

ABSTRACT

MONGE, CECILIA MARIA. Body Shape Perception and Apparel Fit Satisfaction among Young Women. (Under the direction of Dr. Katherine Annett-Hitchcock).

Women between the ages of 18 to 34 are responsible for \$36.34 billion dollars spent within the global apparel market (Shin & Istook, 2007; Smith, 2023). Despite their purchasing power, women of all ages are still having difficulties obtaining their desired product. Apparel fit is the main challenge they encounter with around 50% of women not being able to find a good fit (Kurt Salmon Associates, 2000). Three areas of the apparel industry were explored in this study: fit issues in women's clothing, body perception and the current U.S. sizing system. While there has been a focus on the past on using anthropometric studies, a deeper dive into the psychological relationships between body size and shape perception is needed to better understand the consumer. This study analyzed the degree of accuracy to which women ages 18-35 in the US can self-identify their body shape and whether this self-identification has a relationship with apparel fit satisfaction. This study followed a quantitative research design and collected survey responses and 3D body scan data from 44 participants.

Results indicate that the majority of participants fell into the triangle (50%) and rectangle (47.72%) body shape categories and very few participants were able to self-identify their body shape (6.81%). Satisfaction levels indicate that there may be a positive relationship between body part satisfaction and apparel fit satisfaction due to the closeness of the ratings at each body part. Overall, 52.27% of participants either agreed or extremely agreed that they can easily find clothing that fits them while 36.36% of participants either disagreed or extremely disagreed with the statement.

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Body Shape Perception and Apparel Fit Satisfaction among Young Women

by
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A thesis submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the degree of
Master of Science

Textiles

Raleigh, North Carolina
2023

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DEDICATION

This thesis is dedicated to my abuela,

Serafina Garcia.

It is because of her I discovered my passion for textiles.

BIOGRAPHY

Cecilia Monge was born in 1999 in Miami, Florida. She is the daughter of Carmen and Juan Carlos Monge and a sister to Regina Monge. As a young Latina growing up in Miami she was surrounded by the history of textiles that had been deeply engrained into the lives of so many immigrant women who started their lives in the U.S. as seamstresses. Her grandma gifted her a sewing machine at eight years old and the rest was history. Although Cecilia entered her undergraduate education considering being a teacher, she quickly changed her degree to Retail Merchandising and Product Development and graduated with her Bachelor Degree from Florida State University in May of 2021.

Cecilia decided to further her education by beginning the Master of Science in Textiles program at North Carolina State University in the fall of 2021. During her time at NC State she has furthered her experience by learning skills in pattern drafting, weaving, knitting, digital printing and learning software such as Clo3D, Optitex, APEX, and Lectra. She has also served as a Teaching Assistant for two years where she worked with students fostering their own knowledge in design and pattern drafting. Cecilia intends to take all of her newly developed skills into the fashion industry as an apparel technical designer.

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CHAPTER 1: INTRODUCTION

1.1 Background

The global apparel market is worth about 1.5 trillion dollars annually and women between the ages of 18 to 34 are responsible for \$36.34 billion of those dollars (Shin & Istook, 2007; Smith, 2023). Despite their purchasing power, women are still having difficulties obtaining their desired product. Fit has been a consistent issue for women. Goldsberry et al. (1996) found that 69% of female respondents (n=4000) were dissatisfied with fit while a study conducted by Kurt Salmon Associates (2000) found that 50% of women could not find a good fit in apparel. Although there are significant challenges for women purchasing apparel, Boston Consulting Group surveyed 12,000 women and found that a majority of women said that “they are willing to spend extra to find clothing that really works for them” in regard to fabrication, color, comfort and fit (Silverstein & Sayre, 2009, p. 52). The global apparel market has the opportunity to grow if apparel sizing practices are improved.

As the apparel industry has grown, so too has the size of the population. The current sizing strategies we use to fit the population today derive from the early 1900s (Ashdown & DeLong, 1995). Standardized clothing sizes originally came about to be able to efficiently dress soldiers in the United States Civil War. While measuring soldiers for uniforms, military tailors and seamstresses quickly realized that certain sets of measurements kept recurring, so categories of small, medium and large evolved for greater efficiency in uniform production (Pandaram & YuGa, 2015). Standard sizing categories for women were slower to evolve, eventually appearing in the 1940s with the rise of mail order catalogs and an increase in consumerism. In 1939 it cost U.S. manufacturers an estimated \$10,000,000 (equivalent to \$213,000,000 present day) to alter garments to women’s bodies (Time, 1939). To reduce this cost, manufacturers

appealed to the US government's Department of Agriculture to conduct one of the first recorded efforts to collect female body measurements with a goal to create a "unified system of sizing women's clothing" (Time, 1939). This effort included conducting an anthropometric study, or a study of the dimensions of the human body, which are used to better understand the range of human body types and are used frequently throughout sizing practices. Unfortunately, this study did not produce data representative of the US population, as its criteria required participants to be white (O'Brien & Shelton, 1941). The Mail-Order Association of America worked with the National Bureau of Standards to reassess previous sizing practices resulting in an updated sizing standard in 1958 published as Commercial Standard (CS) 215-58 (Robinson, 2015). However, many of the measurements used were of women who had served in the air force which was also not a true representation of the population (Stampller, 2014). Throughout United States history, collecting data for the standardization of female apparel sizes has been challenging and heavily influenced by researcher bias and methodology making it all the more difficult to create a sizing system that works for everyone.

Anthropometric studies rely on dividing people with the most common body sizes into categories, leaving those that fall in between to wear clothes that do not fit. SizeUSA is an anthropometric study that was completed in 2003 with the goal of gathering US sizing data that would be representative of the US adult population (Yim Lee et. al., 2007). When comparing American Society for Testing and Materials (ASTM) standards to the SizeUSA anthropometric data from 2003, researchers found that the body shapes targeted by ASTM standards were not the most prevalent in the population (Petrova & Ashdown, 2012). Most apparel fit research for the past couple of decades has been focused on collecting more anthropometric data and categorizing data into body shapes. Few have sought to analyze other contributing factors to fit

satisfaction like size labeling confusion, accessibility or body-size and shape self-misperception (BSSM). While anthropometric studies build the base on which we build sizing practices, further investigation into the psychological components is required to better understand the relationship between the consumer and the sizes they pick up while shopping.

1.2 Statement of the Problem

Apparel sizing typically does not conform to a set group of standards and can therefore make it challenging for consumers to find clothing that fits. In order to provide clothing that satisfies multiple body dimensions, apparel brands traditionally define their own size offerings and determine their median dimensions for each size based on their target consumer. They then size up and size down (grade) their patterns accordingly, creating size runs that address many body sizes without compromising the integrity of the design. Due to the lack of universally agreed upon sizing standards, brands can change their sizes as they see fit - meaning sizing can vary significantly across brands. In order to flatter their consumer and ultimately make a profit, many brands have employed the tactic of vanity sizing. Vanity sizing is when brands label “garments with sizes that are smaller than the true dimensions of those garments with the intent to deceive consumers into thinking that they are smaller than they really are” (Ketron & Naletelich, 2017, p. 438). This practice has persisted for decades. For example, a size 14 in a 1937 Sears catalog is “equivalent to a size 8 in 1967, which is a size 0 in 2011” (Clifford, 2011). This can be confusing to the consumer as they may fit one size in one brand and a different size in another and their size may also change throughout time even if their body does not.

Specialty named size categories like Plus, Curvy and Petite attempt to fill gaps in traditional sizing systems to fit bodies not catered to in a brand's straight sizing range. Straight sizes are considered to be sizes 2 to 12. Therefore, Plus size is identified as clothing larger than a

US size 14 (Alexander et. al., 2011). 67% of the female population in the US are Plus size and the average American woman wears between a size 16 and 18 (Hudson & Hwang, 2022).

Regardless of Plus size women being in the majority, Plus size clothing is still considered a specialty category. According to a 2021 study by Mintel reports, 54% of men and 60% of women agree most brands/retailers do not dedicate enough attention to extended sizes such as Plus sizing (Smith, 2021).

Even when brands adopt specialty named sizing categories and cater to underserved body shapes, it is unknown whether consumers have the knowledge to select the best fit for themselves. As an example, a psychological phenomenon known as body size and shape misperception (BSSM) can affect how consumers make purchasing decisions (Brooks et. al., 2020). Challinor et al. reviewed research about BSSM and visual adaptation, the psychological phenomenon where frequent exposure to a specific stimuli distorts the appearance of other inputs. They found that frequent exposure to thin bodies can cause visual adaptation leading to consumers distorting their own body in the opposite direction (Challinor et. al., 2017).

1.3 Purpose of the Study

The purpose of this study is to analyze the degree of accuracy to which women ages 18-35 in the US can self-identify their body shape and whether this self-identification has a relationship with apparel fit satisfaction. Research efforts are currently focused on collecting empirical numeric data to broaden sizing categories for specific body shapes, but the effectiveness of communication between brands and consumers is unknown. Many retailers have begun to offer specialty named size categories like Abercrombie's "Curve Love" line, and American Eagle now offers "Curvy Fit" jeans. But how do they know if and to what extent the

consumer considers themselves curvy? Fit issues may persist because of this and other challenges.

Body shape self-perception is an extremely complex topic. Researchers Song and Ashdown (2013) state that self-determined body size and shape may not be reliable because consumers may not know how to accurately take body measurements, they also state that “response to their body shape is based on personal perceptions and subjective judgments of their own body which may impact reliability” (Song & Ashdown, 2013). Therefore, the primary objective of this research is to determine whether consumers can identify their own body shape in order to select clothing options that fits to their satisfaction. Data collection methods will include quantitative surveys and participant body scanning. The expected outcome is to identify relationships between body shape self-perception, body satisfaction and apparel fit satisfaction.

1.4 Research Questions

In order to effectively analyze the relationship between body shape self-perception, body satisfaction and apparel fit satisfaction, the following research questions were developed:

RQ1: With what degree of accuracy can women identify their own body shape?

RQ2: Is there a relationship between perceived body shape and apparel fit satisfaction for specific areas of the body?

RQ3: Is there a relationship between perceived body shape, apparel fit satisfaction and the overall ability to find clothing that fits?

1.5 Significance to the Field

Research in the field primarily consists of gathering body measurements to round out data sets previously collected in other studies. The thought-process is that the more data that is available, the more brands and manufacturers can cater to those body shapes in the product

development process. Previous research on the body and fit has also explored body cathexis, or “positive and negative feelings toward one’s body” (LaBat & DeLong, 1990) and other psychological components such as body dysmorphia and BSSM. There is a current gap in the literature relating to the intersection of these dimensions.

The benefit of this study is that future researchers and retailers can have a deeper understanding of fit issues as they relate to the psychology of body cathexis and BSSM. This in turn could facilitate effective communication and merchandising practices with consumers and increased fit satisfaction.

1.6 Definitions

ASTM: American Society for Testing and Materials

Body-size and shape misperception (BSSM): “incorrectly perceiving the shape or size of one’s body” (Brooks et. al., 2020)

Body image: “the picture of our own body which we form in our mind” (Schilder, 1935/1950)

Body cathexis: “Positive and negative feelings toward one’s body” (LaBat & DeLong, 1990)

Figure rating scales (FRS): A “psychometric instrument developed to measure individual’s perception of physical appearance” (Jayawardena et al., 2021, p. 687)

Sewist: a person who sews

1.7 Ethical Considerations

Research involving body scanning and body measurements can be a sensitive topic, especially for those affected by the psychological afflictions mentioned previously. Due to the potential link between body shape perception and one’s psychological well-being, the study

excluded people with body dysmorphia and eating disorders to protect participants with these conditions. In addition, all Institutional Review Board for Human Subjects Research requirements were followed.

1.8 Study Assumptions

In order to develop this study, it was assumed that apparel fit issues might be exacerbated by lack of communication of specialty named sizing categories. It was also assumed that body size and shape misperception and body cathexis has an impact on the ability of consumers to find apparel that fits them. There is extensive research on both having psychological impacts on self-esteem, but it has not been determined if the impact crosses over to apparel purchasing habits. Finally, it is assumed that participants will give honest feedback to research questions as well as be open to discussing topics such as body shape and size.

1.9 Limitations

The main limitation of this study is sample size and sampling method. A convenience sample was used in which participants were sourced from a large university campus and its neighboring community. While a random sample of a larger geographical area would have been more representative, travel and incentives to participants requires funding, which this study did not have. A convenience sample facilitates being able to gather participants with an increased likelihood to participate that fit within the target age group. Another limitation of this study is reliability of participant responses to questions about themselves, which is common to quantitative studies.

CHAPTER 2: LITERATURE REVIEW

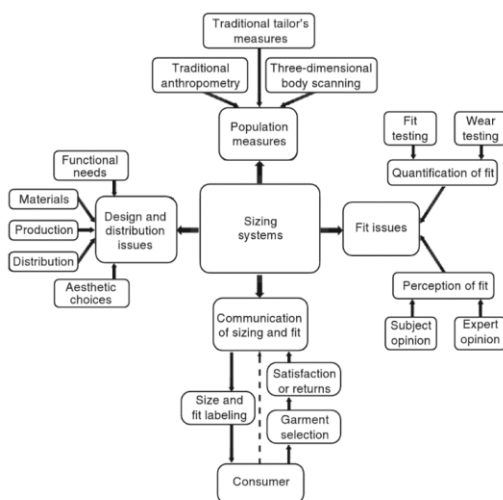
2.1 Organization of the Literature Review

The literature review addresses three areas related to the accuracy with which women ages 18-35 in the US can self-identify their body shape and how this degree of accuracy impacts apparel fit satisfaction. Conceptual frameworks by Susan P. Ashdown (2007) and LaBat & DeLong (1990) were referenced to determine which overarching dimensions of the apparel industry to investigate. The three areas explored in this literature review are as follows: fit issues in women's clothing, body perception and the current U.S. sizing system.

Susan P. Ashdown (2007) created a conceptual framework which illustrated the interactions of different factors that can be explored in sizing and fit research (Figure 1). In this framework Ashdown identified population measures, fit issues, communication of sizing and fit and design and distribution issues as the main factors influencing sizing systems. This research study focuses on three of Ashdown's factors, population measures, fit issues and communication of sizing and fit.

Figure 1

Conceptual Framework for Sizing Research (Ashdown, 2007)

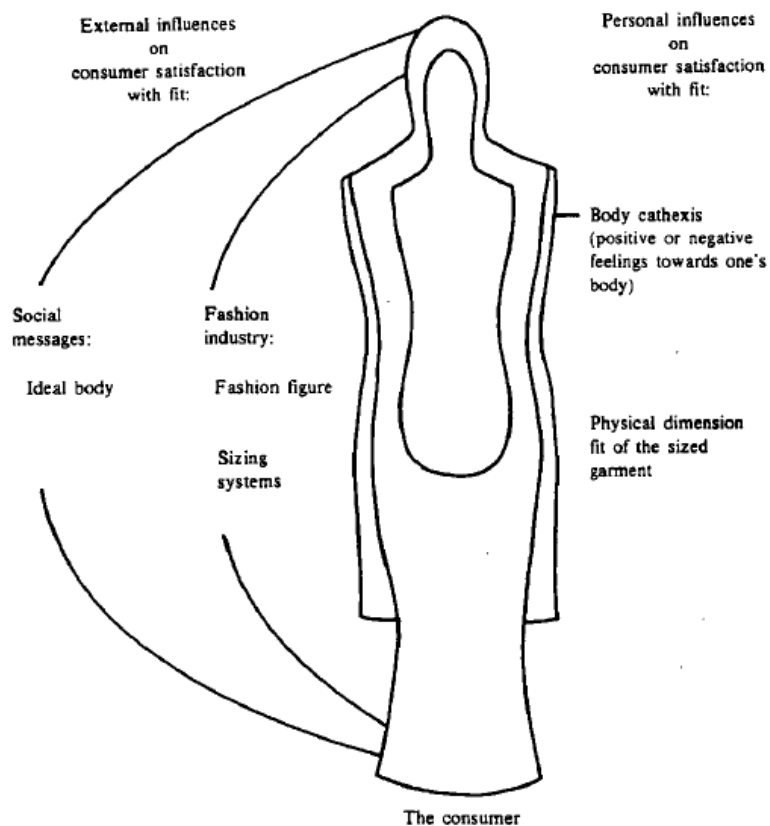


0.1 A conceptual framework showing the topics and relationships of sizing research

Additionally, researchers Karen LaBat and Marilyn DeLong (1990) created a diagram that visually represents the different factors that may influence consumer fit satisfaction (LaBat & DeLong, 1990; see Figure 2). Using this diagram, I identified four areas of research relevant to my purpose statement. This study will explore the physical dimension of apparel fit issues, body cathexis, social messages and current sizing systems.

Figure 2

Influences on Consumer's Satisfaction with Clothing Fit (LaBat & DeLong, 1990)



2.2 Fit Issues in Women's Apparel

Researchers have studied fit in women's clothing from many perspectives, especially regarding satisfaction level. Alexander et. al (2005) found that 64% of study respondents had to alter ready to wear apparel and 54% reported being somewhat dissatisfied with the fit of ready to

wear clothing. The percentage of respondents who had fit problems at specific body parts was: bust (50%), waist (46%), dress length (46.5%), pant length (60.5%), thigh (30%), sleeve length (31.4%), crotch (26.5%) (Alexander et. al., 2005). Alexander's study also found that "respondents who were dissatisfied with their weight preferred a loose fit in dresses". Alternatively, those that were satisfied with specific body parts, wanted a tighter fit in those areas. This may be due to those who are satisfied with specific body parts wanting to accentuate them, and those dissatisfied with their weight preferred to conceal their body shape.

According to research on product psychology, "users are often quick to blame themselves when the product does not work." (LaBat & DeLong, 1990, p. 43). This sense of culpability may account for why there is a psychological connection between apparel fit and social well-being.

Race and ethnicity are important variables to consider when researching fit issues. Bukisile Makhanya et. al. (2014) sought to identify and compare the most prevalent body shapes, body shape characteristics and apparel fit problems of young African and Caucasian women in South Africa. Body shape categories are frequently used in sizing research and typically refer to the overall relationship between a person's body measurements. For example, someone who is considered a triangle typically has a significantly wider upper body than lower body. Some body shape categories commonly used in literature include triangle, inverted triangle, rectangle and hourglass. Makhanya et. al. found that the most prevalent body shape among African women was the triangle at 58.7% while the most prevalent among Caucasian women was the hourglass shape at 40.8% (Makhanya et. al. 2014). The main finding related to fit perception was that both the Caucasian and African triangle shapes reported tight fit around the hips, buttocks and thighs. While there were some differences in body size prevalence between the two groups the common fit issues were consistent within body shapes regardless of race.

The research conducted by Makhanya et. al. and Alexander et. al. were both fit studies with a convenience sample taken from university students with age ranges between 18-35 and 18-29 respectively. Mackhanya's research confirmed body shapes via visual analysis by two trained fashion design researchers. According to Ashdown and DeLong (1995), apparel researchers routinely use wearer responses to "the look and feel of the garment" and responses of "expert judges to a visual analysis of the garment on the wearer" in order to determine fit of a garment. They also stated that an "expert panel in [the] testing environment functions as a sensitive test instrument, capable of providing valid and reliable responses to the sensations being studied" (Ashdown & DeLong, 1995). Additionally, studies researching fit issues commonly ask participants to complete questionnaires on apparel fit problems they have experienced (Mackhanya et. al., 2014; Alexander et. al., 2005).

2.3 Body Perception

The current garment sizing system prioritizes providing well-fitting clothing for certain body shapes over others. Body shape names like apple and pear can be reductive and hierarchical in nature and might discourage women from truly identifying their body shape due to bias of wanting to fit into a specific category. While body shape ideals consistently change over time, current popular culture in the United States "reflects a shift from idealizing a thin body to embracing a more curvy body" (Hunter et. al., 2021, p. 239). Crossley et. al. (2012) found that when studying the ideal body shapes of Caucasian women in the United Kingdom, most women's ideal body involved the narrowing of their body shape at all sites except for bust, which they preferred to have increased in size. Bishop et. al. (2017) conducted qualitative research at a Plus size store named 'Real Style'. When interviewed, one of the employees at the store stated "she shouldn't be afraid to tell a customer she's an apple, even though it's the most

awful shape” admitting that some shapes are more desirable than others (Bishop et. al., p. 193). Joan Brumberg states that many girls “regard [clothing] size, much like weight, as a definitive element of their identity” and might reject clothing that fits solely because of the size on the label being undesirable (Brumberg, 1997, p. 129).

Body size and shape misperception (BSSM) is defined as “incorrectly perceiving the shape or size of one’s body” (Brooks et. al., 2020, p. 133). BSSM is a known risk factor for eating disorders like anorexia nervosa and bulimia nervosa. It is estimated that “39% of women report “moderate to marked” levels of dissatisfaction with their body” (Mond et. al., 2013, p. 4). Challinor and colleagues identified BSSM as “the perceptual component of body image disturbance” while visual adaptation may be its mechanism (Challinor et. al., 2017, p. 2002; Brooks et. al., 2020).

Visual adaptation is when someone viewing a specific stimulus can alter their perception of other inputs. BSSM is the perception that results from this visual adaptation. Challinor et. al. (2017) stated that “prolonged exposure to an extreme “adaptation” stimulus leads to an after effect such that subsequently seen “test” stimuli appear distorted”. In other words, constant exposure to media promoting beauty standards can distort one’s view of one’s own body (Challinor et. al., 2017). Brooks et. al. (2020) found that “when longer exposure durations are used in the laboratory, longer lasting after effects are indeed observed” (p.145). This distortion can potentially make it difficult to distinguish not only what one’s own body looks like but also into which size one may fit. Challinor (2017) states that when it comes to therapy for eating disorders, putting people suffering from anorexia all in the same therapy group may exacerbate this effect since they will be exclusively mixing with other people with thin bodies. Instead, “including people with a range of body sizes in group therapy may mitigate this putative adverse

effect” (Challinor et. al., 2017). This suggests that a person's exposure to specific body types via media and everyday interactions may dictate how they feel about their own body.

It is possible that size inclusivity in stores and in marketing campaigns might be used to counteract this visual adaptation and limit visual distortion. Body cathexis is another component of the visual perception of body image disturbance. Rather than solely perception, body cathexis is the “evaluative dimension of body image” and includes good and bad feelings towards one’s body (LaBat & DeLong, 1990). In a study researching BSSM, they found that “more respondents perceived their waist to be larger and preferred to have a smaller waist” once again conforming to aspirational goals related to popular body shapes in the media (Song & Ashdown, 2013). According to Ng et. al. (2021) out of 1,051 women studied between the ages of 17 and 35, 70.69% wanted to be thinner. This figure included 62.7% of women who were already either “normal weight” or “underweight”.

2.4 Current U.S. Sizing Systems

Sizing systems have proven to be confusing for consumers and the messaging is unclear. Size labels can be triggering to women who have been socialized to become hypersensitive to their weight and body size. Research suggests that clothing size may have a multifaceted impact on a woman’s life including “individual identity, social status, and bodily health” (Bishop et. al., 2018). Some women have developed anorexia, bulimia and depression while trying to attain their ideal image with the “highest reported prevalence of disordered eating occurring during the 1920s and 1980s, the two periods during which the ‘ideal woman’ was thinnest in U.S. history” (Harrison & Cantor, 2006). Bishop wrote that when considering beauty standards, it is reasonable to expect that clothing size is a way in which women receive feedback about how their bodies meet cultural ideals (Bishop et. al., 2018). In 1946, Bruno Antolini who was the

manager of the alterations and repair department at Macy's in New York City, told Women's Wear Daily that: "It is obvious that if the majority of the garments are sold without having to be altered, they will reduce the number of refunds, lower shipping costs, and reduce alterations losses". In this same article Mr. Antolini states that "present dress size did not allow for physical differences of people taking the same size... specific size should fit in all respects without being altered because of the difference in size of a woman's hip or bust" (Urges Standardizing and Types, 1946). These physical differences within the same size can be addressed by offering specialty named sizing categories like Plus or Petite. Evidently, the business model of keeping sizes standardized has been a consistent issue through the decades of the ready-to-wear industry. However, contemporary research suggests that consumers who are frequently dissatisfied with fit actually cause a high volume of returns (Petrova & Ashdown, 2012), which leads in turn to a reduction in profit for brands and retailers.

In product development, current sizing practices require a fixed amount of ease to be added or subtracted as a pattern is graded up and down in size. Grading up a pattern typically requires enlarging existing points on a pattern piece by a set amount to get to the next size needed. However, the larger a person's body, the more it will have to be graded up to get to a larger size. After a certain size this set amount may not be applicable, because bodies do not consistently get larger by a set amount at a specific place and/or at a linear rate. Plus size sewists like Liz Haywood of The Craft of Clothes blog point out that while some body parts may get larger at the same rate, "shoulders and necklines don't get any bigger/wider beyond size 16" (Haywood, 2019). Petrova (2008) made some recommendations for how to adapt current sizing practices to better conform to the population, such as modifying the ASTM standard body sizing table to be better representative of the population, and "using size-dependent ease amounts

across the garment sizes” (Petrova, 2008, page 177). This means altering the ease amounts used in grading depending on the desired size outcome.

All in all, fit issues are extremely prevalent in the ready-to-wear apparel industry. These fit issues may be influenced by how someone perceives their own body and may have a direct impact on an individual’s psychological and social well-being. Research has also found that common fit issues are consistent within body shapes regardless of race. Due to this study’s focus on fit issues rather than the prevalence of specific body shapes within a race, it was decided not to ask participants to identify their race or other demographic information.

CHAPTER 3: METHODOLOGY

The purpose of this quantitative study was to analyze the accuracy to which women ages 18-35 in the US can self-identify their body shape and how their self-perception impacts apparel fit satisfaction. This study followed a quantitative research design to determine the relationship between accuracy of body shape identification and apparel fit satisfaction. Participants completed a survey where they self-selected their body shape and answered questions about body and apparel fit satisfaction. After survey completion participants were body scanned in a SizeStream scanner. The accuracy of body shape self-perception was analyzed by comparing perceived body shape (results from the survey) with actual body shape (results from body scanning). In order to effectively analyze the relationship between fit satisfaction and body shape identification, the following research questions were developed.

RQ1: With what degree of accuracy can women identify their own body shape?

RQ2: Is there a relationship between perceived body shape and apparel fit satisfaction for specific areas of the body?

RQ3: Is there a relationship between perceived body shape, apparel fit satisfaction and the overall ability to find clothing that fits?

3.1 Sample selection

This study took place on the campus of a large public university and included a convenience sample from the student population. There were 37,556 students currently enrolled in the university with an even distribution of female and male students (49.4% and 50.6% respectively). In order to be a participant in this study participants were asked to be female identifying, between the ages 18-35, able to understand written and spoken English, able to travel to the research site, and able to stand unassisted for at least five minutes in the body

scanner. Participants must also be comfortable being scanned in their undergarments.

Participants were recruited using digital and physical flyers. Subjects were scanned in a room in a campus building with a SizeStream body scanner.

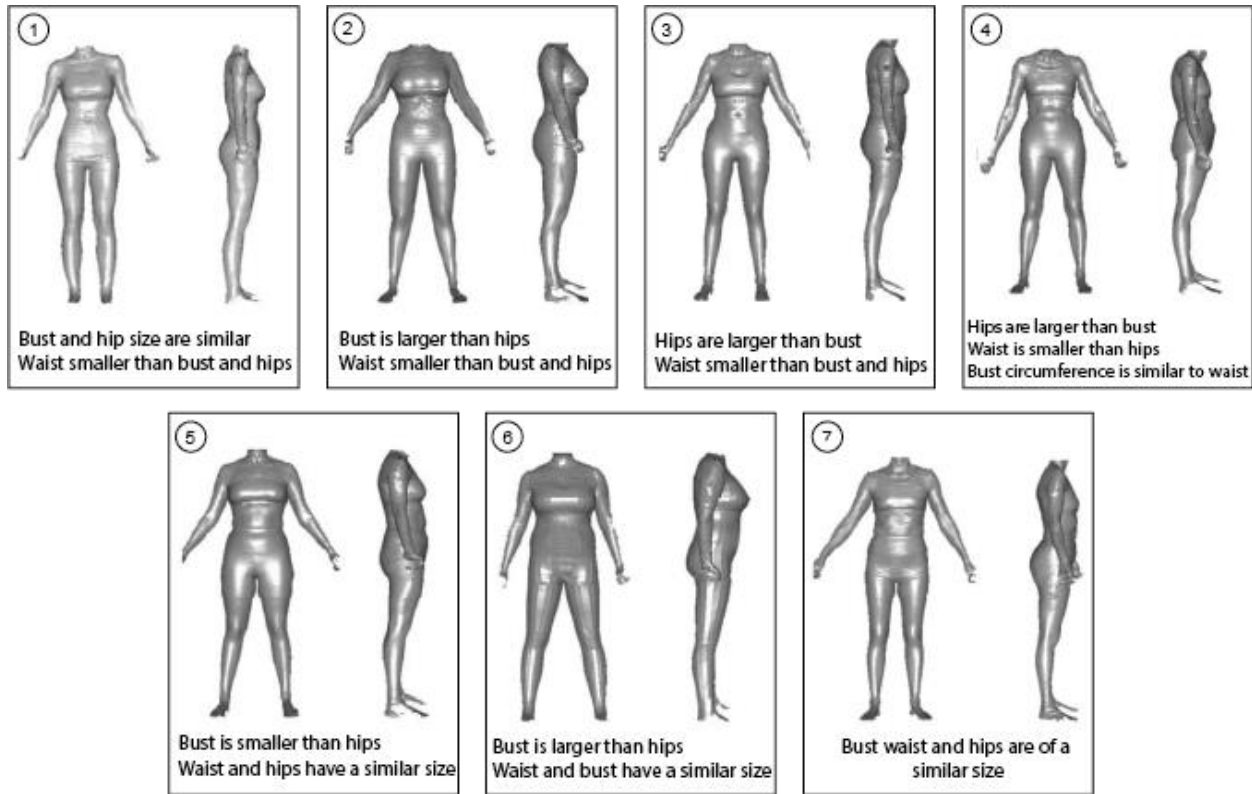
3.2 Survey Development

A consent form and a survey were developed with the approval of the IRB Human Subjects committee. The survey included one multiple choice question where participants self-identified their body shape followed by three Likert scale questions. The goal of the survey was to measure several components relating to body shape perception and apparel fit satisfaction. Variables include body shape perception, attitudes towards ease of finding properly fitting apparel and satisfaction of specific body parts along with how apparel fits in those areas. Participants completed the survey, which took from 10 to 15 minutes, on a computer provided in the testing room.

Within the survey, a Figure Rating Scale (FRS) was used to study body shape perception (Figure 3). An FRS is a “psychometric instrument developed to measure an individual's perception of physical appearance” (Jayawardena et. al., 2021). An FRS consists of a scale of different body silhouette drawings typically lined up in succession from smaller to larger. However, the goal of this study is to analyze body shape and not body size. Therefore, the figures used were all the same body size but had marked differences in body contour, or shape. 3D avatars of seven body types were sourced from Yim Lee et. al. (2007). Text was added to each 3D avatar to describe the avatar's proportions to assist the participant in making their choice. Body scan data was be categorized into body type categories using formulas developed by Yim Lee et. al. (2007). Participant self-selected body shapes were compared to the results of the body scan to determine how accurately participants identified their own body shape.

Figure 3

FRS of 3D Avatars Representing Different Body Shapes



Next, a series of Likert scale questions were used to determine satisfaction of size and shape of specific body parts (Figure 4), gauge attitudes towards ease of finding properly fitting apparel (Figure 5) and satisfaction with how apparel fits in those areas (Figure 6). Rosen and Ross (1973) originally created a body cathexis scale including 9-point Likert scale questions referencing 19 different body sites related to clothing. LaBat & DeLong (1990) adapted this scale into a series of 5-point Likert scales. Eight of the 19 original body sites used in the literature were selected for this study. These eight body parts were chosen because they were the ones that most closely related to apparel fit. They were also selected in order to be able to assess overall attitudes towards top and bottom sections of the body. Bust, shoulder width, arms and waist represent the top half of the body and knees, legs, thighs and hips represent the bottom half

of the body. Typically apparel is sold within top and bottom categories so the ability to split up attitudes in this way will assist in providing suggestions to the apparel industry.

Figure 4

Survey Question Used to Assess Satisfaction of Size and Shape of Specific Body Parts

Each item below is related to a part of your body. For each item please select the option that indicates how satisfied you are with the size and shape of each aspect of your body.

	Extremely Satisfied	Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Dissatisfied	Extremely Dissatisfied
Height	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hips	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Waist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Legs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shoulder Width	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thighs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 5

Survey Question Used to Assess Attitudes Towards Ease of Finding Clothing that Fits

To what extent do you agree with the following statement:

"I can easily find clothing that fits me."

- Extremely Agree
- Agree
- Neutral
- Disagree
- Extremely Disagree

Figure 6

Survey Question Used to Assess Satisfaction with How Apparel Fits at Specific Body Parts

Each item below is related to an area of your body. For each item please select how satisfied you are with apparel fit at this area.

	Extremely Satisfied	Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Dissatisfied	Extremely Dissatisfied
Hips	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Waist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Legs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shoulder Width	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thighs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3.3 Measurement Instruments

3D body scanning offers a less expensive and time consuming alternative to traditional anthropometry typically done by hand (Petrova, 2008). A SizeStream body scanner was used to take anthropometric measurements of the participants. The SizeStream “core measurements” were chosen to be measured which includes 240 measurements. This list of measurements was selected as it is extensive and ensured that the 3D avatar developed from those measurements has robust data to draw from. The SizeStream body scanner took a series of measurements by using infrared lasers to measure how far the body was from the laser at several different parts of the body. These measurements then created a “point cloud” or a collection of physical data points in space, to generate a 3D mesh (Appendix C). This mesh data was then measured to extrude the final body measurements. Therefore, the more points of measure the machine had for the point cloud, the more accurate the resulting body measurements were. Proper use of the body scanner

was demonstrated to participants before they entered. Participants were then asked to enter the body scanner and close the curtain. Once the curtain was closed, participants undressed and stood in the body scanner until the scan was complete.

3.4 Data Collection and Analysis

Participant body scan data was categorized into body shapes by applying formulas defined in Yim Lee et. al. (2007). Formulas were defined for hourglass, bottom hourglass, top hourglass, spoon, triangle, inverted triangle and rectangle body shapes (See Table 1).

Table 1

Formulas Used to Categorize Body Scan Data into Body Shape Categories

Body Shape	Measurements Used	Formula
Hourglass	Bust Hips Waist	If (bust-hips) \leq 1 Then If (hips-bust) $<$ 3.6 Then If (bust-waist) \geq 9 Or (hips-waist) \geq 10 Then shape = "Hourglass"
Bottom Hourglass	Bust Hips Waist High Hip	If (hips-bust) \geq 3.6 And (hips-bust) $<$ 10 Then If (hips-waist) \geq 9 Then If (high hip/waist) $<$ 1.193 Then shape = "Bottom Hourglass"
Top Hourglass	Bust Hips Waist	If (bust-hips) $>$ 1 And (bust-hips) $<$ 10 Then If (bust-waist) \geq 9 Then shape = "Top Hourglass"
Spoon	Bust Hips Waist High Hip	If (hips-bust) $>$ 2 Then If (hips-waist) \geq 7 Then If (high hip/waist) \geq 1.193 Then shape = "Spoon"
Triangle	Bust Hips Waist	If (hips-bust) \geq 3.6 Then If (hips-waist) $<$ 9 Then shape = "triangle"
Inverted Triangle	Bust Hips Waist	If (bust-hips) \geq 3.6 Then If (bust-waist) $<$ 9 Then shape = "Inverted Triangle"
Rectangle	Bust Hips Waist	If (hips-bust) $<$ 3.6 And (bust-hips) $<$ 3.6 Then If (bust-waist) $<$ 9 And (hips-waist) $<$ 10 Then shape = "Rectangle"

A statistical software was used (JMP) to sort participant body scan data into different body shape categories using the formulas shown in Table 1. Once the body shape was determined from the body scan data, the result was compared to the participant's self-identification of their body type in the survey. If the participants perceived body shape matched their actual body shape, their response was labeled as "Accurate". If the participants perceived body shape did not match the actual body shape, their response was labeled as "Inaccurate".

Data collected via survey responses was analyzed using descriptive and inferential statistics. Survey response data was entered into Microsoft Excel to enable body shape accuracy data to be organized and described using simple counts and means. JMP was used to analyze the same survey data to determine any correlations between apparel fit satisfaction and satisfaction of specific body parts. Data was also analyzed to test for statistically significant differences between the top and bottom halves of the body for body part satisfaction and apparel fit satisfaction. In order to determine which statistical tests would be used, the Anderson-Darling and Shapiro-Wilk tests were conducted to test for normality and it was determined that the data was not normally distributed. In order to analyze data that is not normally distributed, non-parametric statistical tests need to be used. The non-parametric tests chosen for this study were the Spearman's rank correlation test and the Wilcoxon two sample rank-sum test ~~conducted~~. The Spearman's rank correlation test measures the strength and the direction in which two independent variables are correlated while the Wilcoxon two sample rank-sum test compares the differences between medians of independent variables.

CHAPTER 4: RESULTS

The purpose of this study was to analyze the degree of accuracy to which women ages 18-35 can self-identify their body shape and whether body shape self-perception has a relationship with apparel fit satisfaction. The methodology was guided by the following research questions:

RQ1: With what degree of accuracy can women identify their own body shape?

RQ2: Is there a relationship between perceived body shape and apparel fit satisfaction for specific areas of the body?

RQ3: Is there a relationship between perceived body shape, apparel fit satisfaction and the overall ability to find clothing that fits?

The total number of subjects recruited for the study was N=45, which included participants meeting the criteria of being a female between the ages 18-35, being able to understand written and spoken English, being able to travel to the research site, and being able to stand unassisted for at least five minutes in the body scanner. Due to a malfunction in the body scanner, the entire dataset belonging to one participant was rejected since not enough measurement data was retrieved for this subject. In total, N=44 data sets were collected which includes survey responses and body scan data for each participant. The first question of the survey asked for the participant to input their participant number which was a tool to keep data free from identifying information.

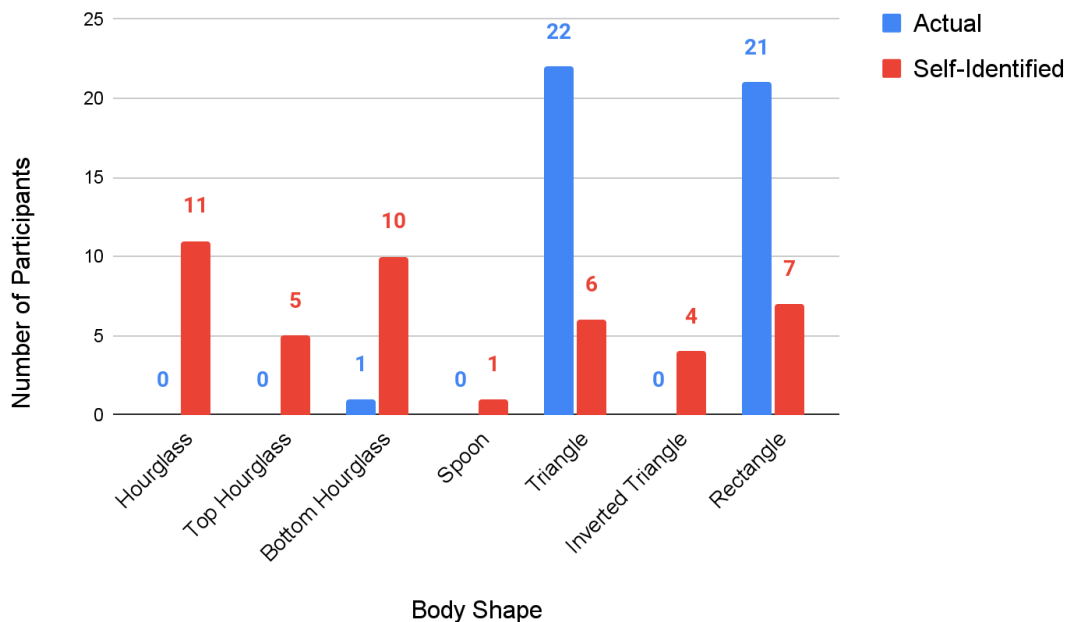
The results of the study will be reported on in the following order, the data relating to body shape self-perception will be reported first which corresponds to the second question of the survey. Next, the data relating to the relationship between body shape self-perception and reported apparel fit satisfaction will be reported which corresponds with questions three through five in the survey.

4.1 Body Shape Self-Perception

The second question of the survey asked participants to self-select their body shape by comparing themselves to the body shapes in the Figure Rating Scale shown in Figure 3. Their response to this question was then compared to their actual body shape, which was determined using their body scan data and the formulas in Table 1. The distribution of actual participant body shapes was as follows: bottom hourglass (2.27%), triangle (50%) and rectangle (47.72%). All participants fell into only three of the seven possible body shape categories as defined by Yim Lee et. al. (2007). However, when self-identifying their body shapes (question 2), participants self-selected from all seven body shape categories. The distribution for selected body shapes, which can be seen in comparison to actual body shapes in figure 7, was as follows: hourglass (25%), top hourglass (11.36%), bottom hourglass (22.73%), spoon (2.27%), triangle (13.64%), inverted triangle (9.09%), and rectangle (15.91%).

Figure 7

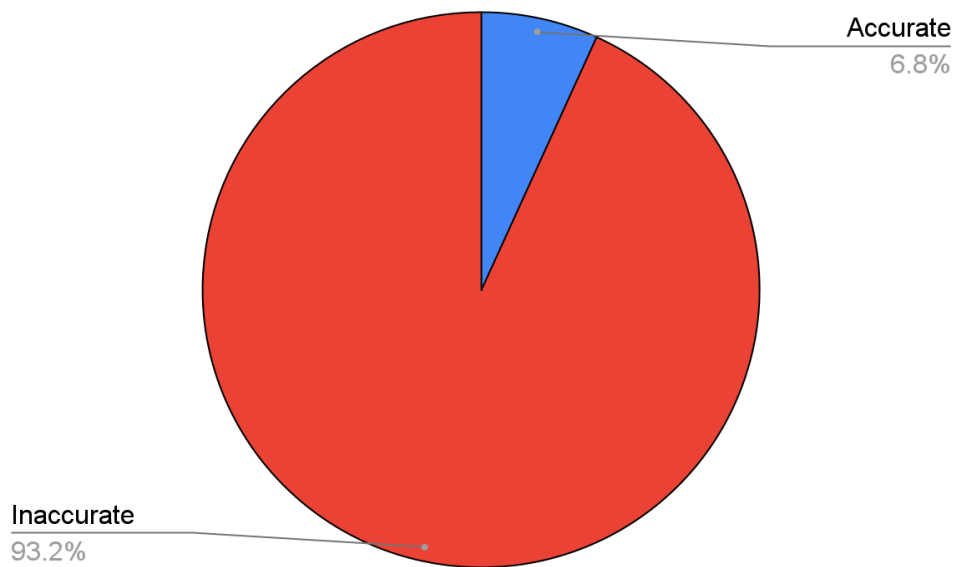
Comparison Between Actual and Self-Identified Body Shapes



Out of the 44 participants, three participants (6.81%) accurately self-identified their actual body shape while 41 participants (93.18%) inaccurately self-identified their actual body shape (Figure 8).

Figure 8

Body Shape Self-Identification Accuracy



4.2 Body Shape Self-Perception and Reported Apparel Fit Satisfaction

The relationship between body shape self-perception and apparel fit satisfaction was determined using the final three questions in the survey (see Figures 4, 5 and 6), all of which had Likert scale response options from one to seven. A rating of one was a negative rating of either extremely dissatisfied or extremely disagree and a rating of seven was a positive rating of either extremely satisfied or extremely agree. In question three, body shape self-perception was measured by asking participants to rate their satisfaction with the size and shape of each specific body part listed (see Figure 4). In question four participants were asked to what extent they agreed with the following statement “I can easily find clothing that fits me” (see Figure 5).

Question five asked participants to rate their satisfaction with apparel fit at the specific body parts listed (see Figure 6).

Next, RQ2 was investigated to determine whether there is a relationship between body shape self-perception and apparel fit satisfaction. The overall means across all participants were determined for satisfaction with each body part and satisfaction of apparel fit at those body parts. Means for both questions are displayed in Figure 9. The means of participant satisfaction with specific body parts ranged from a low of 4.55 (hips) to 5.16 (legs) with a median of 4.98 (on a seven point scale). The means of participant satisfaction with apparel fit at the same specific body parts ranged from a low of 3.93 (legs) to 5.56 (knees) with a median of 4.37. The overall mean and standard deviations for satisfaction with specific body parts was 4.93 and 0.22 respectively, while that of satisfaction of apparel fit at specific body parts was 4.60 and 0.62 respectively. The Spearman's rank correlation test was conducted to test for correlations within the data (Figure 10). The overall correlation between satisfaction of specific body parts and apparel fit satisfaction had a correlation coefficient of 0.19 with a p value of 0.0003. The correlation coefficients when comparing the two satisfaction levels within each body part ranged from 0.03 to 0.47. This suggests that there is an overall very low correlation between satisfaction of specific body parts and apparel fit satisfaction but this correlation was found to be statistically significant. Shoulder width had a correlation of 0.47 which is in the range defined by Richard Taylor in 1990 labeled as a moderate correlation and it was found to be statistically significant.

Figure 9

Comparison of Satisfaction of Body Parts and Satisfaction of Apparel Fit

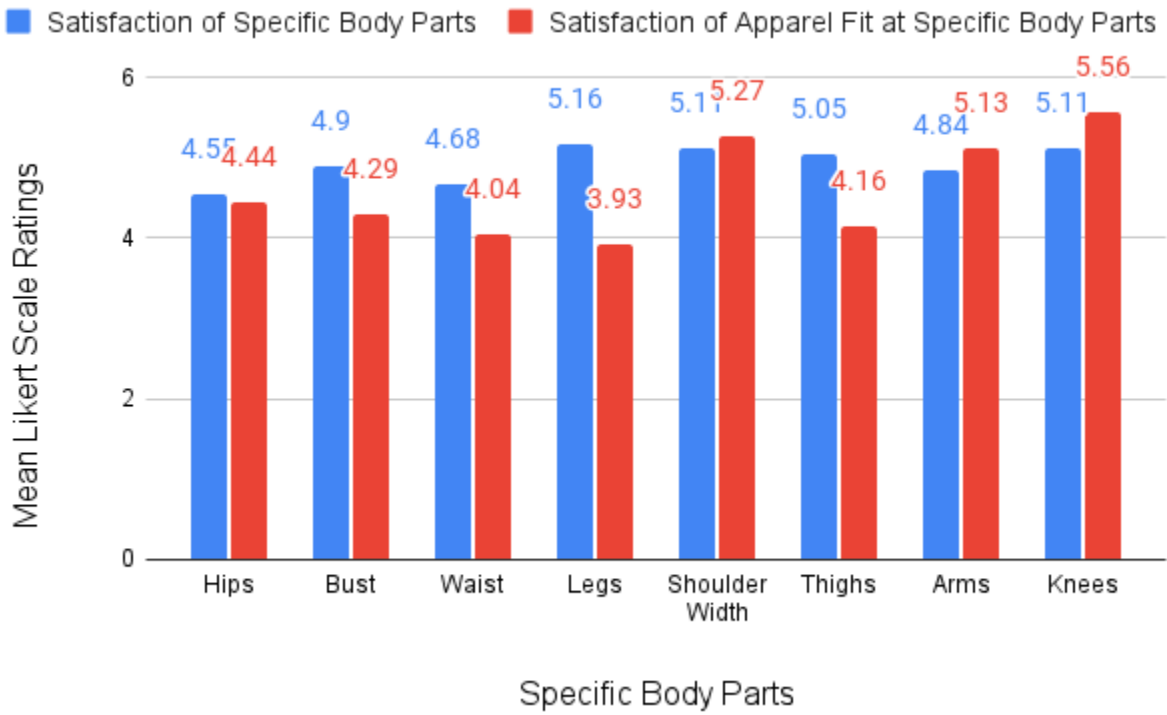


Figure 10

Correlation Between Satisfaction of Specific Body Parts and Apparel Fit Satisfaction

Specific Body Part	Correlation	<i>p</i> value
Overall	0.19	0.0003*
Hips	0.28	0.0657
Legs	0.22	0.1345
Thighs	0.20	0.1943
Knees	0.03	0.8353
Bust	0.14	0.3792
Waist	0.09	0.5813
Shoulder Width	0.47	0.0012*
Arms	0.30	0.0516

To further investigate body shape self-perception and align with merchandising practices, the specific body parts were separated into two categories, the top half of the body and the bottom half of the body. Bust, shoulder width and arms were assigned to the top half of the body category and waist, hips, legs, thighs and knees were assigned to the bottom half of the body category. The overall means for the top and bottom halves of the body for each satisfaction dimension can be seen in Figure 11. The Wilcoxon two sample rank-sum test was conducted to determine if there is a statistically significant difference between the top and bottom halves of the body for body part satisfaction and apparel fit satisfaction. Using the Wilcoxon test, apparel fit satisfaction produced a z value of 5.05 with a p value of 0.0001 (Figure 12) while body part satisfaction produced a z value of -0.59 with a p value of 0.54 (Figure 13). This shows that apparel fit satisfaction yielded statistically significant results while body part satisfaction did not. Apparel fit satisfaction was significantly different at the top and bottom halves of the body with the top half of the body having higher apparel fit satisfaction. The top half of the body had a mean of 203.153 while the bottom had a mean of 149.847.

Figure 11

Comparison of Satisfaction with Top Half of the Body and Bottom Half of the Body

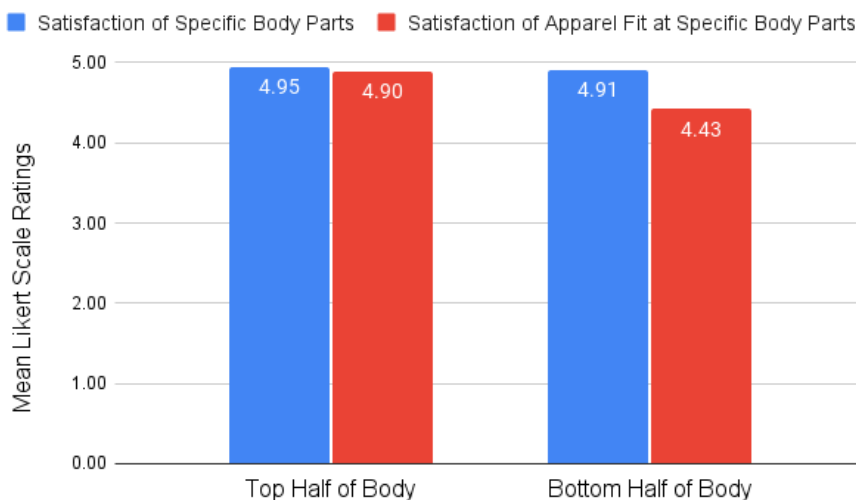


Figure 12

Apparel Fit Satisfaction: Wilcoxon Test Comparing Top and Bottom Halves of the Body

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0	S	Z	p value
Bottom	176	26373	31064	149.847	-5.052	35755	5.05	<0.0001*
Top	176	35755	31064	203.153	5.052			

* means p value is significant

Figure 13

Body Part Satisfaction: Wilcoxon Test Comparing Top and Bottom Halves of the Body

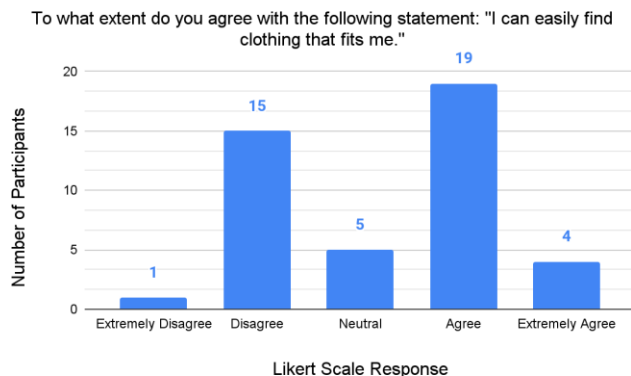
Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0	S	Z	p value
Bottom	176	31617	31064	179.642	0.599	30511	-0.59	0.5494
Top	176	30511	31064	173.358	-0.599			

4.3 Satisfaction Levels and Ability to Find Clothing that Fits

Question 4 in the survey addressed how participants relate with the following statement: “I can easily find clothing that fits me”. The responses to question 4 are displayed in Figure 14. Overall, more than half of participants (52.27%) either agreed or extremely agreed that they can easily find clothing that fits them. Alternatively, 36.36% of participants either disagreed or extremely disagreed with the statement. 11.36% of participants felt neutral about the statement.

Figure 14

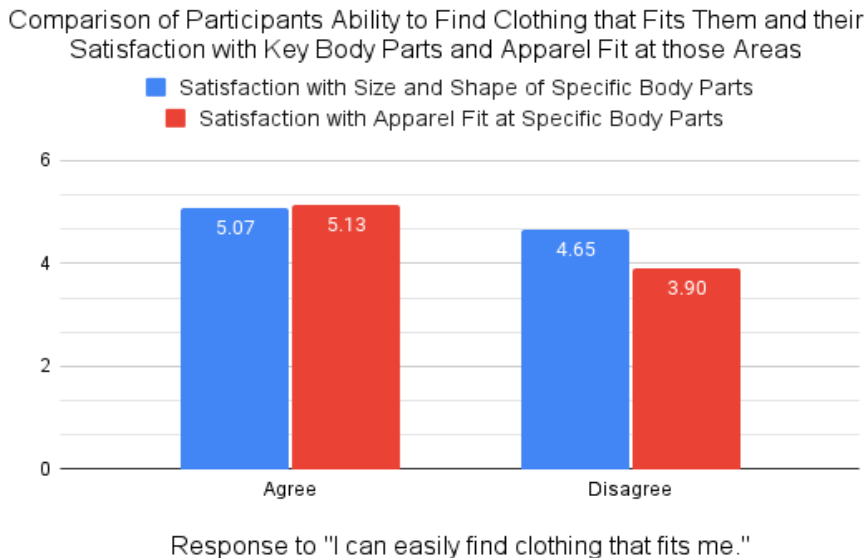
Participant Responses to “I Can Easily Find Clothing that Fits Me”



Finally, participant responses about whether or not they are able to easily find clothing that fit them was compared to their satisfaction with specific body parts and with apparel fit. Participant data was divided into two groups. Participants who agreed or extremely agreed with the statement “I can easily find clothing that fits me” were put into the “agree” group while those who disagreed or extremely disagreed with the statement were put in the “disagree” group. Satisfaction levels with body parts and apparel fit at those body parts (Figure 9) were then averaged across participants within the “agree” and “disagree” groups to obtain an overall mean satisfaction level for both groups. Participants who agreed with the statement had a body satisfaction mean of 5.07 while those who disagreed had a body satisfaction of 4.65. Those participants who agreed or extremely agreed that they can easily find clothing that fits them had a higher overall satisfaction compared to those who said they disagreed or extremely disagreed with the statement (Figure 15).

Figure 15

Comparison of Mean Scores Between Consumer Groups



CHAPTER 5: DISCUSSION

Apparel sizing in the United States does not conform to a set of industry standards, which can make it challenging for consumers to find clothing that fits. Although some brands adopt specialty named sizing categories to cater to underserved body shapes, it is unknown whether consumers have the knowledge to select the best fit. While most research has sought to collect anthropometric data to round out the data set and improve fit, there are a variety of psychological components like Body Size and Shape Misperception and Body Cathexis that may be contributing to apparel fit problems.

The purpose of this study was to analyze the degree of accuracy to which women ages 18-35 in the US can self-identify their body shape and whether this degree of accuracy has a relationship with apparel fit satisfaction. In order to effectively analyze this relationship, the following research questions were developed:

RQ1: With what degree of accuracy can women identify their own body shape?

RQ2: Is there a relationship between perceived body shape and apparel fit satisfaction for specific areas of the body?

RQ3: Is there a relationship between perceived body shape, apparel fit satisfaction and the overall ability to find clothing that fits?

5.1 Body Shape Self-Perception

The comparison between actual and self-identified body shapes showed that only 6.8% of participants identified their own body shape correctly while using a figure rating scale. While self-identifying their body shapes, participants chose from all seven body shape options but in reality only three of the body shapes were found in the sample. The distribution of actual participant body shapes was as follows: bottom hourglass (2.27%), triangle (50%) and rectangle

(47.72%). This distribution varies greatly from previous studies. Research conducted by Yim Lee et. al. (2007) and Simmons et. al. (2004) both used the same formulas as this study (Table 1) to categorize body measurement data into body shape categories. Yim Lee et. al. (2007) studied 6,310 women from the US between the ages of 18 and 66+. Their body shape distribution was as follows: hourglass (11.8%), top hourglass (3.0%), bottom hourglass (9.4%), spoon (21.5%), triangle (4.8%), inverted triangle (0.5%), and rectangle (49%). While the distribution of body shapes is more varied in the study conducted by Yim Lee et. al. since participants were identified in all 7 body shape categories, the proportion of participants who were categorized as rectangles was very similar to the results of this study. Rectangle is the most prevalent body shape in the research conducted by Yim Lee et. al. while it is a close second in the present study.

When studying 222 women aged 16-65+, Simmons et. al (2004) found that bottom hourglass was the most prevalent in their data set with 40% of participants being in that category contrasting the fact that none of the participants in the current study were categorized as any of the three hourglass categories. While there are several similarities and differences between all three studies, it is important to note that there is about a 16 - 19 year difference between the supporting literature and the current study. As body ideals and health and lifestyle trends change, the population shifts as well, which may be the cause for these differences. Additionally, there is a large difference between the age ranges of this study and the supporting literature. Due to participants selecting from all seven body shape categories but only falling into three of these categories as well as the low rate of accuracy, more information may need to be presented to the participants for them to make a more accurate body shape self-identification.

5.2 Body Shape Self-Perception and Reported Apparel Fit Satisfaction

The relationship between body shape self-perception and apparel fit satisfaction was determined using three questions in the survey, all of which had Likert scale response options. Two of the questions had a scale from one to seven, and one question had a scale from one to five. A rating of one was a negative rating of either extremely dissatisfied or extremely disagree and a high rating (of either 5 or 7 depending on the question) was a positive rating of either extremely satisfied or extremely agree. Satisfaction of apparel fit had the highest mean scores at the knees and shoulder width (Figure 9). Satisfaction at specific body parts varied from other literature. When studying 83 female participants from the U.S. between the ages of 18 to 35, Song and Ashdown (2013) found that participants ranked their body part satisfaction at the hips, waist and thighs as “neutral” while in the current study the average participant mean landed in the “somewhat satisfied” ranking. Researchers LaBat and DeLong studied apparel fit satisfaction of 107 women from the U.S. between the ages of 19 and 40. They utilized a similar body cathexis scale as this study, derived from Rosen and Ross. In their study, the thigh ranked the lowest in body satisfaction and out of the specific body parts both studies have in common, shoulder width ranked the highest. This is similar to the current study where shoulder width ranked the second highest and was statistically significant. However, the current study had the lowest satisfaction at the hips which differs from LaBat and DeLong.

When analyzing the overall correlation between the satisfaction of all of the body parts and the satisfaction of apparel fit at those body parts (Figure 10), there was a very low, but statistically significant, correlation. In the analysis of individual body parts, there were weakly correlated satisfaction levels and insignificant *p* values but they did all have positive correlation coefficients. This means that regardless of the strength of this relationship, they do have a

positive linear relationship. As an exception, the body part “shoulder width” was determined to have a moderate correlation that was statistically significant. This means that there is a strong probability that as one’s satisfaction with their shoulder width increases so does their satisfaction with apparel fit in that area and that this positive linear relationship has a moderate strength. There are a number of reasons why this body part displayed a different correlation to all the others, including lack of fit awareness at this body part. In typical apparel product development processes, the shoulder width can be a variable measurement depending on the style of the garment and the intended range of motion while wearing the garment. Therefore, this moderate correlation at the shoulder width may be due to the fact that shoulder width is less consequential to the overall fit of a garment (with the exception of highly functional products) but rather is dictated by the style of the garment resulting in a lack of fit awareness in this area or a subversion of the importance of fit due to stylistic preferences.

The Wilcoxon two sample rank-sum test was conducted to determine if there is a statistically significant difference between the top and bottom halves of the body for body part satisfaction and apparel fit satisfaction so that further information could be obtained about the opinions of participants relative to areas of their bodies. This test showed that apparel fit satisfaction was significantly different at the top and bottom halves of the body with the top half of the body having higher apparel fit satisfaction. This suggests that participants are struggling with the fit of garments for the lower half of their body more so than for the top half and could also suggest a lack of well-fitting garments at the retail level for the lower half of women’s bodies. This finding is interesting at a time when many brands, like those mentioned in the literature review, are in the process of introducing different fit types to accommodate customer body shapes that are focused on the bottom half of the body.

5.3 Satisfaction Levels and Ability to Find Clothing that Fits

Participants were asked to what extent they agree with the following statement: “I can easily find clothing that fits me” (Figure 11). While 52.27% of participants either agreed or extremely agreed that they can easily find clothing that fits them 36.36% of participants either disagreed or extremely disagreed with the statement. 11.36% of participants felt neutral about the statement. It is clear that the majority of participants have strong opinions about the statement. Due to the sometimes emotional nature of apparel fit issues as it may pertain to the aforementioned psychological challenges (BSSM and body cathexis) this may result in a strong and definitive reaction to the statement. Alexander (2003) and Kurt Salmon Associates (2000) found that approximately 50 percent of the women in their studies could not find appropriately fitted apparel. While 50% is a larger portion of participants, the data in the current study was almost split evenly similarly to that of the other researchers.

Finally, participants' ability to find clothing that fits them and their satisfaction with specific body parts and apparel fit was compared (Figure 12). Those participants who agreed or extremely agreed that they can easily find clothing that fits them had a higher overall satisfaction with both, body satisfaction and apparel fit satisfaction compared to those who said they disagreed or extremely disagreed with the statement. While more data collection would be necessary, the data suggests that there may be a positive relationship between body satisfaction and ability to find clothing that fits. It would also be important to better understand in which way this relationship flows, since participants may be highly satisfied with apparel fit because they are satisfied with the size and shape of their body parts, and vice versa.

5.4 Limitations

The main challenge in this study was the sample size. In this study there were 44 participants. A greater number of participants may have presented an opportunity for analysis using inferential statistics methods. One of the challenges was in the wording of the question that asks for ratings based on apparel fit satisfaction. Apparel fit satisfaction is an extremely subjective factor and while we know whether the participant thinks positively or negatively about apparel fit at a body part we do not know what kind of apparel fit they like or dislike to result in that answer. For example, there may be a participant who prefers a looser fit in clothing and will therefore rate apparel fit satisfaction low if clothing is tight fitting regardless of how well the garment fits their body simply because it does not fit their preference. Apparel fit satisfaction may then fluctuate with current trends and personal preferences.

5.5 Recommendations for Future Research

Based on the results of the study there are many opportunities for more research on the topic. In order to minimize limitations related to sample size, this study could be expanded to a longer time frame and to a much wider sample that is more representative of the total population. A larger sample analyzed using inferential statistics may result in further connections being identified to inform the behavior of brands and retailers. Additionally, further studies might inform the topic by identifying information participants need to self-identify their body shape. For example, in the Figure Rating Scale used in this study, the word “bust” was used. “Bust” may not be a term familiar to participants but “chest” may be. Lastly, more work needs to be done in understanding how participants define their ideal apparel fit. Investigations could be carried out to explore the effectiveness of current brands’ attempts to expand sizing options and naming systems for the lower half of the body.

5.6 Implications for the Apparel Industry

One of the main results of this study was that accuracy of body shape self-identification is low for women aged 18-35. This has implications for the apparel industry since industry messaging has shifted to communicate fit by using body shape information such as “curvy”. This messaging might not be the most effective since consumers may not identify their body shape correctly in order to select the garment with the best fit for them. The information given to consumers during their shopping experience should be modified so that it makes the most sense for the customer and they can then make the most informed decision. Therefore, brands should prioritize offering measurement services in store or through one on one fit sessions where consumers receive assistance obtaining the garments which best match their body type. While these options might be expensive to provide, it may reduce the expenses incurred by processing returns resulting from improper fit.

Another result of the study was that levels of satisfaction with specific body parts may have a positive linear relationship with apparel fit at those areas. This relationship may be due to the consumer putting forth more effort to find clothing that fits a body part they are satisfied with and less effort finding a good fit for body parts they are not satisfied with. This indicates that brands should identify the body parts that their consumers tend to be more satisfied with and prioritize fit at those areas. This relationship may also be impacted by general fashion trends. If the current fashion trend is to accentuate the waist, consumers may put forth more effort in finding apparel that fits at the waist which will increase their apparel fit satisfaction at that area. Another possibility may be that apparel that fits simply appears better than apparel that does not fit therefore making specific body parts appear better increasing body part satisfaction. While there are many possibilities, it is up to the brand to research their specific consumer base.

Due to apparel fit satisfaction at the top half of the body being significantly greater than the satisfaction at the bottom half of the body, brands should focus their attention on improving the fit of apparel at the bottom half of the body. This can be done by modifying product development practices to pay closer attention to the bottom half of the body during fit sessions and using fit models with a variety of body shapes to represent different fit types brands can potentially introduce to their range of offerings. Brands should also prioritize educating consumers on new and improved styles of garments so consumers can more accurately identify if a garment is for their body size or shape.

This study found that participants' ability to find clothing that fits them is split with 52.27% being able to and 36.36% not being able to. Other literature places this number between 50% and 69% (Goldsberry et al., 1996) (Kurt Salmon Associates, 2000). It is clear that apparel fit issues are a major challenge for female consumers. Brands must continue to improve fit and, as indicated by this study, obtain a better understanding of what information their consumer needs to make better fit decisions. Apparel fit can be improved by utilizing 3D technology and virtual fit sessions during the prototyping process to fit the same garment size on different body shapes. While there has been a focus on the past on using anthropometric studies, a deeper dive into the psychological relationships between body size and shape perception will prove useful in better understanding the consumer.

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APPENDICES

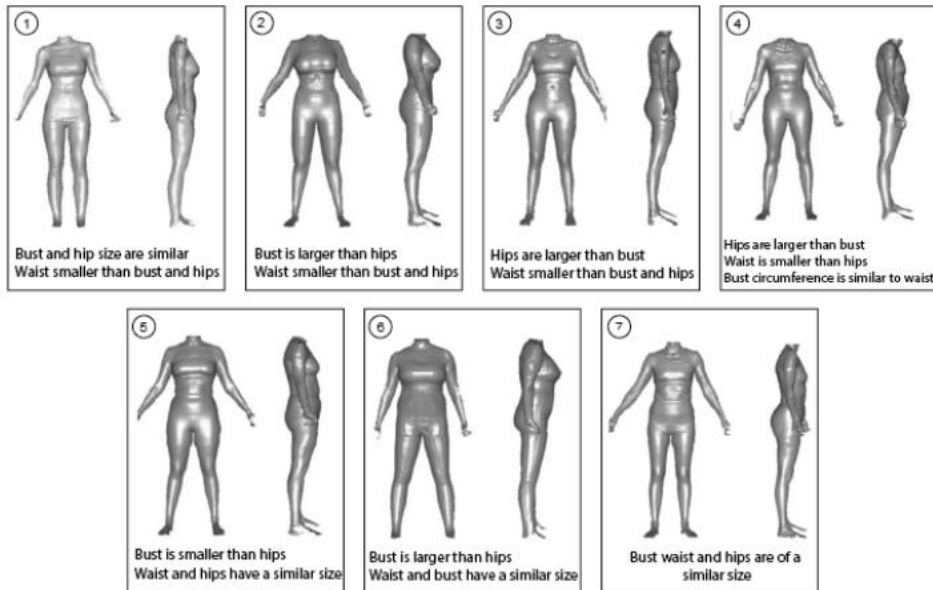
Appendix A: Survey Questions

Question 1

What is your participant number?

Question 2

Disregarding avatar *size* and *posture*, please thoroughly examine the body *shape* of the figures below:



Select the number that corresponds to the figure you think looks MOST like your own body *shape*.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- Other

Question 3

Each item below is related to a part of your body. For each item please select the option that indicates how satisfied you are with the size and shape of each aspect of your body.

	Extremely Satisfied	Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Dissatisfied	Extremely Dissatisfied
Height	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Weight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hips	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Waist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Legs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shoulder Width	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thighs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Question 4

To what extent do you agree with the following statement:

"I can easily find clothing that fits me."

- Extremely Agree
- Agree
- Neutral
- Disagree
- Extremely Disagree

Question 5

Each item below is related to an area of your body. For each item please select how satisfied you are with apparel fit at this area.

	Extremely Satisfied	Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Dissatisfied	Extremely Dissatisfied
Hips	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Waist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Legs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shoulder Width	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thighs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Arms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Knees	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix B: Consent Form

Consent Form

Title of Study: Body Shape Perception and Apparel Fit Satisfaction Among Young Women (**eIRB # 25352**)

Principal Investigator: Cecilia Monge, cmmonge@ncsu.edu, 786-250-7194

Funding Source: None

NC State Faculty Point of Contact: Katherine Annett-Hitchcock, kecarrol@ncsu.edu, 919-515-0905

What are some general things you should know about research studies?

You are invited to take part in a research study. Your participation in this study is voluntary. You have the right to be a part of this study, to choose not to participate, and to stop participating at any time without penalty. The purpose of this research study is to gain a better understanding of the accuracy with which females (aged 18-35) can identify their body shape in relation to established named body shapes utilized in the fashion industry. We will do this through asking you to complete a short survey followed by asking you to complete a body scan using scanning equipment at the Wilson College of Textiles.

You are not guaranteed any personal benefits from being in this study. Research studies also may pose risks to those who participate. You may want to participate in this research because if desired, you will receive body measurements and a 3D avatar that may assist you in finding better fitting clothing. You may not want to participate in this research because you will be asked questions about how you feel about your own body and will be asked to undress down to your underwear in a private changing room where you will be body scanned.

Specific details about the research in which you are invited to participate are contained below. If you do not understand something in this form, please ask the researcher for clarification or more information. A copy of this consent form will be provided to you. If, at any time, you have questions about your participation in this research, do not hesitate to contact the researcher(s) named above or the NC State IRB office. The IRB office's contact information is listed in the *What if you have questions about your rights as a research participant?* section of this form.

What is the purpose of this study?

The purpose of the study is to explore the accuracy with which females (aged 18-35) can identify their body shape in relation to established named body shapes utilized in the fashion industry.

How many people will be in the study?

There will be approximately 30 - 60 participants in this study.

Am I eligible to be a participant in this study?

In order to be a participant in this study, you must be female identifying, between the ages 18-35, able to understand written and spoken English, be able to travel to the Wilson College of Textiles, and be able to stand unassisted for at least 5 minutes in the body scanner. Participant must also be comfortable being body scanned in their undergarments.

You cannot participate in this study if you do not meet the inclusion criteria, have a history of body dysmorphia and/or eating disorders.

What will happen if you take part in the study?

If you agree to participate in this study, you will be asked to do all of the following:

1. Indicate your availability to come to the NC State University Centennial campus for a lab visit which will take you about 5 minutes to schedule. The student researcher will confirm a date and time with you over email.
2. Come to the NC State University Centennial campus for your lab visit where you will fill out a consent form that should take you 5 minutes to complete
3. Take an online survey where you will answer some questions about yourself, your body shape, and how you feel about your body. This will take you about 10 to 15 minutes to complete.
4. After this, your body will be scanned which should take approximately 10 minutes in total to complete. You will remove your clothing (except your bra and underwear) in a private changing room attached to the body scanner. The body scanner will not be collecting data while you undress. You will then stand in the body scanner for 5 minutes without moving while the body scanner collects your measurements and generates a 3-D avatar. After the scanning is complete, you will exit the scanner and leave the lab.

The total amount of time that you will be participating in this study is 30 - 35 minutes.

Risks and benefits

There are minimal risks associated with participation in this research. The risks to you as a result of this research include the possibility of feelings of psychological or emotional distress that may arise when answering survey questions about comparing your own body shape to those listed in the survey and indicating feelings about body parts. Additionally, feelings of distress may occur when undressing to your undergarments in preparation for the body scanning process which you will then subsequently stand in your undergarments inside the body scanner for about 5 minutes. We are mitigating this risk by excluding participants with a history of body dysmorphia and/or eating disorders. Throughout your appointment feel free to take as much time as you need and/or withdraw from the study at any point.

Two of the 3D avatars generated by the body scanner will be chosen to be used in a final thesis. There is a low likelihood that the 3D avatar generated by the body scanner could be reidentified by those intimately familiar with you because your head will be cropped out of the avatar image, filters will smooth out the skin of the body, and the student researcher will be saving the body scan data under a participant number and not your name. This participant number will be connected to your name in a master list located on a secure drive. While there will be a list indicating whose body scans are whose, that list will be only available to the student researcher and the faculty advisor. Some of the de-identified avatars will be submitted to academic journals for publication. None of the raw data will be shared with sponsors, journals or other researchers.

The direct benefits to your participation in the research is that, if desired, you will receive your body measurements and/or your 3D avatar. The indirect benefits are the potential for the body measurements and 3D avatar to assist in finding fashion sizing systems which best fit your body shape or assist you with weight loss/gain or muscle gain goals. Additionally, another indirect benefit includes assisting fashion brands in understanding consumer perceptions of established sizing systems via the thesis and subsequent publications.

Right to withdraw your participation

You can stop participating in this study at any time for any reason. To do so, just stop any research activity that you are doing or contact the student researcher, Cecilia Monge at cmmonge@ncsu.edu and 786-250-7194. You can also contact the faculty advisor for this research, Dr. Katherine Annett-Hitchcock, at kecarrol@ncsu.edu and 919-515-0905. If you choose to withdraw your consent and to stop participating in this research, you can expect that the researcher(s) will redact your data from their data set, securely destroy your data, and prevent future uses of your data for research purposes wherever possible. This is possible in some, but not all, cases.

Confidentiality, personal privacy, and data management

Trust is the foundation of the participant/researcher relationship. Much of that principle of trust is tied to keeping your information private and in the manner that we have described to you in this form. The information that you share with us will be held in confidence to the fullest extent allowed by law.

Protecting your privacy as related to this research is of utmost importance to us. There are very rare circumstances related to confidentiality where we may have to share information about you. Your information collected in this research study could be reviewed by representatives of the University, research sponsors, or government agencies (for example, the FDA) for purposes such as quality control or safety. In other cases, we must report instances in which imminent harm could come to you or others.

How we manage, protect, and share your data are the principal ways that we protect your personal privacy. Data that will be shared with others about you will be de-identified.

De-identified. De-identified data is information that at one time can directly identify you, but that we will record this data so that your identity will be separated from the data. We will have a master list with your code and real name that we can use to link to your data. In this study, your survey responses are the de-identified data. When the research concludes, there will be no way your real identity will be linked to the survey data we publish.

Future use of your research data

Your information, even with identifiers removed, will not be stored or distributed for future research studies.

Compensation

There is no compensation for participating in this study.

Emergency medical treatment

If you are hurt or injured during the study session(s), the researcher will call 911 for necessary care. There is no provision for compensation or free medical care for you if you are injured as a result of this study.

What if you are a student?

Your participation in this study is not a course requirement and your participation, or lack thereof, will not affect your class standing or grades.

What if you are an employee?

Your participation in this study is not a requirement of your employment, and your participation or lack thereof, will not affect your job.

What if you have questions about this study?

If you have questions at any time about the study itself or the procedures implemented in this study, you may contact the student researcher, Cecilia Monge, at cmmonge@ncsu.edu and 786-250-7194. You can also contact the faculty advisor for this research, Dr. Katherine Annett-Hitchcock, at kecarrol@ncsu.edu and 919-515-0905.

What if you have questions about your rights as a research participant?

If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this project, you may contact the NC State IRB (Institutional Review Board) office. An IRB office helps participants if they have any issues regarding research activities. You can contact the NC State University IRB office at IRB-Director@ncsu.edu, 919-515-8754, or [fill out a confidential form online](https://research.ncsu.edu/administration/participant-concern-and-complaint-form/) at <https://research.ncsu.edu/administration/participant-concern-and-complaint-form/>

Consent to participate

By signing this consent form, I am affirming that I have read and understand the above information. All of the questions that I had about this research have been answered. I have chosen to participate in this study with the understanding that I may stop participating at any time without penalty or loss of benefits to which I am otherwise entitled. I am aware that I may revoke my consent at any time.

Yes, I want to be in this research study.

Name _____

Today's Date _____

No, I do not want to be in this research study.

Thank you for your consideration.

Appendix C: Body Scanner Process



size stream

Height 1795.56
Jeans Waist 786.81
Jeans Size MEDIUM
Jeans Length X-LONG
Max Inseam 895.36
Shirt Collar 344.49
Shirt Sleeve 840.92
Men's Body Fat Estimation 23.05
Women's Body Fat Estimation 28.88

SS Female