Investigation of usability and improvement strategy for national sizing database

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ABSTRACT

Objective: This study investigated how well the present national sizing database such as Size Korea adopted by the companies and industries in Korea, in particular how well the dynamic anthropometric data are used.

Background: The dynamic anthropometric data collection had begun since 1996 in South Korea. The dynamic anthropometric data can contribute to a more appropriate design of workplaces, tools, and the equipment's which indirectly will produce a positive impact on workers' well-being, increase productivity, and overall process improvement. Even though there have been lots of applications of dynamic data, the usability of those data among the Korean industries are limited. **Method:** The investigation consisted of 3 stages were literature review, expert review and in-depth interview. The literature review was conducted in PubMed using combinations of keywords (for example: dynamic anthropometry, dynamic anthropometry application, applicability of anthropometric data, furniture design and so on). A total of 1,000 participants were recruited from Korean civilian for online survey. For online survey, the survey questionnaire was developed by the experts in the field of anthropometry. Finally, the in-depth interview was conducted with the industrial professionals and professors. **Results:** This study found that many companies needed various dynamic anthropometric data particularly automobile, heavy equipment, medical, ship, mattress, construction industries needed various dynamic anthropometric data namely ROM, the angle between the body parts, spine curvature data, center of pressure and so on.

Conclusion and Application: The inclusion of those dynamic anthropometric data in the national sizing database could benefit industries for effective product design and increase the usability of products.

Keywords: Dynamic anthropometry, Size Korea database, usability

1. Introduction

Anthropometric data are used for proper design of workstations, equipment, furniture, and so on in order to decrease awkward postures and stress on human body due to improper design (Bolstad et al., 2001). Anthropometry is the measurement of the dimensions of the body and other physical characteristics. It is further classified into two types: structural and functional (Yoon et al., 2002). The structural anthropometry is the measure of body dimensions in a series of static postures and the dynamic anthropometry is the measure of body dimensions when the body is in motion.

There were lots of dynamic anthropometry studies conducted around the world. The dynamic anthropometric dimensions can contribute to a more appropriate design of workplaces, tools, and the equipment's which indirectly will produce a positive impact on workers' well-being, increase productivity, and overall process improvement (Ibarra-Mejia et al., 2010). Hertzberg (1960) reported the dynamic anthropometry of working positions. Han (2000) reported that dynamic anthropometric data contributed to improve human comfort, and reduce worker fatigue.

The percentage of the aged is expected to grow from 9.4% in 2005 to 14.4% in 2019, and then will reach 35.1% in 2050 (Jeon and Shin, 2010). Korea is not only

aging faster than any other country in the world, it is expected to become the most aged country by mid-21st century (Paul 2009). With decreasing mobility, aged people find difficulties in their daily life.

This study investigated how well the present national sizing database (Size Korea) adopted by the companies and industries in Korea. The investigation performed by literature review, expert review of selected questionnaire items, personal in-depth interviews, and online.

2. Method

This study consist of 3 stages such as literature review, expert review for questionnaire items and in-depth interview.

2.1 Literature review

A systematic literature review of dynamic anthropometry was conducted in PubMed using the following keywords and their combinations: “dynamic anthropometry”, “dynamic anthropometry application”, “applicability of anthropometric data”, “furniture”, “design”, “automobile”, “helmet”, and so on

The literature search restricted to the period from 2003 to 2013. The search was restricted to articles written in English. A total of 352 articles was accessed by searching keywords for the last 10 years.

2.2 Questionnaire

The question was: do you need the dynamic anthropometry data in your work field? The online survey was conducted using survey agency.

Table 1. Number of respondent ($N=1000$)

		Number of sample	Rate (%)
Sex	Male	505	50.5
	Female	495	49.5

2.3 Depths interview

In-depth interview was conducted with professionals from the industries and with two university professors. The interview content was sent to the respondents in advance (about a week) to prepare the respondents for in-depth interviews.

3. Results

3.1 Literature review

The results of the literature review on applications of dynamic anthropometric data are arranged based on the ranking: standard, automobile, garment, furniture, medicine, human modeling, wheel chair, station (bus station and so on), heavy equipment, mask, helmet, playing facilities, home interior, manual device, work table.

3.2 Online survey

The results for the question “Do you need the dynamic anthropometry data in your work field?” that over 70% of the respondents were needed the data for their work field (Table 2).

Table 2. The response rate

		Number of sample	Yes (%)	No (%)	Rate (%)
Total		1,000	71.8	28.2	100
Sex	Male	505	69.3	30.7	100
	Female	495	74.3	25.7	100

3.3 Depths interview and descriptive questionnaire

The in-depth interview was conducted with professionals and professors. The in-depth interview results were mainly classified as: automobile assembly line, automotive seat design and mattress industry. The dynamic anthropometry data requested: ROM (range of motion), angle, seat contact area, spine curvature by using X-ray picture on each body part in whole industries.

4. Discussion

Anthropometry data being collected in static posture (structural anthropometry) in Korea. However, the demand for the dynamic anthropometry data is constantly increasing among industrial professionals for many applications.

First, it is needed to have workers ROM data and push force to assemble the automotive A-pillar in the automotive assembly line. Those data could help to make breaks and shift schedules.

Second, automotive seat manufacturing industries required various ROM data and joint angles of Korea population. Specially, head, neck, torso, hip, knee, and ankle angles. In Korea, car designers utilizing American's body size and angle data. The seat designed with American body dimension not comfortable for the Korean.

Third, mattress makers requested spine curvature and ROM data. The spinal curvature data could be used to classify and select an appropriate mattress for the users (Bergholdt et al, 2008). The size of the mattress can be decided using ROM data, when one or two people lying on the mattress.

5. Conclusion

The inclusion of those dynamic anthropometric data in the national sizing database could benefit industries for effective product design and increase the usability of products.

Acknowledgements

This work was funded by grants from Korean Agency for Technology and Standards.

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