Head Shape Comparisons between Korean and American

Jinhee Lee, Ph.D.
Fashion Design & Industry, Wonkwang University, South Korea

Su- Jeong Hwang Shin, Ph.D.
Texas Tech University, Lubbock, TX, U.S.A.

Cynthia L. Istook, Ph.D.
North Carolina State University, Raleigh, NC, U.S.A.

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Human body measurement data is important for the apparel industry. Accurate data is very useful for developing sizing systems, comfort fit, and safety products. Head measurement data is tightly related to the sizing systems to develop head production for protection. The measurement data is very important to develop head products for a protection purpose such as hats, hardhats, and helmets. For instance, helmets are useful tools for protecting the head in hazardous environments such as construction sites, military excursions, professional sports, or vigorous activities. On the other hand, there are demands of hats for fashion styles. A good fit with comfort design is essential for developing hat production for either protection or fashion style. This requires an accurate measurement of head shapes. Average people try on several different styles and sizes of hats to find a good fit. Since people are not able to describe their head shape or their hat sizes, they are not able to describe problems of the fit.

A method of initial three dimension forms for assisting in the early stages of helmet design was devised in the early 1990s (Robinette & Whitestone, 1992). Using body scan technology, head geometry can be captured in a few seconds. Further, fitting to maximize performance of helmet mounted display systems has been studied in the CARD (Computerized Anthropometric Research & Design Laboratory) in the Warfighter Interface Division located at Wright-Patterson Air Force Base (Whitestone & Robinette, 2002). In the study, to identify fit problems such as asymmetry, designers needed fit test results that included both the fit quantification information and the three dimension spatial location of the head with respect to the helmet in sufficient detail to visualize the relationship. The ability to measure the three dimension geometry permits accurate identification and correction of fit problems.

There are several national sizing surveys to provide current apparel sizing systems.
In South Korea, ATS (Agency for Technology and Standards) have anthropometrical data from surveys taken every 4 to 6 years. More recently, Size Korea survey (2003) for South Korea was conducted for two years to collect data for developing industrial products. SizeUK (2002) for the British population and SizeUSA (2003) for the United States population were conducted in each nation sites, using advanced measurement technology, the 3D body scanner. However, head dimensions were not included in these national sizing surveys. Only little study of head dimensions was found.

Currently, the importance of global production is increasing. When we consider global production between America and Korea, it is necessary to compare head dimension data. However, there is not enough head data to develop sizing systems for global head products in both Korea and America. The purpose of study is to provide head measurement data and to suggest international head sizing systems by comparing different head shapes between American and Korean people.

The head dimension data was collected from two locations: South Korea and Texas in the United States. During our survey, 214 Korean men (age 18-23) and 105 American men (age 18-55)-participated in this survey. Martin instrument was used to measure head dimensions. In this study, four landmarks were used: Gallabella (The anterior point on the frontal bone midway between the bony brow ridges), Menton (Bottom of the chin), Tragion (The superior point on the juncture of the cartilaginous flap of the ear with the head), and Zygion (The lateral point on the zygomatic arch, chick bone). Martin Measurement Instrument’s spreading caliper and a measuring tape were used to size head dimensions. Acrylic panel (size in cm: 40(height) x 24 (width) x 0.1 (depth)) were used for top of head measurements. In this study, measurement methods were based on Lee’s head study method (2004) and a measurer’s handbook (Clauser, et al., 1988) that was used for U.S. army anthropometric survey. T-test, factor analysis, and cluster analysis were used for statistic analysis. The head shapes were analyzed in the following categories: girth, length, width, and height. Total nine items were measured and two calculated ratios were used.

According to statistical analyses, height was not significantly different between Korean men and American men. The head dimensions show significant differences between Korean men and American men (**p<.001). For example, in menton-top of head, Korean men had 1.7 cm smaller than American men. In head breadth and head thickness, Korean men had larger head breadth than Americans’, while American men had deeper head thickness than Korean men. This indicates that American men’s head shapes are horizontally narrower, vertically longer, and longer length from the front of the head to back of the head than Koreans’.
In addition, Bizygomatic breadth (t-value 12.1***, p<.001) was significantly different between the American men and Korean. This indicates that American men have smaller faces as well as head shapes.

Factor analysis was performed for the two groups, Korean and American. In the analysis Koreans’ head shapes were categorized with 3 factors, including depth factor, width factor, and length factor, while the Americans’ head shapes were categorized with 4 factors, including depth factor, width factor, length factor, and girth factor. According to the head shape distributions, in Korea, narrow head was the most dominant head shape, small head in next dominant, big head, and long head (very less dominant head shape). On the other hand, in America, big head was the most dominant head shape, small head, narrow head and long head (very less dominant head shape). Long head shape was not common in both countries. While small head shape and narrow head shape showed similar distributions in both countries. This indicates that Korean men in the young age group (18-25) have very similar head shapes to American men’s and Korean’s westernized lifestyle and nutrition.

This study provides a small picture of the existence of head shape variations between two cultures of men. It would seem essential that manufacturers that produce head protection goods create products with this in mind. In the end, with better data available, those that develop head safety products and hats will be better able to serve their customers.

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