

Body Scan Analysis for Fit Models Based on Body Shape and Posture Analysis

Lenda Jo Connell, leader; Pam Ulrich (Auburn), Alistair Knox, Graham Hutton (Nottingham Trent), Dave Bruner ([TC]²), Susan Ashdown (Cornell)

Fit is a critical issue when women seek to purchase a garment. Fifty percent of women indicate that they cannot find a good fit in the market (KSA, 2000) and 50% of catalog returns are based on fit problems (DesMarteau, 2000). According to Lifestyle Monitor (2002), 85% of women cite fit as the leading reason they dislike an item of clothing after purchase. Fit is a problem that frustrates consumers and cuts into the bottom line of merchants.

By understanding body scan data, we seek to develop virtual fit models and slopers for mass produced female apparel based on body shape, posture and weight distribution.

In this research we are:

- developing body analysis standards based on body scan data relative to body shape, posture and weight for women ages 19-55.
- producing an expert system which can be used to analyze body scans as a basis for realigning sizing and pattern development for specific target markets.
- developing virtual fit models and slopers based on body shapes and posture occurring in the population to enhance the fit of women's apparel.

Most body shape analysis tools only analyze a frontal view. To obtain more adequate sizing categories for women's wear, it is necessary to analyze both a more detailed frontal view and a side view as well and to look at prominence and relationship of parts to the whole body. Using expert evaluation of whole and component body shapes found in the population, we developed a set of nine Body Scan Analysis Scales (BSAS[®]). The scales consist of a frontal view of the body used to assess body build, body shape, hip shape and shoulder slope and a side view of the body to define front torso shape, bust prominence, buttocks shape, back curvature and posture (see Figures at right).

All consumers who wear a particular apparel size are not the same shape. To better understand female body shape, we obtained a convenience sample of 3-D body scan data for 529 women ages 19-55. We found that BSAS[®] Body Build scores were significantly related to the BSAS[®] categories of Slender,

Average, Full and Heavy. In the 19-25 age group, almost twice the expected number of respondents had an Average, Rectangular body shape and only half of the expected respondents had a Full, Rectangular body shape. When shape was considered with age, the Pear shape was the dominant shape in each age category. Hip Shape and Bust Shape appear to be the strongest factors used to discriminate and predict different Body Builds of consumers.

Body Shape Analysis of Overweight and Obese

Because of the incidence of obesity in this culture, we focused another study on body measurements and shapes of overweight/obese female consumers using current 3-D body scan data.¹ ASTM standards for apparel sizing are based on measurements originally derived from a youthful sample, which included only a few overweight women. Body Mass Index (BMI), which uses height and weight to quantify the degree of body fat present in an individual, was used by Strawbridge, Wallhagen & Shema (2000) to define overweight and obese females. This sample consisted of 500 body scans of women aged 19 to 56 extracted from a larger set of scans collected by [TC]² for the Size USA project. Using the incidence of overweight/obesity in the population as a guide, approximately 2/3 of the sample was categorized as overweight and 1/3 "obese." Using BSAS[®] we determined that nearly 1/2 of overweight and over 1/2 of obese women were categorized as having a pear-shaped body. Forty percent of both groups had rectangular body shapes. Only 13.5% of the overweight women and 3.5% of obese women had an hourglass shape. Mean weights of the sample were 160 pounds (overweight) and 201 pounds (obese). More than 1/2 of the total sample (61.8 percent for the obese) were 64 inches or less in height.

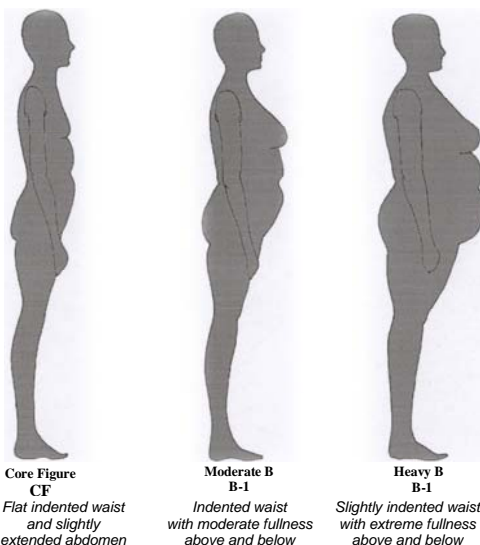
Comparing overweight and obese women across various body shapes, the mean weights and heights were similar, but circumference measurements varied. For example,

whether overweight or obese, rectangular-shaped women had larger busts (2"), waists (1 3/4") and hips (about 3") than pear-shaped women.

To understand the plus-sized female figure, it is important to consider both measurements and body shape. The traditional method of making apparel slopers to a single fit model's shape may need to be examined. For this market, rectangular and pear shapes predominate and body measurements vary between Body Mass Index categories.

Contributing Graduate Students:
Ma Li, Gina Pisut, Mei-Lin Fu, Juan Juan Wu, Lara Belliston, Shiara Farish, Marina Alexander,

Body Scan Analysis Scales (BSAS[®]) Front Torso



1. A 1999-2004 NHANE survey reported that almost 65% of American adults were overweight and 31% were obese, implying new body measurements for plus sized apparel are needed.

Seung Li, Marina Aghenykan (Auburn).

Industry Interactions: 12 [JC Penney, Lands' End, Dillard's, SAK's, Inc., Russell, Corp., Julianna Collection, MBrio, Denim North America]; **Other Interactions:** Non-NTC Academic: 155; Government: 35

Project Web Address:

<http://www.humsci.auburn.edu/cahs/faculty/connell/webpage923.htm>

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For Further Information:

1. M. Li, **Auburn Theses**, *An Exploratory Study of Body Shape and Body Build to Understand Women's Fit Preferences and Problems* (Spring 2003).
2. S. Farish, **Auburn Theses** *Perceptual Evaluation of 3-D Body Scans of Females Relative to BMI Categorization* (2004).
3. M. Alexander, **Auburn Dissertation**, *Applying Three-Dimensional Body Scanning Technologies to Body Shape Analysis*. (Fall 2003)
4. M. Fu, **Auburn Dissertation**, *Body Shape Analysis of Overweight/Obese Women* (Spring 2004).
5. M. Li, *An Exploratory Study of Body Shape and Body Build to Understand Women's Fit Preferences and Problems* (2003).
6. M. Alexander, L. J. Connell and A. B. Presley, *Fit Preferences of College Aged Females*, in review for International Journal of Clothing Science and Technology (2004).
7. G. Pisut and L. J. Connell *Fit Preferences of Female Consumers Relative to Body Shape, Body Cathexis, Clothing Benefits Sought, and Fit Problems: A National Study Proceedings of the International Textile and Apparel Association Annual Conference*, Kansas City MO (Nov 2001)
8. L. J. Connell, E. Brannon, P. Ulrich and A. B. Presley, *Exploring Female Consumers' Fit Preferences*. Presented at the Korean Society of Clothing and Textiles/International Textile and Apparel Association Joint World Conference and published in the *Proceedings of the International Textile and Apparel Association*. Seoul (Jun 2001).

Lenda Jo Connell, a Professor in Consumer Affairs at Auburn, joined the faculty in 1971 after receiving a masters degree in clothing and textiles from Louisiana State Univ. In 1990, she earned a Ed.D. in adult education from Auburn. For 15 years she was an Extension Resource Management Specialist for the textile and apparel industry and now coordinates the Apparel Production Management program. Lenda Jo's research interests include electronic sourcing, apparel product development and consumer preference style testing.



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lander1@auburn.edu

(334)-844-3789

<http://www.humsci.auburn.edu/publish.php?id=84&facultyId=61>

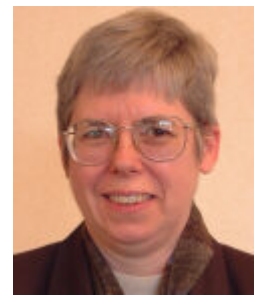
Graham Hutton, an Analyst in Size-Shape-Fit Research at Nottingham Trent Univ. (UK), joined the staff in 1997 as a clothing analyst, then development manager for 3D analysis software for Computer Clothing Research/CCR Ltd in 1999. Graham earned First Class Honours in mathematics from Bath Univ. (UK) in 1989 and an M.S. in human computer interaction from Nottingham Univ. in 1991. His research interests include improving apparel fit via large-scale sizing surveys, human body modeling and shape analysis.



S01-AC27

graham.hutton1@ntu.ac.uk ; 0115 848 4741

Susan P. Ashdown, an Associate Professor of Textiles and Apparel at Cornell, joined the faculty in 1991. Susan earned a Ph.D. in apparel from Univ. of Minnesota in 1991, a M.A. in textiles: apparel design from Cornell in 1989, and a B.A. in theater arts from Grinnell in 1971. Her research interests include anthropometrics; apparel sizing, fit and perception of fit and 3D body scanning.



S01-AC27, S01-CR01*, S04-CR01*

(607)-255-1929

spa4@cornell.edu

<http://www.human.cornell.edu/faculty/facultybio.cfm?netid=spa4&facs=1>

David A. Bruner, Director of Technology Development at [TC]², joined the staff in 1995. David earned a BS in mechanical engineering from Univ. of Missouri Rolla in 1983 and a Ph.D. in mechanical engineering from Univ. of Kentucky in 1993, specializing in nonlinear finite element analysis. For 12 years David was in development engineering and management at IBM (input devices and notebook computers), Ericsson (cellular telephones) and Brother Int. (ink jet products). His research interests include full body scanning and automatic measurement extraction software.

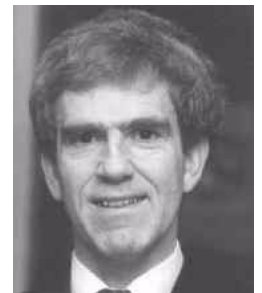


F02-NS08, S01-AC27, S04-AC01

dbruner@tc2.com

(919)-380-2171

Alistair Knox, a Senior Lecturer in Fashion & Textiles and Director of Size-Shape-Fit Research at Nottingham Trent Univ. (England), joined the faculty in 1995 following a 22-year career at Courtaulds Textiles culminating as a Systems Manager in 1994. Alistair earned a B.S. in physics at Manchester Univ. in 1969, an M.S. in physics at Univ. of Michigan in 1970 and a Ph.D. in laser spectroscopy at Manchester Univ. in 1972. His research interests include CAD/CAM and information technology systems, supply chain management and body scanning for health service uses.



S01-AC27

alistair.knox@ntu.ac.uk

+44[0] 115 848 2398

<http://www.ntu.ac.uk/ntsad/rws/index.htm>

Pamela V. Ulrich, an Associate Professor in Consumer Affairs at Auburn, joined the faculty in 1987. She earned a Ph.D. in American history from Univ. of Oregon in 1991 and a M.S. in clothing and textiles from Auburn in 1980. She has department store experience. Pamela is curator of Consumer Affairs' Historic Costume and Textile Collection at Auburn. Her research interests include commercial development of the textile, apparel and retail sectors; fashion history, analysis and forecasting; and marketing trends.



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S01-AC27, S04-AC01

ulricpv@auburn.edu

(334)-844-1336

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