### Marking Instructions

Use a No. 2 pencil, only. Do not use ink, ballpoint pen, or felt tip pens.

Make solid marks that fill the response completely.

Erase cleanly any marks that you want to change.

Make any write-in responses on the lines or boxes provided.

Correct: ●

Incorrect: ☑ ☒ ☓ ☔

1. Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_

2. What is your gender? ☐ Male ☐ Female

3. What is your current rank / grade?

| Enlisted  | Warrant Officer | Officer |
|-----------|-----------------|---------|
| ① Private | ① W01           | ① 2LT   |
| ② PV2     | ② CW2           | ② 1LT   |
| ③ PFC     | ③ CW3           | ③ CAPT  |
| ④ CPL     | ④ CW4           | ④ MAJ   |
| ④ SPC     | ⑤ CW5           | ⑤ LTC   |
| ⑤ SGT     |                 | ⑥ COL   |
| ⑥ SSG     |                 | ⑦ BG    |
| ⑦ SFC     |                 | ⑧ MG    |
| ⑧ MSG     |                 | ⑨ LTG   |
| ⑧ 1SG     |                 | ⑩ GEN   |
| ⑨ SGM     |                 |         |
| ⑨ CSM     |                 |         |
| ⑨ SMA     |                 |         |

4. Today's date: (mm/dd/yyyy) \_\_\_\_ / \_\_\_\_ / \_\_\_\_

5. Installation: \_\_\_\_\_

Natick Form 3094 (One-Time)  
 06 Apr 2011

6. Component: ☐ Regular Army ☐ Army Reserve ☐ Army National Guard

7. Branch you are in:

- ☐ Combat Arms ☐ Combat Service Support  
☐ Combat Support (CSS incl: Med, Vet, Dental, JAG, Chaplain, etc.)

8. Please identify your UIC by number: (ex: WJM5BO, W1D1AA, W6DW04)

\_\_\_\_\_

9. Please identify your primary MOS: (ex: 11B; 19D; 79R; 13B; 15P; 25X; 38B; 68A)

\_\_\_\_\_

10. Please identify the state, territory, foreign country or military installation where you were born. \_\_\_\_\_

11. Your Population Subgroup: (please mark all that apply)

- ☐ White, not of Hispanic Origin
- ☐ Black, not of Hispanic Origin
- ☐ Hispanic (please mark all that apply)
- ☐ Mexican ☐ Latin American: \_\_\_\_\_
- ☐ Puerto Rican ☐ Other Hispanic: \_\_\_\_\_
- ☐ Cuban
- ☐ Asian or Pacific Islander (please mark all that apply)
- ☐ Chinese ☐ Japanese ☐ Korean
- ☐ Vietnamese ☐ Filipino ☐ Samoan
- ☐ Guamanian/Chamorro ☐ Melanesian ☐ Micronesian
- ☐ Polynesian ☐ Other Pacific Islander: \_\_\_\_\_
- ☐ Other Asian: \_\_\_\_\_
- ☐ Native American (please mark all that apply)
- ☐ Eskimo ☐ Aleut ☐ U.S./Canadian Tribe(s): \_\_\_\_\_
- ☐ Other (please mark all that apply)
- ☐ East / Asian Indian ☐ Arab or Middle Eastern
- ☐ Caribbean Islander ☐ Other: \_\_\_\_\_

What single group do you usually select on military questionnaires that offer only the following options?

- ☐ White ☐ Black ☐ Hispanic ☐ Asian ☐ Pacific Islander ☐ Amer. Indian/Alaskan Native

12. Please identify the state, territory, foreign country or military installation where your MOTHER was born. \_\_\_\_\_
13. Your MOTHER'S Population Subgroup. (Please mark all that apply.)
- ☐ White, not of Hispanic Origin
  - ☐ Black, not of Hispanic Origin
  - ☐ Hispanic (please specify) \_\_\_\_\_
  - ☐ Asian or Pacific Islander (please specify) \_\_\_\_\_
  - ☐ Native American (please specify) \_\_\_\_\_
  - ☐ Other (please specify) \_\_\_\_\_
  - ☐ Don't know
14. Please identify the state, territory, foreign country or military installation where your FATHER was born. \_\_\_\_\_
15. Your FATHER'S Population Subgroup. (Please mark all that apply.)
- ☐ White, not of Hispanic Origin
  - ☐ Black, not of Hispanic Origin
  - ☐ Hispanic (please specify) \_\_\_\_\_
  - ☐ Asian or Pacific Islander (please specify) \_\_\_\_\_
  - ☐ Native American (please specify) \_\_\_\_\_
  - ☐ Other (please specify) \_\_\_\_\_
  - ☐ Don't know
16. When did you return from your last deployment?
- ☐ Never deployed
  - ☐ Less than 1 month ago
  - ☐ 1-3 months ago
  - ☐ 4-6 months ago
  - ☐ 7-12 months ago
  - ☐ More than 1 year ago
17. Where were you last deployed?
- ☐ Iraq
  - ☐ Other \_\_\_\_\_
  - ☐ Afghanistan
  - ☐ N/A (I have never deployed)
18. Are you scheduled for deployment in the near future?
- ☐ Not scheduled
  - ☐ Less than 6 months from now
  - ☐ More than 6 months from now
  - ☐ Don't know

Continued on other side...

Write-in answers to the following questions on the lines provided.

Fill in the bubbles below each question to correspond to the numbers you enter on the line.

For numbers which are only 1 digit, fill in a zero in the first column. (See example)

| <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <div style="text-align: center; border-bottom: 1px solid black; margin-bottom: 5px;">6</div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"><input checked="" type="radio"/> 0</div> <div style="text-align: center;"><input type="radio"/> 1</div> </div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 1 <input type="radio"/> 1</div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 2 <input type="radio"/> 2</div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 3 <input type="radio"/> 3</div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 4 <input type="radio"/> 4</div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 5 <input type="radio"/> 5</div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 6 <input checked="" type="radio"/></div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 7 <input type="radio"/> 7</div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 8 <input type="radio"/> 8</div> <div style="display: flex; justify-content: space-around;"><input type="radio"/> 9 <input type="radio"/> 9</div> </div> | <p>19. 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23. Writing preference:

- ☐ Right hand
 ☐ Left hand
 ☐ Either hand (no preference)

**Please do not write in the area below this line**

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## APPENDIX I

### GLOSSARY OF ANATOMICAL AND ANTHROPOMETRIC TERMS

Acromion - tip of the shoulder

Acromial process - an oblong portion of the shoulder blade at the top of the shoulder

Anatomical position - a standard position of the body to which all anatomical directions (e.g., superior, medial, anterior) are referenced (see figure I-1)

Anterior - pertaining to the front of the body; to the opposite of posterior

Axilla - armpit

Bi - a prefix denoting connection with or relation to each of two symmetrically paired parts

Biceps - used to refer to the two heads of a muscle; the term is most commonly used to refer to the large muscle on the anterior surface of the upper arm (biceps brachii).

Canthus - a corner or angle formed by the meeting of the eyelids

Coronal plane - any vertical plane at right angles to the midsagittal plane; divides the body into anterior and posterior divisions (see figure I-1)

Deltoid muscle - the muscle that forms the flesh of the lateral side of the upper third of the upper arm

Distal - farther from the trunk of the body, as opposed to proximal (see figure I-1)

Dorsal - pertaining to the back of the body or one of its parts [on the hand, its top surface as opposed to its palmar surface and on the foot, its top surface as opposed to its plantar (bottom) surface].

Epicondyle - the bony prominence at the distal end of the humerus and femur (bones)

Extend - to move adjacent segments of a limb so that the angle between them is increased, as when the leg is straightened; as opposed to flex

Femoral epicondyle - the bony projections on either side of the distal end of the femur

Femur - the thigh bone

Flex - to move adjacent segments of a limb in such a direction as to bring the two parts together, as when the elbow is bent; as opposed to extend

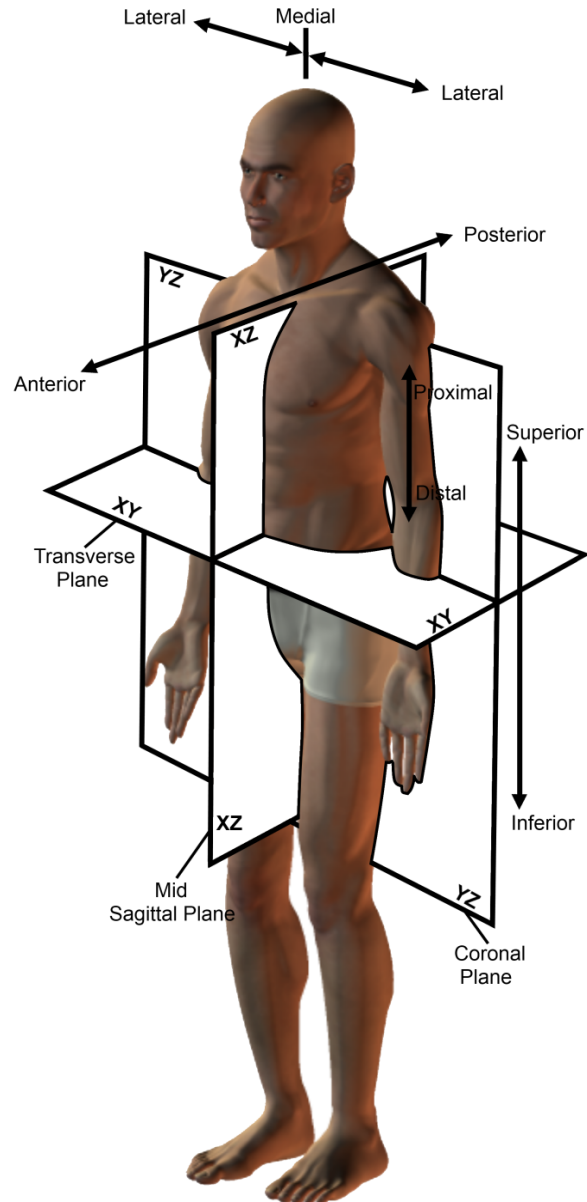


Figure I-1

### Anatomical Position and Terminology

Frankfurt plane - the standard horizontal plane orientation of the head; the plane is established by a line passing through the right trignon (approximate earhole) and the lowest point of the right orbitale (eye socket)

Gluteal furrow - the crease at the juncture of the buttock and the thigh

Hyperextend - to overextend a limb or other part of the body

Iliac - pertaining to the ilium, one of the three fused bones that form one side of the pelvis

Iliac crest - the superior rim of the ilium

Inferior - below, in relation to another structure; lower (see figure I-1)

Lateral - away from the midline of the body; as opposed to medial (see figure I-1)

Malleoli - rounded bony projection on either side of the ankle; the lateral malleolus, on the outside of the ankle, is at the distal end of the fibula (one of the two bones of the calf); the medial malleolus, on the inside of the ankle, is at the distal end of the tibia (the shin bone)

Mandible - the lower jawbone

Mastoid process - lowest bony projection behind and below the ear—best felt immediately behind the earlobe

Medial - lying near or toward the midline of the body; as opposed to lateral (see figure I-1)

Metacarpophalangeal joint - a joint (knuckle) formed by the juncture of a finger bone (phalanx) with the palm bone (metacarpal)

Metatarsophalangeal joint - a joint formed by the juncture of a toe bone (phalanx) with the foot bone (metatarsal)

Midsagittal - the vertical plane that divides the body into equal right and left halves (see figure I-1)

Olecranon - the proximal end of the ulna (the elbow)

Omphalion - the navel

Orbit – the bony socket in which the eye rests

Palmar - pertaining to the palm side of the hand; as opposed to its dorsal surface

Patella - the kneecap

Phalanx - a finger or toe bone

Popliteal fossa - dorsal juncture of the calf and thigh; back of the knee

Posterior - pertaining to the back of the body; as opposed to anterior (see figure I-1)

Proximal - closer to the trunk of the body; as opposed to distal (see figure I-1)

Radius - the bone of the forearm on the thumb side of the arm

Scye - a tailoring term referring to the armhole of a garment

Sternum - the breast bone

Stylian - the lowest point at the bottom of the radius (bone)

Superior - above, in relation to another structure (see figure I-1)

Supra - prefix designating above or on

Supraorbital ridges - the brow ridges above the eye sockets at the bottom of the forehead

Thelion - the center of the nipple on men

Tibia - the shin bone

Tragion - the juncture of the top of the cartilaginous flap of the ear with the head

Tragus - the cartilaginous flap of the ear near the earhole

Trapezius - the large muscle that originates on the neck and the upper half of the back and converges on the shoulder between midshoulder and acromion

Trochanter - a point in the center of the lateral side of the large prominence at the top of the thigh bone (femur), located on a sitting subject

Ventral - the front or inside surface

Vertebra - a bone of the spine; in humans there are 7 cervical (neck), 12 thoracic (chest), 5 lumbar (lower back), 5 sacral (fused), and 4 caudal (tail, also fused) vertebrae

Zygomatic arch - the bony arch below and to the side of the orbit of the skull extending horizontally along the side of the head from the cheekbone (the zygomatic bone) nearly to the external ear

Zygomatic bone - a bone of the face underlying the upper part of the cheek