

Development of grading rules based on lower body type for leg guard production

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Baseball has been an important part of daily leisure activity as a modern day sport to refresh people. Leg guards are mandatory during baseball sports activities; however, they are not manufactured to fit different body types. Most have size charts only distinguished by labels indicating if they are for a child, youth, or adult, which makes it difficult to purchase the appropriate size and cause discomfort to wearers. The development of size charts has largely focused on clothing and not protective gear. Studies on the size of protective gear for a specific body part such as the legs have rarely been conducted. Therefore, in order to design leg guards with the appropriate fit, lower body types need to be categorized and analysis of the comparison of size by body shape is required. The purpose of this study was to classify the body types of Korean men based on measurement and suggest a grading rule chart by body type to improve the fit of leg guards.

For categorization of lower body type, the 6th Anthropometry of Size Korea (2010 Size Korea data) was used. Among body measurement items of 2,169 men aged 20-49 years, data from 21 items related to production of leg guards was used to conduct factor analysis. K-means clustering was conducted to categorize the lower body into several defining characteristics. A t-test was used to analyze differences among body type groups categorized by clustering. Size combination, which had more than 2-5% of frequency in two-factor frequency analysis and two-factor distribution table, was re-tabulated in a multi-frequency distribution table to produce a grading rule chart. In addition, a grading rule deviation was proportionally calculated by taking into consideration the body surface coverage of leg guards and skin length deformation during 120° of knee flexion (Lee et al., 2015). For data and statistical analysis, the SPSS (Version 22) program was used.

As a result of factor analysis, three factors were found. Factor 1 was 'lower body size', factor 2, 'lower body height', and factor 3, 'lower body muscles'. Regarding categorization of men's lower body type, group 1 (922 persons) had a larger circumference and height of the lower body and more developed lower body muscles. Group 2 (1186 persons) had a smaller circumference and height of the lower body and less developed lower body muscles. Using the height of the lower body parts, both groups can be illustrated in five sections. Regarding two-factor frequency analysis, mid-thigh circumference was divided into two groups by respective height sections to

produce a combination grading system. Figure 1 shows each group’s results of the grading rule chart according to thigh circumference in 10 size charts depending on height. The range of grading rule deviation for length was approximately 0.6 to 2.0 cm and for circumference, approximately 0.3 to 2.0 cm, in order to provide leg guards with the appropriate size fit for various body types. The grading rule chart presented in this study will improve size specification suitability with the use of our data, reflecting the lower body shape and dimensions of Korean men.

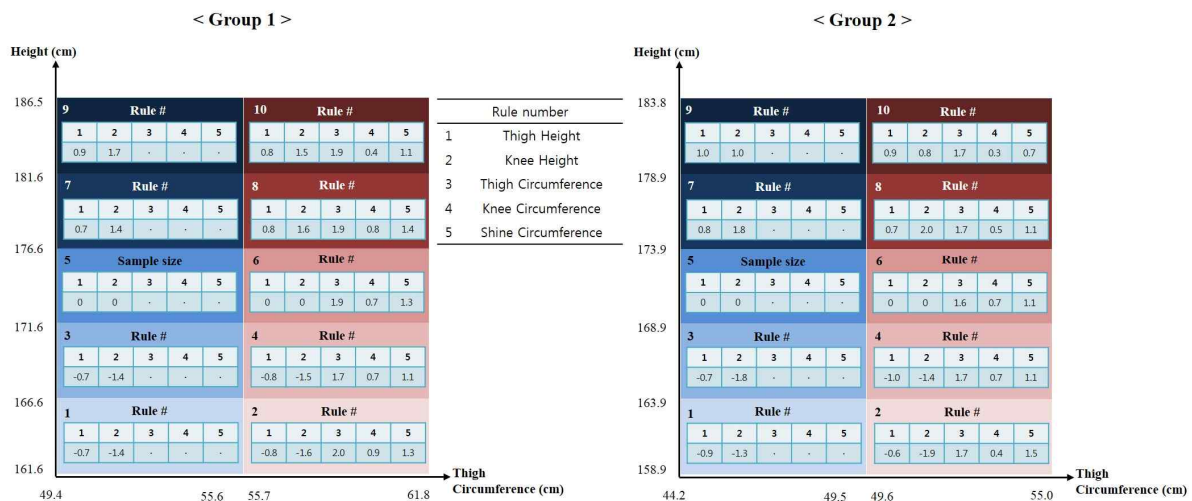


Figure 1. The grading rule chart of group1 and group2

References

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