A Longitudinal Body Scanning Research Study to Improve Apparel Grading: Methodological Implications

Laurel D. Romeo & Casey R. Stannard, Louisiana State University

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Standardized sizes and pattern grading practices used in the industry are factors that contribute to poor fit (Gribbin, 2014). Additionally, body shape determines how a particular garment will fit and two people with the same circumference measurements may experience a different fit with the same garment (Brown & Rice, 2014). The US apparel sizing system has its roots in anthropometric data collected 70 years ago and does not represent the diversity in ethnicity and body shapes of the current population (O'Brien & Sheldon, 1941). Sizing systems are based on anthropometric data and in turn grading systems are based on sizing systems (Mullet, 2015). Grading practices are based on assumptions, for instance, all body measurements increase and decrease in both width and length at the same rate and location when migrating from one standardized size to another (Mullet, 2015). To examine how various body shapes transform as they migrate through multiple standardized apparel sizes and explore the relationship of body shape to current fit and grading practices, a longitudinal study was initiated. The purpose of the multi-year, funded study was to: Determine if different body shapes require different grading practices; to identify at which locations and to what degree various body shapes change; and to lay a foundation for a grading system based on body shape.

No apparel related studies could be found which tracked body size and shape as individuals decreased through multiple apparel sizes. Therefore, to gather the needed data, a longitudinal research project was designed. Men and women over the age of 18 enrolled in weight loss programs are being solicited to document their weight loss with 3D body scans as they decrease their body weight and size from obese/overweight to an average weight. Participant enrollment is ongoing. Participants have their weight and height taken and receive a baseline 3D body scan which records 172 body measurements. Initially, participants received a 3D body scan to track their measurement changes with each 25 pounds of weight loss. However, as data collection continued, methodological issues soon became apparent.

First, recruitment presented a major hurdle. The researchers initially intended to recruit participants from a hospital-based bariatric weight-loss support group. They attended meetings of the group and presented the study in hopes of recruiting participants. This was unsuccessful, next the researchers began contacting local weight-loss groups, posting flyers in online weight-loss forums, and contacting medically supervised fitness centers. These recruitment methods increased enrollment but recruitment was still difficult and a high-rate of drop-out was observed.

It became clear upon looking at the initial sets of scans that 25 pounds resulted in significantly more inches lost than anticipated. The 25 pounds was meant to approximate two sizes for overweight/obese individuals. However, for grading, the amount of inches lost was of concern (one participant lost 83" with 25 pounds). Thus, the protocol was amended for follow-up scans at every 10 pounds of weight loss to approximate a single apparel size.

A total of 29 measurements were used to find the grade for a basic bodice, pant, and sleeve. The grade was found by taking the difference between the two scans for each participant in inches. These differences were then compared to published (Hanford, 1980; Mullet, 2015) standards for a simplified 2" grade (doubled to create a two size difference like the scans). The preliminary data was significantly different than published standards. Both participants were at least ¼" different than the published grades at the key girths-bust, waist, hips. The participants were also significantly different at other locations such as the thigh, neck circumference, and the back rise. Finally, the scans varied on key widths such as the front hip and across chest. This suggests a complex grading system in which the front and back of the body are graded differently might be needed to provide proper fit.

Unexpected changes in length measurements were observed. Participant one's inseam and underarm lengths were greater on scan two than on the initial scan. Similarly, Participant two experienced a decrease of almost 6" around the armscye. The researchers postulate an inability of the scanner to accurately read these lengths on some overweight/obese body shapes. A new stance during scanning was implemented to correct these issues.

Longitudinal studies can provide rich data for solving complex research problems such as the one in this study.. Currently 40 individuals are actively participating in this study data collection and results reporting are ongoing.

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