An Analysis of the 3D Sample Size Model Built by Individual Users

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Significance of Research. Current apparel CAD technology enables manufactures to develop products rapidly in an efficient way. In addition, 3D technologies with virtual models are considered for an advanced design process. This can help a technical designer visualize the entire process from 2D pattern creation to end product fit assessment on a 3D virtual model. The 3D virtual design tools are offered by several apparel CAD vendors. The 3D virtual design tools offer two ways to create 3D virtual models: 1) a manual 3D formation and 2) a 3D body scan. The manual 3D formation is an indirect virtual model that users can build from a built-in feature or a pre-existing 3D body template by manually inputting actual measurements.

The 3D body scan is a direct morph image from a scan, in which a virtual model is directly imported. This provides highly consistent measurements since the virtual model is automatically morphed at over a thousand points on the scanned body. Several studies (Thomassy & Bruniaux, 2013; Song & Ashdown, 2013) have shown successful outcomes of using virtual garment evaluation with the 3D body scan images. The virtual body image is an open-source format which can be imported into several 3D applications; Maya, 3D Studio Max, and other apparel 3D applications supporting OBJ file format. According to Thomassy & Bruniaux (2013), the body scan image enables evaluation of the overall 3D outfit in an efficient and reliable way.

However, scanning individuals to create a sample model is challenging for apparel manufactures due to the high cost of 3D tools and unacquainted procedure. The manual 3D formation is commonly accepted by technical designers. Users edit or input measurements from the built-in 3D body template for a sample size model: one model for one type of body silhouette. This may not be difficult for the experienced users dealing with one sample body, but for learning users the following questions were raised.

Question 1: Having one type of body silhouette (e.g. Hourglass- a common body shape in the apparel industry), would individual users have a consensus of the sample size model? Question 2: Would having more information of body dimensions increase consistency of a virtual model of the sample size? Thus, the purpose of this study was to examine differences in the manual 3D formation results when using more or less points of measurement and through the change of users.

Method. In this experimental study, seven apparel CAD pattern program users were trained and asked to create two virtual models for the one size, which is “Sample Size 8” in an

hourglass silhouette. The first virtual model (Model A), users were asked to use a long reference of the sample size that contains 39 measurements from ASTM D 5585 standard. For the second virtual model (Model B), users were asked to use a short reference of the sample size that contains 11 measurements from a technical size chart. OptiTex 3D virtual software program were used to build virtual sample size models. Descriptive statistics and paired t-test were used for the data analyses.

Results. When users created a virtual model based on the ASTM standard (Model A), results showed average standard deviation 1.28 and maximum SD 9.06. The average user's input difference from ASTM size chart was 0.53 inches. The error input range was between -4.58 and 1.94 inches. When users created a virtual model based on the short reference (Model B), results showed average standard deviation 1.27 and maximum SD 4.52. The average user's input difference from the technical size chart was 0.55 inches and maximum 2.27 inches with the short reference. The error input range was between -0.64and 2.27 inches. According to the paired t-sample test, while 42.8% of users were significantly different from the technical size, 57.1% of users' were different from the ASTM body dimensions ($p < 0.05$). This reveals that users made more differences of the body dimensions with the long reference than the short reference.

Conclusion/Implications. In this study, users had a consensus of one sample size model when a virtual model was directly imported from the 3D body scan. The users were able to assess fit without any confusion. However, the manual 3D formation was inconsistent by the individuals. When users made a virtual sample size model with manual 3D formation, the models were inconsistently created whether they had long or short references of the body dimensions. The problems were associated with inconsistency of input by the individual users; various interpretations of the body dimensions and body proportions of the pre-existing 3D body template. Automatic scale adjustment caused more difficulties for adjusting a body figure when the users had a long reference of body dimensions.

In conclusion, manual 3D formation will cause an inaccurate assessment of final garment fit with confusion of the sample size model. Further research should be done for developing a standard virtual model for sample sizes in the apparel industry and provide a guideline for technical designers to have consensus of the sample size model. Further 3D design curriculum should be considered for education to respond to a shift from manual to digital virtual models and products in the apparel industry.

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