A Study of the Anthropometric Dimensions of the Lower Body of Young Men in Western China

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Abstract

A survey was performed to measure the anthropometric dimensions of 201 young men, with ages ranging from 18-28 years, in Western China. A total of 25 anthropometric dimensions were measured for these young men. Mean values, standard deviations, 5th, 50th and 95th percentiles for these anthropometric dimensions and 7 body proportions were determined. Subsequently, the anthropometric dimensions of these young men were compared with those from central and eastern regions of China and also national standards. It was found that the body shapes of the young Western Chinese men were significantly different from those of other regions. In addition, the following five factors were identified, according to a factor analysis of the data obtained in the study: waist girth, abdominal girth and waist height, as being the most important anthropometric variables to be considered when designing trousers.

Keywords: Anthropometric Dimensions; Western China; Young Men; Lower Body

1   Introduction

It is very important for product design to have some knowledge of the anthropometric dimensions [1] of the target consumer population. Consequently, collecting anthropometric data and the subsequent analysis of body dimensions are receiving an increasing amount of attention. In some countries, anthropometric databases for different population groups such as civilians, military personnel, students, and workers [2, 3] have been established. Scholars have performed anthropometric studies on female chests [4-7] and elderly people [8-13]. As it is commonly known, human body shapes also differ between regions [14]. Ethnic diversity may lead to differences in anthropometric data. In China, some researchers have conducted studies to analyze the body shapes of adult men from different regions [15-21]. However, only a few studies have been published concerning investigations into the anthropometric data of young men's lower bodies [21-23]. An investigation into young men's lower body dimensions and an analysis of such data is essential for the purpose of improving the design of products, intended to fit young men.

The aim of this study, therefore, was to generate and analyze lower body anthropometric data for a population of young men in Western China in order to compare these data with data from

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similar studies of young men from other regions of China and to provide information to improve the design and fit of trousers for manufacturers and retailers.

2   Method

2.1   Subjects

201 healthy young men between 18 and 28 years of age were enrolled in this study. The subjects were born and bred, and currently live in Western China.

2.2   Equipment

A Tecmath non-contact 3D body scanner system (Tecmath Company, Germany) [24] was used to take measurements in the study. The system consists of VitusSmart 3D laser body scanning hardware and ScanWorx digital body measurement software. The scanning process is completed within 20 seconds, during which, over 50 million data points for a human body can be captured and more than 100 human-related critical dimensions can be obtained by the system. It can measure to within an accuracy of 0.2 mm.

2.3   Procedure

The subjects were required to be barefoot and wear only tight-fitting underwear. Two trained experimenters, who were familiar with the equipment and measurement procedures, performed all the measurements. The subjects were informed about the objectives, body dimensions, clothing requirements and the measurement procedures of the study [25] beforehand. The subjects were required to stand on the footprints indicated on the floor of the scanning room and look straight ahead with their hands holding the handles. In the scanning process, the subjects were required to keep a steady posture. After the scan was completed, 3D point data were automatically generated and saved in the specific file format "csf" for further analysis by the ScanWorx software.

2.4   Body Dimensions

25 body dimensions, which included ten vertical measurements, 13 horizontal measurements and two angular measurements, were identified for analysis in this study. The definitions of these anthropometric dimensions were based on the recommendations of the National Standardization and International Standardization [26, 27]. The body dimensions include Stature, Waist height, Hip height, Crotch height, Knee height, Waist girth, Hip girth, Abdominal girth, Thigh girth, Knee girth, Ankle girth, Waist depth, Abdominal depth, Hip depth, Waist breadth and Abdominal breadth. The landmark definitions of a further nine, additional, anthropometric dimensions, which are not included in the standards, are presented in Table 1. Diagrams showing the dimensions measured are presented in Fig. 1 [28].