COMPARING SELF AND OTHERS' PERCEPTIONS OF ADOLESCENT GIRLS'

BODY SIZE USING FIGURAL STIMULI AND 3D BODY SCANS

Except where reference is made to the work of others, the work described in this thesis is my own or was done in collaboration with my advisory committee. This thesis does not include proprietary or classified information.

_____

Aarti Y. Mahajan

Certificate of Approval:

_____	_____
Pamela V. Ulrich, Co-Chair Professor Consumer Affairs	Lenda Jo Connell, Co-Chair Professor Consumer Affairs
_____	_____
Karla Simmons Professor Consumer Affairs	Veena Chattaraman Professor Consumer Affairs

_____

George T. Flowers
Dean
Graduate School

COMPARING SELF AND OTHERS' PERCEPTIONS OF ADOLESCENT GIRLS' BODY SIZE USING FIGURAL STIMULI AND 3D BODY SCANS

Aarti Y. Mahajan

A Thesis

Submitted to

the Graduate Faculty of

Auburn University

in Partial Fulfillment of the

Requirements for the

Degree of

Master of Science

Auburn, Alabama
May 9, 2009

COMPARING SELF AND OTHERS' PERCEPTIONS OF ADOLESCENT GIRLS'

BODY SIZE USING FIGURAL STIMULI AND 3D BODY SCANS

Aarti Y. Mahajan

_____

Signature of Author

_____

Date of Graduation

VITA

Aarti Mahajan, daughter of Yuvraj Mahajan and Anjali Mahajan, was born March 8, 1984, in Nagpur, India. She graduated from School of Fashion Technology, Pune, India, in May, 2004 with a Bachelor of Science degree in Fashion Design. After completing her one year Diploma in Marketing Management, she entered Graduate School, Auburn University, in August, 2005. She received the first place scholarship prize with "Best Marketable Textile Design" award at International Textile and Apparel Association's Annual Meeting in 2007. She married Yogesh Mahajan, on December 24, 2004.

THESIS ABSTRACT

COMPARING SELF AND OTHERS' PERCEPTIONS OF ADOLESCENT GIRLS' BODY SIZE USING FIGURAL STIMULI AND 3D BODY SCANS

Aarti Y. Mahajan

Master of Science, May, 2009
(B.S., Indian Institute of Modern Management, India, 2005)
(B.S., School of Fashion Technology, Pune, India, 2004)

123 Typed Pages

Directed by Dr. Pamela V. Ulrich and Dr. Lenda Jo Connell

The overall objective of this study was to explore young adolescent girls' body size perceptions and older female students' perceptions of the adolescent girls' body size based on a nine point figural scale. Forty-two body scan images of adolescent girls were included in a Power Point stimulus and shown to the students. The convenience sample of 107 female students ages 19- 23 was recruited in classes from the Department of Consumer Affairs at Auburn University, AL. A written instrument was used to record female students' responses. Students were asked to rate the body scan images on the figural scale and in a separate section to assess them as to being underweight, normal, overweight and obese. Data recorded from the students and the existing data of adolescent girls' self-perceptions were analyzed.

A significant difference was found between adolescent girls' self-perceptions of their body sizes and female students' perceptions of those girls' body sizes. The girls on average saw themselves smaller than female students did on the figural scale. Overweight and obese girls saw themselves as no larger than a figure 6, even if their BMI was as high as 50.6. On the figural scale, African-American adolescent girls saw themselves as larger than the Caucasian adolescent girls saw themselves. Female students most correctly identified the overweight and obese scans on the figural scale. Female students often perceived normal scans as overweight.

Female students misperceived a few body scans to be underweight. The mean BMIs associated with each size category (underweight, normal, overweight, and obese) identified by female students' for the adolescent girls' body scan images were compared to the CDC's BMI scores for the same ages of adolescent girls. The mean BMI scores for each size category identified by the female students were much larger than the BMI ranges classified by the CDC for 12 year old girls. For age 13, students correctly identified normal, overweight and obese sizes that fell within the BMI ranges classified by the CDC. For age 14, female students correctly identified normal and obese sizes.

Overall this study indicated that adolescent girls saw their bodies as smaller by one interval on a figural scale than females in a student sample. This is consistent with other research (Lee, 2006) and indicates that adolescents' perceptions of their body sizes differ from others perceptions. The study was limited by the number of body scans available by age and size category.

Acknowledgements

Sincere gratitude is expressed to Dr. Pamela V. Ulrich and Dr. Lenda Jo Connell, Co-chairs for this thesis, for their constant guidance, support, understanding, and encouragement throughout the completion of this research project. Appreciation is also expressed to the committee members Dr. Karla Simmons, and Dr. Veena Chattaraman, for their valuable ideas and support. Moreover, the author would like to express her special thanks to Dr. Carol Warfield – Department head, for her continuous support and encouragement throughout the study.

The author would also like to give her thankfulness and gratefulness to her friends and family; parents and parents in law for their love and constant support during the completion of this research. Much love and thanks are due to her soul mate, loving husband, Yogesh Mahajan, who constantly had words of support and praise through the difficult times, who always offered a guiding hand and always supported her dreams.

Style manual or journal used: Publication manual of the American Physiological Association (5th ed.).

Computer software used: Microsoft Word 2007, Microsoft Excel 2007, SPSS 16 for windows.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I. INTRODUCTION

Researchers have been interested in the topics of body image, body size perception, body satisfaction and dissatisfaction, and body attractiveness perception for decades. They have studied how individuals see themselves and how they see others. Subjects have included male and female adults, adolescents, and children. Females have tended to be studied more than males because of evidence that their body dissatisfaction is higher. Young females have been the topic of research about eating disorders. Body size dissatisfaction is usually associated with female perceptions of body weight, especially for females who believe they are overweight (Levine & Smolak, 2002). Body size may affect perceptions of attractiveness and body image (Rucker & Cash, 1992).

There are many reasons to be interested in the development of body image and attractiveness issues during adolescence. Research on the development of body image and attractiveness in children of age 11 and under show that concerns regarding negative body image in adolescents may be generated in childhood (Smolak, 2002). Studies show that approximately 40- 70% of adolescent girls are dissatisfied with some aspect of their body (Levine & Smolak, 2002). Smolak (2002) studied body image development in elementary school children. She found that girls and boys start showing concerns about being overweight as young as at the age of 6 years, and in fourth grade and beyond (by the end of elementary school) it was not uncommon to find the desire to be thinner in

children. “Longitudinal studies revealed that, for girls, satisfaction with body parts and overall appearance declines significantly over the years 12-15, before leveling off or even increasing slightly in middle and later adolescence” (Levine & Smolak, 2002, pp. 75).

Though body scans have been used to study adult females, they have not been used to study adolescents. Adolescence is a general term and is often divided into age groupings. A portion of the adolescent years is often referred as “Tweens” which is a marketing-derived term for older children and younger teens. Tweens are between ages 9 and 13 years (Center of Disease Control -Fact sheet, 2007a). Ryan (1966) divided adolescence into early (ages 12-15) and older (ages 16-20) segments. Curtis (1991) defined early adolescents’ ages 11 to 15 years. Smith (2002) defined the tween market as ages 7 to 14 years old. Definitions of tweens vary from ages 6 to 16 years, but most scholarly articles define tweens as ages 9 to 14 years. For the purposes of this study, tweens are between ages 9 to 14 years.

Cultural and ethnic values affect people’s interpretations and perceptions of their bodies. American culture appears to emphasize the value of thinness for females. This can increase girls’ and women’s concerns about their body weight or size and shape. There are many variables that contribute to perceptions of body size. Social factors include the influences of peers and family members, who can affect an individual’s body size perception (Maloney, Maguire, & Daniels, 1989). Figures seen in fashion, on television, and in many magazines which seem to make the slender figure the ideal figure make an impact on body image development (Tiggemann, 2002). In addition to these

external factors, internal factors such as gender roles, health awareness, depression, and personal values may influence body perception and assessment.

"Cultural values influence perception of and behavior toward others, which in turn influence the behavior of others, which in turn influences the self-perception of others" (Jackson, 2002, p. 14). According to Tantleff-Dunn and Gokee (2004), others' viewpoints of us have a significant effect on how we see ourselves. Receiving comments (positive or negative) from others about one's physical appearance affects perceptions of how others see them. The comments may come from family, peers, romantic partners, teachers, employers or from a complete stranger (Tantleff-Dunn & Gokee (2004). It is well known to us that people perceive thin bodies as attractive among females. Murray, Touyz, and Beumont (1995) examined the influence of others on body shape and weight in a group of eating disorder patients and a community sample. They found that female subjects were more likely than males to report that other persons influenced their body shape and weight related attitudes and behaviors. They commented that females are much more likely to receive negative criticism of their bodies than males. Thus, others, including family, peers or even strangers, can affect body size perceptions by providing feedback on physical appearance or in some other way, which may increase concerns in individuals about appearing attractive to others.

"Appearance perceptions are influenced not only by the images that are observed and evaluated, but also by the characteristics of the perceivers themselves. "Perceivers bring with them to any social context a variety of personal backgrounds that shape what and how they see" (Kaiser, 1997, p. 271). A study done by Willinge, Touyz, and Charles

(2006) to explore body image perceptions found that body-dissatisfied females misperceived the real size of thin females, whereas body-satisfied females made correct judgments of actual body size.

Females seem to be more worried than men about weight (Feldman, Feldman, & Goodman, 1988). Because of societal concerns about girls developing eating disorders in pursuit of thinness, multiple researchers have investigated adolescent girls' body image and weight concerns, body attractiveness perceptions, and body satisfaction. Agras and Kirkley (1986) found that females, because of their body image perception, are at the greatest risk for developing eating disorders in their adolescence. Abramovitz and Birch (2000), in their study related to dieting ideas of five years old girls predicted by their mothers' dieting, found that girls as young as five had weight concerns when their mothers showed weight concerns. In their sample they noticed that those young girls whose mothers were involved in dieting were much more likely to have ideas about dieting.

Adolescence is an important period for the development of body image concerns related to weight, especially for girls. "Girls' development through the stages of puberty in early adolescence is associated with increased body mass, a more negative body image, and higher levels of drive for thinness and dieting. Pubertal timing, however, does not consistently correlate with body dissatisfaction, nor has it been shown to consistently predict negative body image in middle or late adolescence. With respect to the impact of synchronous stressors, girls who begin middle school, begin puberty early, and begin dating during the same year report more body dissatisfaction at the time. Furthermore,

this disadvantage increases over the middle school period (ages 11-14)" (Levine & Smolak, 2002, p. 75).

Research indicates that concerns about body image and aspects related to it begin to develop in girls during the early stages of adolescence. Girls normally develop a heightened interest in their own appearance in the early stages of adolescence. Physical changes, the influence of peer groups to show group identity, and the emphasis of the media all contribute to the development of negative body image behavior in adolescents (Tselepis & De Klerk, 2004). Tselepis and De Klerk (2004) studied early adolescent girls to understand what contributes to their perceptions of clothing fit. Their results suggested that early adolescent girls were concerned about both the fit and functional aspects of their clothes and also about the emotional affect and self image related to the use of clothing.

Over the last three decades, increasing concern about eating disorders among adolescent females has directed most research in the area of body image and size dissatisfaction. Although eating disorder research on females focuses on their desire to be thin, a current problem in many countries of the world, including the U.S., is the rising incidence of obesity, including excessive weight gain in young children. U.S. Census Bureau (2006) data show that there are approximately 10.3 million females aged 10-14. According to the National Center for Health Statistics (NCHS, 2007b), adolescence includes ages 10-19. Population data show that "In 2005, there were 73.5 million children under age 18 in United States. The number of children under age 18 in the United States

has grown from 47.3 million in 1950 to 73.5 million in 2005 and by the year 2030, that number is expected to grow to 85.7 million" (Data Bank, 2007) (see Figure 1).

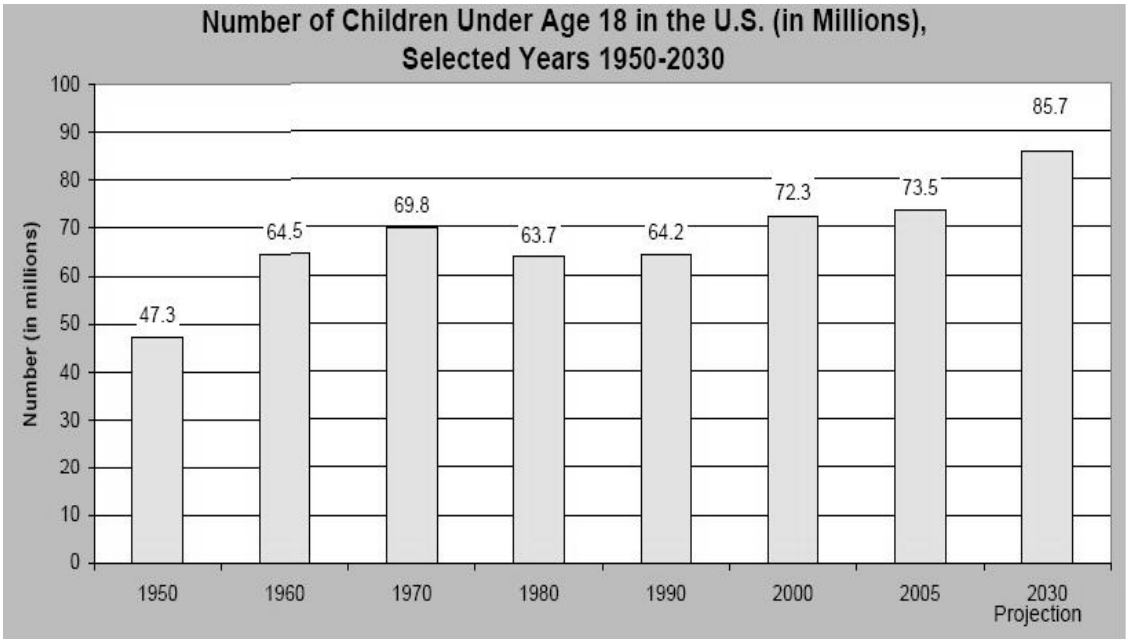


Figure 1: Chart for number of children under age 18 in the U.S. (Data Bank, 2007)

Obesity is a serious health concern for children and adolescents. As the population numbers of children has grown, there has also been an increase in the number of overweight children. Data from the National Health and Nutrition Examination Survey (NHANES, 2007) shows increases in the prevalence of overweight children among all age groups. Data show that in children aged 6–11 years, the prevalence of overweight increased from 4.0% to 18.8%, and among adolescents aged 12–19 years, the prevalence of overweight increased from 6.1% to 17.4% from 1971 to 2004 (see Table 1).

Table 1

*Overweight Trends among Children and Adolesc*ents in the U.S.

Prevalence of Overweight Among U.S. Children and Adolescents (Aged 2–19 Years)				
	Survey Periods			
	NHANES I 1971–1974	NHANES II 1976–1980	NHANES III 1988–1994	NHANES 2003–2004
Ages 2 through 5	5%	5%	7.2%	13.9%
Ages 6 through 11	4%	6.5%	11.3%	18.8%
Ages 12 through 19	6.1%	5%	10.5%	17.4%

Note. Source- NHANES, (2007)

The growing numbers of adolescents/tweens, combined with concerns about eating disorders and obesity, make it logical to study body perceptions in this group. According to studies, negative body image is related to eating disorders and increasing problems of obesity among adults, and children (Levine & Smolak, 2002). Agras and Kirkley (1986) indicated that females, because of their negative body image perceptions, have the greatest risk for developing eating disorders during the adolescence period. Slade and Russell (1973) noted that anorexia nervosa patients estimated their body size to be larger than people who do not have any eating disorders. Since body size

dissatisfaction and concerns of being overweight or obese begin to develop among females in their early adolescence, more research is needed to understand how adolescent girls see their own body sizes.

According to Gardner (2002), body size disturbance can be distinguished by two different components: perceptual and attitudinal. The attitudinal component, identified in individuals with eating disorders, involves their own body size or shape dissatisfaction. The perceptual component, observed in individuals with eating disorders, involves inaccurate judgment of one's body size or shape. Thompson and Gardner (2002) found that body size overestimation is specific to eating disorder patients. This indicates that individuals may not look at their own body size correctly and may judge others' body size inaccurately.

Body image studies have been conducted by researchers in many fields. In the apparel field, investigations have been conducted in relation to body satisfaction/dissatisfaction, fit problems, and clothing behavior issues. Research also targeted body size perception in relation to body attractiveness and shape (Aghekyan, 2005; Farinah, 2005; Lee, 2006). Body Mass Index (BMI), as an indicator of body size, and figure drawings or photographs are commonly used as tools to study body size and attractiveness perceptions. Singh (1993) used line drawings to rate attractiveness of female figures, and Tovee and Cornelissen (2001) used real color images of women to rate attractiveness of female bodies.

Line drawings (figural stimuli/figural scales) have been used for studying actual and ideal body sizes. A widely used scale was first introduced by Stunkard, Sorensen, and Schulsinger (1983) and later used by Fallon and Rozin (1985) (see Figure 2).

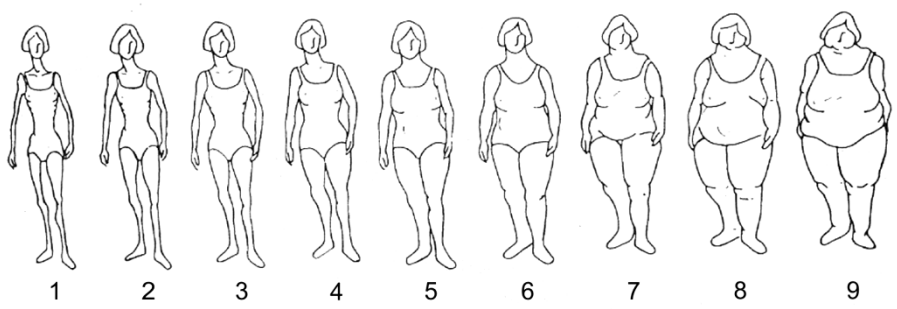


Figure 2: Female figure drawings from figure rating scale, Stunkard et al. (1983)

Singh (1993) also used line drawings to study body shape and body attractiveness. A disadvantage in the interpretive use of line drawings is that there are no physical or size measurements associated with the original scale. Bulik, Eaves, Heath, Stunkard, and Wade (2001) completed research that associated BMI values for adults with each of the nine figures in Stunkard et al.'s figural scale.

Three- dimensional body scans, which present images of real people whose sizes are measured, offer a new tool for studying body image perception. Aghekyan (2005) and Farinah (2005) used body scan images of adult females as stimuli to have subjects identify a range of 3D body scans according to body size category (defined according to BMI as underweight, normal, overweight, or obese). Subjects were also asked to rate each scan for body attractiveness.

Statement of Purpose

Although some researchers have looked at the accuracy of body perception of patients with eating disorders and obese patients' perceptions of their own body size, relatively little is known about "average" individuals. Considering social concerns about girls' desire to be thin and the rising incidence of obesity, it is logical to ask, how accurately do young girls in the general population perceive their body size? Do they see themselves as others see them? How do their perceptions compare to health professionals' definitions of what is underweight, normal, overweight, or obese? This study has two related purposes. First, the purpose was to apply perception based on a figural scale stimulus in the comparison of adolescent girls' self perceptions of body size with other individuals' perceptions of the girls' body size. Second, knowledge of the girls' actual size, as defined by BMI, allowed BMI scores to be linked to specific figure drawings to understand actual size calculated to a commonly used graphic figural scale. Use of 3-D body scan images to present the girls' bodies to other raters allowed girls' figure sizes to be anonymously rated.

The following research questions were explored:

1. Is there any difference between girls' self- identification of their body size based on a figural scale and others' (female students) identification of the girls' body size using the same figural scale?
2. What are the differences between the mean BMIs associated with self-figures selected by girls and the mean BMIs associated with figures identified by others (female students) for the girls' body sizes for each figure on the figural scale?

3. For each figure on the figural scale, what are the differences between the mean BMIs of Caucasian and African-American girls who select a figure?
4. What are the mean BMIs and BMI ranges associated with the female student sample's classification of girls' body scans as underweight, normal, overweight and obese?
5. What are the differences between the mean BMIs for each size category based on CDC standards and the mean BMIs for each size category based on the classification by female students?

CHAPTER II. REVIEW OF LITERATURE

Everyone sees their own and others' body sizes, but they may not all perceive them in the same way. This chapter presents the literature that relates to the present research. The literature review is divided into the following sections: body size measurements; classifying body size and shape; self perception of body size and perception of others' body size and shape. Each section explains the importance of the research subject and explores research studies that have been done in the topic area.

Body Size Measurements

Anthropometric assessment of the human body may include height, weight, Body Mass Index (BMI), Waist-to-Hip (WHR) and other ratios, and a variety of circumference, length and width measurements. Traditionally, human body measurements were taken by hand with a tape measure, weight scale, sliding compass, anthropometer, caliper, and head spanner (Simmons & Istook, 2003). These measurements were considered one-dimensional and taken as circumferences, distances, and weight (Bubb, 2004). These measurements did not show the human body as a three-dimensional object. Douty (1954) saw the human body as a three-dimensional form made up of a pattern of curves and flat areas. She used her method of somatography (a photography method) to analyze and understand body shape of her subjects with a three dimensional view. Later Douty (1968) developed Body Build and Posture Scales, to identify body build and postural patterns.

Researchers used somatography technique to study human body shapes and patterns until 3D body scan technology became available.

Three-dimensional body scanners are the newest and fastest tool used in anthropometry. “The three-dimensional body scanner is a tool that captures information about the surface of the body using multiple laser or white lights and CCD (Charge-Coupled Device) cameras. Electronic circuitry and a microprocessor unload the data which are processed, saved as a file, and visualized as a three-dimensional image on a computer monitor. This image is a full, dimensionally accurate replica of the scanned object that can be viewed, rotated, and measured on the computer screen” (Cornell University, 2006). Three-dimensional (3D) body scanners are able to take into account all points, lengths, surfaces, shapes, and volume measurements of a human body. With the technology of 3D body scanners, the study of the 3D human figure became much easier and faster for the anthropometrist as the measurements and body shapes could be analyzed again and again without the subject.

O’Brien and Shelton (1941), who conducted the first known U.S. anthropometric study, were not able to identify any body measurements that could be used to calculate all other body size measurements. The authors made a suggestion to divide the population by vertical and horizontal measurements and then further divided them into three categories that would cover a wider range of people. The vertical measurements were divided into three height categories and the horizontal measurements into three weight categories. Today, those two measurements are used to calculate an individual’s Body Mass Index (BMI) using a person’s height and weight. The Center for Disease Control (CDC, 2007b)

developed charts identifying the human body sizes as underweight, normal, overweight, and obese categories for adults and children.

According to the National Center for Health Statistics definitions (NCHS, 2007a), BMI is a measure of size that relates the body weight and height of a person and then classifies the body sizes. BMI is a reliable indicator of body mass and is a tool for indicating weight status in children, teens, and adults. The CDC (2007b) explains that "Body Mass Index (BMI) is a number calculated from a person's weight and height. For adults 20 years old and older, BMI is interpreted using standard weight status categories that are the same for all ages and for both men and women. For children and teens, the interpretation of BMI is both age- and sex-specific" (CDC, 2007b). BMI is calculated in the same way for both adults and children. The calculation is based on the following formulas (Table 2).

Table 2

Calculation of BMI

Measurement Unit	Formula and Calculation
Kilograms and Meters	Formula: weight (kg) / [height (m)]^2 With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared. Since height is commonly measured in centimeters, divide height in centimeters by 100 to obtain height in meters.
Pounds and Inches	Formula: weight (lb) / [height (in)]^2 x 703 Calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703.

Note. Source- CDC, (2007b)

Adult male and female body sizes are classified by BMI scores into the four basic categories, Underweight, Normal, Overweight, and Obese (Web MD, June 2, 2007). The standard weight/size status categories using BMI ranges for adults are set by CDC (2007b) and the definitions for the four basic size categories are described by Web MD (June 2, 2007); these are shown in Table 3.

Table 3

Four Basic Size Categories Associated With BMI for Adults by CDC (2007b) and Their Definitions

BMI	Weight Status	Definitions
Below 18.5	Underweight	The condition of weighing less than normal or desirable for one's height and build.
18.5 – 24.9	Normal	An ideal or healthy weight.
25.0 – 29.9	Overweight	A condition in which a person's weight is 10%-20% higher than "normal", as defined by standard height/weight chart.
30.0 and Above	Obese	A condition in which a person's weight is 20% or more above normal weight.

Note. Source- Web Md (2007) and CDC (2007b)

"For children, BMI is age and gender specific and is often referred to as BMI-for-age" (CDC, 2007b). CDC growth charts for children and adolescents aged 2-20 name the weight/size status categories somewhat differently than for adults; these are: underweight, healthy weight, at risk of overweight, and overweight. BMI- for- age size status categories, defined by percentiles, are shown in Table 4.

Table 4

BMI Weight Status Categories and Corresponding Percentiles for Children

Weight status category	Percentile Range
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than the 85th percentile
At risk of overweight	85th to less than the 95th percentile
Overweight	Equal to or greater than the 95th percentile

Note. Source- CDC, (2007c)

Figure 3 shows the CDC growth chart (2007c) for interpreting BMI for age in terms of percentiles from the 3rd to 97th percentile for girls aged 2-20. Age is a factor that should be considered when assessing BMI. Lee (2006) studied body image perceptions and clothing behavior issues of 9 to 14 year old girls and their mothers. She calculated girls' BMI in order to relate their body image and body size perceptions. Lee (2006) derived the range of BMI scores (Table 5) for children for the four categories delineated by the CDC BMI-for-age chart shown in Figure 3, where underweight is below the 5th percentile in BMI-for-age, healthy weight is the 5th to 84th percentile, at risk of overweight is between the 85th and 94th percentiles, and overweight is over the 95th percentile in BMI-for-age.

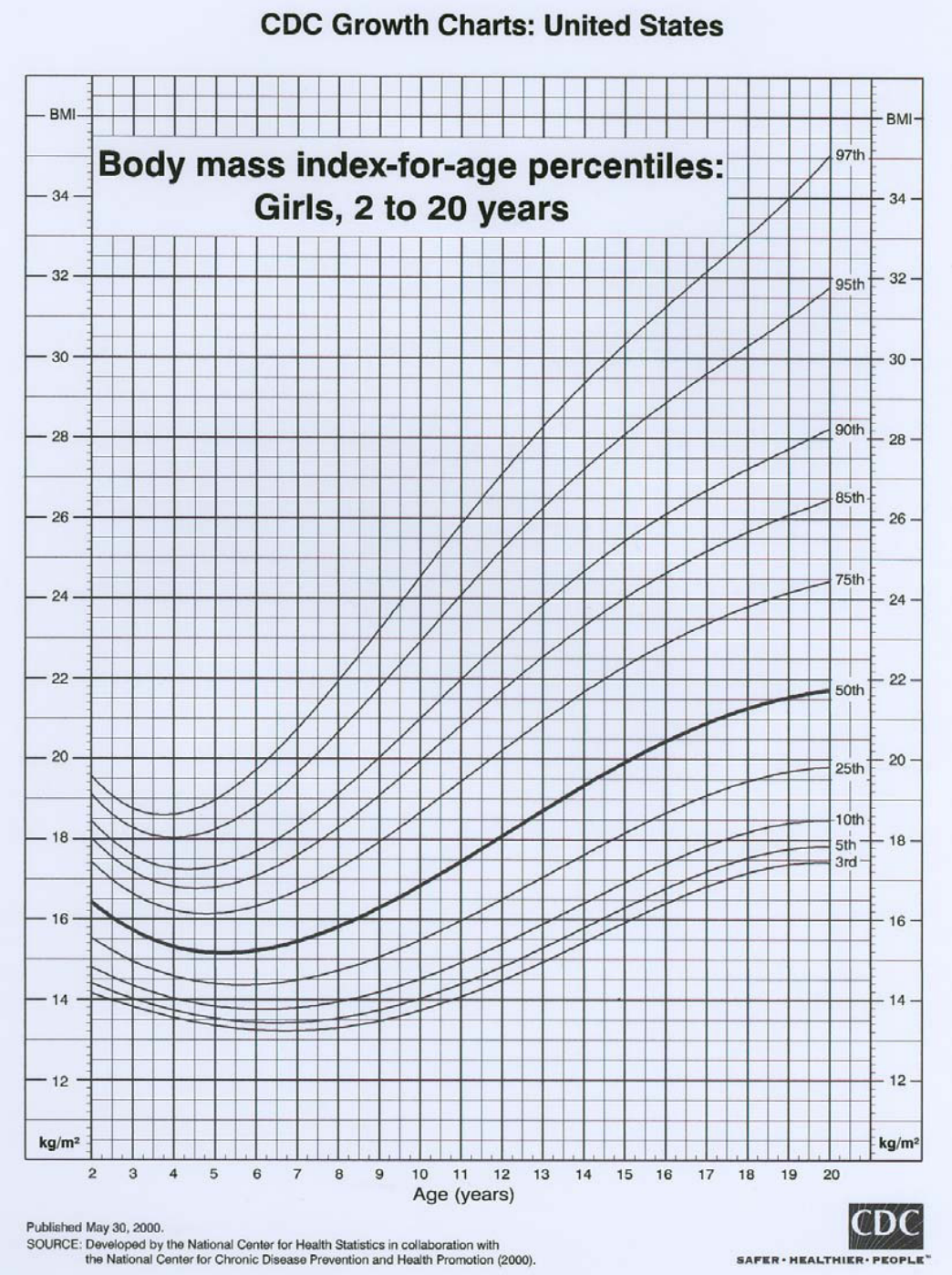


Figure 3: CDC growth chart: BMI-for-age percentiles for girls 2-20 years (CDC, 2007c)

Table 5

BMI Range by Age Derived from CDC Growth Chart

Age	BMI range under the 5th percentile	BMI range 6th to 84th Percentile	BMI range 85th to 94th percentile	BMI range over the 95th percentile
9	Up to 13.6	13.7 - 19.1	19.2 - 21.8	Over 21.9
10	Up to 14.0	14.1 - 20.0	20.1 - 23.0	Over 23.1
11	Up to 13.9	14.0 - 20.8	20.9 - 24.1	Over 24.2
12	Up to 14.8	14.9 - 21.6	21.7 - 25.2	Over 25.3
13	Up to 15.2	15.3 - 22.6	22.7 - 26.2	Over 26.3
14	Up to 15.8	15.9 - 23.2	23.3 - 27.2	Over 27.3

Note. Source- Lee (2006, p. 59)

BMI has been used to evaluate health risks in individuals. Most medical experts and health professionals note that the adult BMI range of 18.5 to 24.9 is a healthy sign for any individual. Since body fat contributes to the shape and size of an individual's body and BMI represents size, BMI may be related to body fat and shape. However, it is important to note that "BMI is not a direct measure of body fatness and that BMI is calculated from an individual's weight which includes both muscle and fat. As a result, some individuals may have a high BMI but not have a high percentage of body fat" (CDC, 2007b).

Classifying Body Shapes

Several systems have been developed for classifying body sizes and shapes. Body shape was first introduced by William Sheldon in 1940. He introduced the word 'somatotype' and defined somatotyping as "a quantification of three primary components determining the morphological structure of an individual expressed as a series of three numerals, the first referring to endomorphy, the second to mesomorphy, and the third to ectomorphy" (as cited in Carter & Heath, 1990, p. 30). He classified men's body types into three basic categories (Figure 4): ectomorph (slender to very thin), endomorph (plumper) and mesomorph (more muscular). He used 4000 photographs of college-age men to somatotype the basic components of men's body types for the purpose of relating their personality characteristics to their physical characteristics.

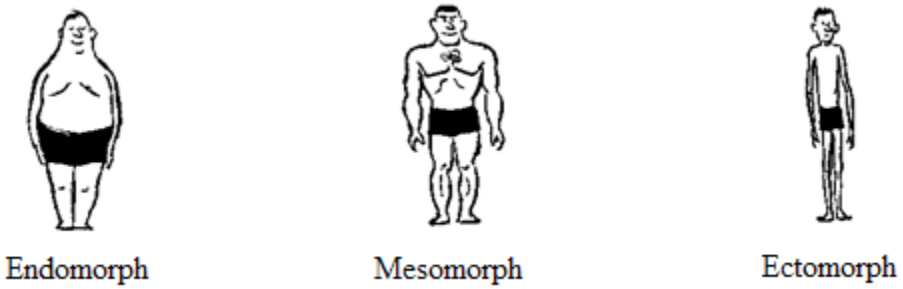


Figure 4: Basic categories of human physique (Sheldon, 1940)

Body shapes and sizes have also been studied by experts in the apparel field. Douty (1954) took photographs of her students using somatography in order to gain a picture of students' body shapes. Somatography, introduced by Douty (1954), is a method of photography to capture the silhouettes to study body shape. By showing

students silhouettes of themselves, she discussed shape, posture, proportion, and weight distribution with students and how these characteristics affected the way clothing draped and fit on the body. With further analysis, Douty (1963) introduced a somatographic technique to measure the human body. Douty's (1968) Body Build and Posture Scales, which used side and front views of subjects to categorize their figures, allowed researchers to identify body build and postural patterns. Using somatographs (real silhouettes projected against a grid), Douty, Moore, and Hartford (1974) developed a body build and posture scale for women.

August (1981) presented different body shapes based on alphabet symbols to classify female body shapes. She identified four main categories of body types:

- 'A': narrow shoulder and wider hips
- 'X': proportional shoulders and hips
- 'V': broader shoulders and narrow hips
- 'H': same width of shoulders, waist line, and hips

August (1981) also evaluated the side views of female bodies and classified them based on lower case letters including 'b'(abdomen is prominent); 'd'(derriere is prominent); 'i'(bust line is minimal); and 'r'(bust is prominent) (see Figure 5). She mentioned that many women can have a combination of more than two body types. Similar to August, Armstrong (1987) defined four body shapes; Hourglass (like the X); Rectangular (like the H); Inverted Triangle (like the V); and Pear shape (like the A), based on shoulder/hip relationships.

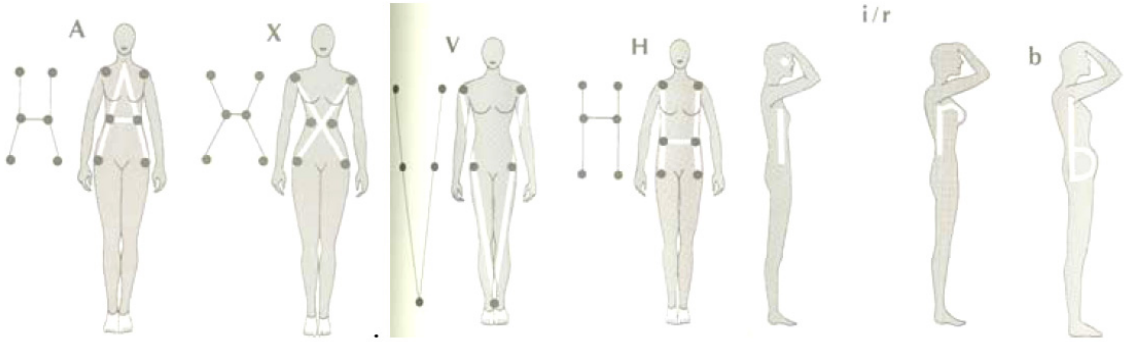


Figure 5: August's (1981) body shapes

Apparel experts have studied body size and shape to research body image, body satisfaction, and physical attractiveness. Connell, Ulrich, Brannon, Alexander, and Presley (2006) developed the Body Shape Assessment Scale (BSAS©) based on 9 body shape templates created by other researchers. The BSAS© has Body Build, Body Shape, Hip Shape, Shoulder Shape, Front Torso Shape, Bust Shape, Buttocks Shape, Back Shape, and Posture as whole and component. BSAS© was developed to assess body shape based on front and side views. Istook, Simmons, and Devarajan (2002) categorized nine body shapes: bottom hourglass, hourglass, spoon, rectangle, oval, triangle, diamond, inverted triangle, and top hourglass, using 222 body scans to analyze whole body shape. The researchers described each body shape by using bust, waist, hip, stomach, and abdomen circumferences.

One method for studying these topics has been the use of figure line drawings as prompts or cues. Figural stimuli have been used to measure body image perceptions, including current body size, ideal/desired body size, and comparisons between these two measures. Some figural stimuli provide drawings which can be used to classify individual body shape and size from thin to obese. Stunkard, Sorensen, and Shulsinger's (1983)

scale of progressively larger figure line drawings, is the most widely used figure rating scale in body image related studies. Unlike Sheldon's (1940) and Douty's (1954) research objectives, Stunkard et al.'s (1983) figure drawings were primarily used for body size perception and attractiveness studies. The female scale (see Figure 6) by Stunkard et al. (1983) includes nine figure drawings ranging from thin to obese.

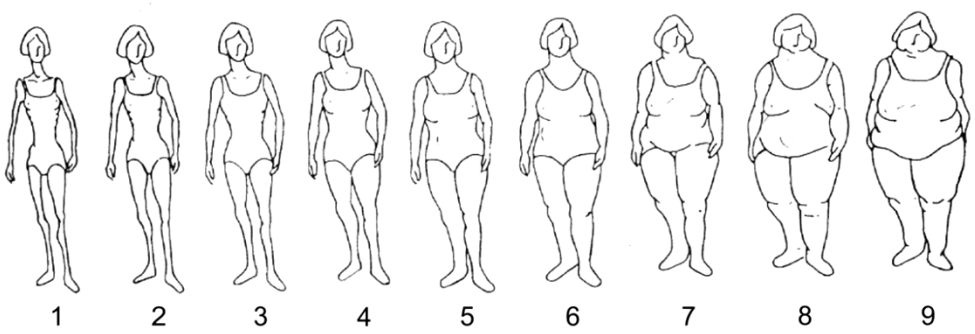


Figure 6: Female figure drawings from figure rating scale, Stunkard et al. (1983)

Applying Stunkard et al.'s (1983) concept, Collins (1991) developed figural scales for boys and girls. Rand and Resnick (2000) developed more sets of line drawings to include children, young adults, and middle- age adults (see Figure 7), using the basic line drawings from Stunkard et al. (1983), to investigate socially acceptable body sizes.

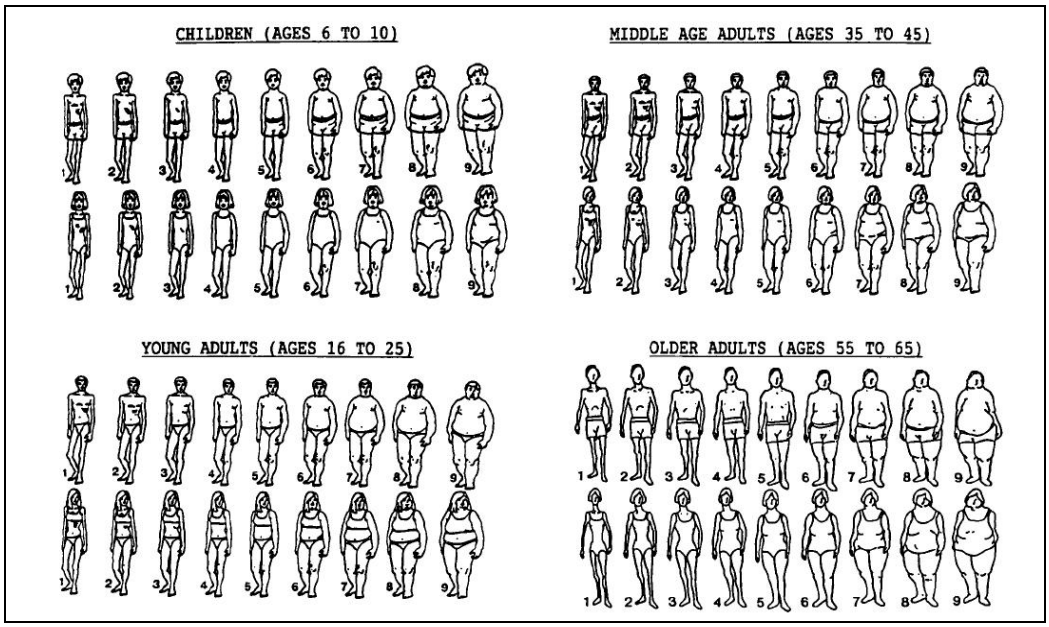


Figure 7: Line drawings of children, young adults, and adults Rand and Resnick (2000)

Rand and Resnick (2000) found that line drawings were a reliable tool for current and ideal body size assessment. Gardner, Friedman, and Jackson (1998) argued that the scales existing when he wrote, including Stunkard et al.'s (1983) scale had "methodological shortcomings, which include a small number of figure drawings in the scale and the restricted range of figures from which subjects can select". Gardner et al., (1998) identified problems related to having a non-interval scale for changes in figure size as well as methods of figure presentations. Despite these shortcomings Stunkard et al. (1983) in their study of obesity and thinness found that the figural scale is highly robust and significantly correlated with measured percentage of overweight ($r = 0.79$). They concluded the figural scale to be reliable predictor of obesity.

One of the limitations identified for line drawings is that there are no physical measurements (height and weight) associated with the figures. Bulik, Wade, Heath, Stunkard, and Eaves (2001) used Stunkard et al.'s (1983) figural scale to examine the effectiveness of line drawings in identifying obesity and thinness among a Caucasian population. They chose BMI > 30 as an indicator of obesity and BMI < 20 as an indicator of thinness for both men and women. Participants were asked to report their current height and weight and to choose the closest figure to their current appearance and to identify their ideal figure, using the Stunkard et al.'s (1983) figure drawing scale. They concluded that Stunkard et al.'s (1983) figural scale helped participants to sort out thin and obese individuals and were useful in accurate self-description (Bulik et al., 2001). Bulik et al. (2001) calculated women's and men's average BMI for each body figure type and concluded that in most cases a person's BMI could be estimated from the columns in Table 6 and Table 7 once he or she chose a figure type on the figural scales (Figure 8 and Figure 9).

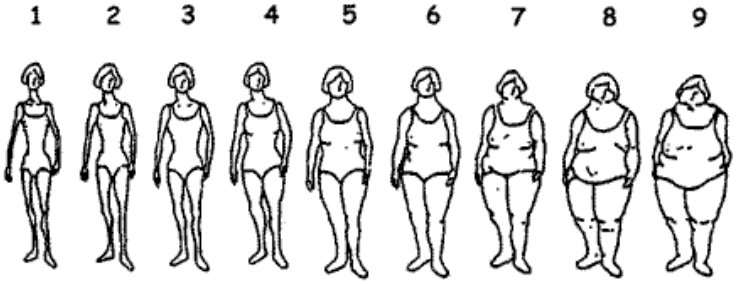


Figure 8: Female figures corresponding to BMIs from Tables 6 (Stunkard et al., 1983)

Table 6

Women's Average BMI for Each Drawing in Figure 8

Drawing	1	2	3	4	5	6	7	8	9
BMI	18.3	19.3	20.9	23.1	26.2	29.9	34.3	38.6	45.4

Note. Source- Bulik et. al. (2001)

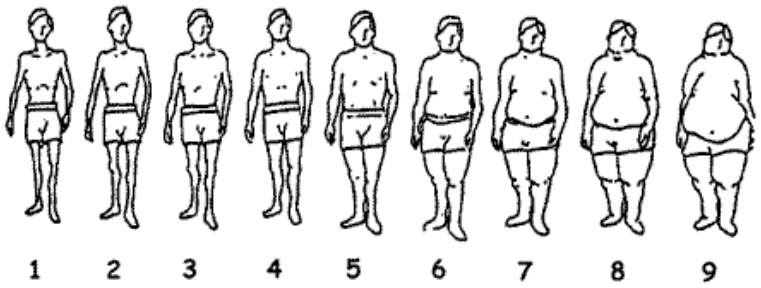


Figure 9: Male figures corresponding to BMIs from Tables 7 (Stunkard et al., 1983)

Table 7

Men's Average BMI for Each Drawing in Figure 9 (Bulik et al., 2001)

Drawing	1	2	3	4	5	6	7	8	9
BMI	19.8	21.1	22.2	23.6	25.8	28.1	31.5	35.2	41.5

Note. Source- Bulik et. al. (2001)

Line drawings obscure facial features and vary by body size. In addition to size perception, they have been used for body perception studies such as attractiveness and social acceptability. Another method of studying body attractiveness is to use photographic images as stimuli. Singh (1993) examined the influence of Waist-to-Hip-Ratio (WHR) on attractiveness in females. He used WHR to determine how male subjects

select and judge attractiveness in female figures. Singh (1993) used his set of line drawings with three levels of body weight (underweight, normal, and overweight) to test if WHR was an indicator of a female's body attractiveness. His results showed that females with low WHR were significantly more attractive for both males and females. The results indicated that women with healthy bodily features were more attractive for males.

Henss (2000) used color photographs of six attractive females instead of line drawings and digitally manipulated each picture to study body attractiveness in relation to WHR. He represented one set of photographs with lower WHR, while the other set represented higher WHR. Subjects were asked to rate the stimuli using a six point Likert-type scale. Henss (2000) concluded that although WHR was an important element of female attractiveness, other features such as face and weight might also be important and independent from WHR.

The use of photographic images can be considered a privacy issue; some subjects are uncomfortable having their photographs used publically (Science, Nude and Faces, 2007). Sheldon (1940) used nude photographs of 4000 male college students in his study to relate to personality characteristics of participants. Considering the privacy issue, Tovee, Hancock, Mahmoodi, Singleton, and Cornelissen (2002) blurred the faces of photographs in their photographic stimuli. In contrast to identifiable photographic images, three dimensional body scanners generate a very dense cloud of points representing a human figure, in which face of a person is not recognizable (see Figure 10).

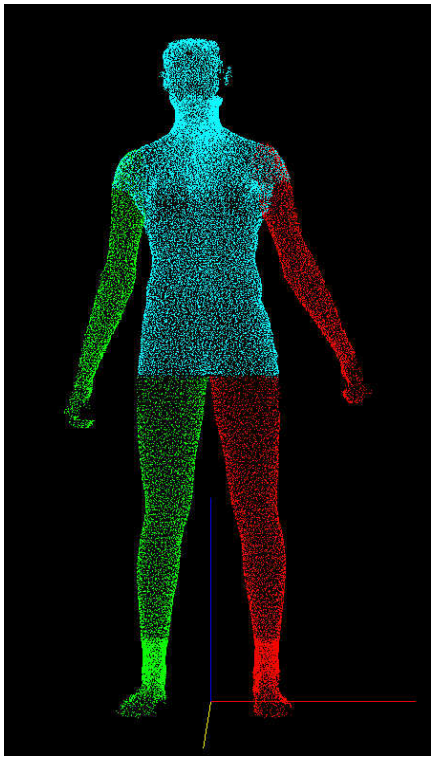


Figure 10: Three-dimensional body scan image

Douty and Brannon (1984) used somatographs (silhouette photos of real people projected on a grid) to investigate attractiveness. Male and female subjects were asked to rate attractiveness based on different body features. They found that both male and female respondents rated thin bodies with a small waist and hips as the most attractive figure. However, among the many body characteristics that influenced the ratings, body weight was the most important and other body features that influenced perceived attractiveness were abdomen size, body proportionality, and hip size.

Tovee et al. (2002) used photographic images of 60 female bodies with different BMIs to study attractiveness. Male and female subjects were asked to rate (using a nine-point Likert-type scale) the attractiveness of front-view color images. They treated the

outline of the torso as a waveform and carried out waveform analyses on it to quantify body shape (particularly WHR) and correlate it with attractiveness and to examine if body shape was an important factor in evaluating female physical attractiveness. Tovee et al. (2002) found that BMI and body shape (WHR) were two factors used to determine women's physical attractiveness and ratings were influenced more by BMI than by shape (WHR). In contrast to Singh (1993) and Henss (2000), who suggested WHR as an important indicator for females' body attractiveness, Tovee et al. (2002) concluded that BMI was a stronger predictor of attractiveness than WHR. This finding supported results from previous studies done by Tovee, Reinhardt, Emery, and Cornelissen (1998), Tovee, Maisey, Emery and Cornelissen (1999), and Tovee, Tasker, and Benson (2000) that BMI was a stronger predictor of body attractiveness.

Self-perception of Body Size

A common factor in most of the figural stimuli and body image related studies is that participants are asked to self- report their current body size by choosing a figure on a figure rating scale that looks like their actual body shape and size. They may also select an ideal or desired body shape and size by choosing a figure in order to study body satisfaction. Studies done by Fallon and Rozin (1985), Fitzgibbon et al. (2000), Rand and Resnick (2000), Bulik et al. (2001), and Lee (2006), used figural stimuli to examine body image satisfaction and body attractiveness perceptions. They concluded that line drawings were better tool for assessing body satisfaction, attractiveness, body sizes and shapes. In their study of body attractiveness, Barnett and Keel (2001) found that women reported their current figure to be larger than their ideal figure, representing the desire to

be thinner. Their findings matched the results of Cohn, Adler, Irwin, Millstein, Kegeles, and Stone (1987), Fallon and Rozin (1985), and Tiggemann and Pennington (1990). Studies have been done to see the differences between self-reported and measured data. A study conducted by Jacobson and DeBock (2001) compared BMI values calculated from subjects' self-reported heights and weights with heights and weights that were measured by researchers. Their results indicated significant differences between the two BMIs. Findings suggested that women tended to report a lower weight than their actual weight. However, no difference was found between self-reported height and measured height.

Ma (2003) reported the accuracy of subjects' self reporting of bust and hip measurements in a study about women's body shapes and fit problems. Her results suggested a difference between subjects' self reported body shape and the expert evaluators' identified body shape for them. She found that only 50% (hourglass), 58.82% (pear shape), and 40% (rectangular) of women correctly reported their body shape when compared with experts' identified body shape for participants. 59% of the women whom experts said were pear shaped did not pick that shape themselves, so the difference was greatest among the pear shaped group. For weight measurements there was no overall significant difference between self reports and weight captured by evaluators. The average self reported measurement for bust was 7.28% lower than average of actual measurements taken by the experts. For waist it was 8.05% lower and for hip it was 8.26% lower than evaluators' reports.

Research on body size estimation suggests that most women tend to perceive their body as heavier and larger than it actually is and inaccurately self report their body measurements. Thompson, Penner, and Altabe (1990) stated that women tend to overestimate body size and that the waist is the main part overestimated to the greatest degree.

Perception of Others' Body Size

Each person may see another's body in a different way than the person sees him or herself. According to Tantleff-Dunn and Gokee, as cited in Cash and Pruzinsky (2002, p. 115), "what others think and do matters; but more importantly, perceptions of what others think and prefer regarding physical appearance influence how we think about our bodies and our body image."

Research reported by Lee (2006) used figural stimuli (see Figures 4 or 6) to study body image perceptions of normal and plus-size mothers and daughters. She found significant differences between how mothers of plus size girls (n = 20) saw their daughters and how the girls (n = 20) saw themselves. On average, the girls identified their bodies as larger than the fourth figure (mean = 4.35) on the scale; their mothers saw them as slightly larger than the fifth figure (mean = 5.10). Mothers of normal size girls saw their daughters as being smaller than the girls saw themselves, but the difference was not significant (n = 21). On the other hand, normal size daughters identified their mothers as significantly larger than the fourth figure on the same scale (mean = 4.33); mothers saw themselves as smaller than the fourth figure (mean = 3.83). These results suggest that

self-perception of body size can differ, even between individuals who are very familiar with each other.

Farinah (2005) studied the perceptions of the size and attractiveness of female body scans. She used 3D body scans with both front and side views shown together and separately to see how accurately individuals could perceive four different body sizes as categorized by BMI i.e. underweight, normal, overweight, and obese. She found that subjects mostly correctly perceived the normal (84%), overweight (77%) and obese (85%) sizes. However, only 32% of the subjects could identify the underweight size correctly, and the remaining subjects perceived underweight image as normal size. Aghekyan (2005) cross- culturally investigated the effect of BMI and three body shapes; Rectangle, Pear, and Hourglass on the perception of female body attractiveness and body size. She used American and Russian female students to rate body size and attractiveness using 3D body scan images. She found that underweight and overweight body scans were classified most correctly and underweight scans were perceived as being most attractive; in contrast, overweight scans were perceived as the most unattractive by both American and Russian female samples. Both American and Russian female samples tended to see themselves as more overweight and less underweight than in reality. Aghekyan (2005) reported that 94% of the American and 97% of the Russian females were mostly correct in perceiving the overweight body images. Similar to Farinah's (2005) findings, most of the underweight body scans were perceived as normal by both American and Russian sample groups. This may be an issue of concern because subjects misjudge the images as normal that are medically categorized as underweight sizes.

Other Influential Factors on Body Size Assessment

Ethnicity may define one's group relationship such as a race, culture, or social group. Research has shown that ethnicity may be an element in one's body image. Fitzgibbon, Blackman, and Avellone (2000) studied women from three ethnic groups: white, Hispanic, and black. The women completed a general demographic self-report questionnaire; the Figure Rating Scale to assess body image (Stunkard, Sorensen, & Schulsinger, 1983); and the Short Acculturation Scale (Marin & Marin, 1991) to assess the acculturation of the Hispanic participants. The BMIs for all participants were calculated using height and weight measurements taken by the researchers. The researchers found that white women experienced body dissatisfaction at a lower BMI level than women of other ethnicities. This type of discrepancy suggests that to study concepts such as body image and/or body satisfaction, ethnicity should be an important factor. For females being overweight or obesity is more common in African-American and Hispanic ethnic groups than in Caucasian (Paeratakul et al., 2002). Powell and Kahn (1995) found that Caucasian women felt more pressure to be thin than African-American women. It has been argued that selection of ideal figure or body size may differ across the ethnic groups, but findings of different studies vary. Fitzgibbon et al. (2000) found no difference in the selection of ideal figures across the ethnic groups. Although these studies sampled adults, their findings suggest that ethnic differences may influence body perceptions among adolescent girls.

Tiggemann (2002) found that media is highly influential in cultural acceptance about attractiveness and physical appearance. Television and other visual media put the mark of slim and graceful body, with an attractive face as the key to happiness for consumers (Featherstone, 1994). Thinness is considered a symbol of beauty and professional success (Silverstein & Perdue, 1988). The way we see ourselves in comparison to others using feedback from peers and strangers influences our self-concept and how we view our physical appearance. Other studies have suggested that adolescent girls experience increased social pressures to meet the thin ideal, in competitive environments that emphasize weight and appearance (Brooks-Gunn & Warren, 1985; Garner & Garfinkle, 1980; Hamilton, Brooks-Gunn, & Warren, 1985). Peer group influence has an impact on physical appearance and body size perceptions in adolescents. Studies have found that women within friendship organizations, sororities, or peer groups are similar in the degree to which they are concerned about body image and engage in dieting behaviors (Crandall, 1988).

Adolescence is a period of life that is characterized by multiple physical and psychological changes. These changes may influence perception of body size and weight. Studies have consistently found that body size concerns increase with an increase in body weight (Heatherton et al, 1997). Weight and body size perception may refer to one's perception of body shape, which is an important factor in body size perception (Cash & Pruzinsky, 1990). It may be true that childhood and adolescent body dissatisfaction due to body weight issues may be linked to adulthood body dissatisfaction. Understanding

more about adolescents' body size perception should expand understanding of possible dissatisfaction.

This review of literature has discussed body size measurements, classification of body sizes and shapes, self-perception of body size, perceptions of others' body size, and other influential factors on body size perception. These studies highlight the importance of body size, shape and body attractiveness perceptions. This study was designed to examine individuals' perception of adolescent girls' body size and to provide deeper understanding of relationship between BMI and figure drawings.

CHAPTER III. METHODOLOGY

This chapter provides an outline of the research methodology used to examine the research questions, including a description of the sample, data collection and data analysis procedures. The purpose of this research was to explore body size perception using a figural scale and body scan image stimuli to compare adolescent girls' self perceptions of body size with perceptions of a sample of female students of the girls' body size. This chapter is divided into two sections: The first section explains data collection from the original sample of adolescent girls, which was collected by researchers from the Consumer Affairs Department at Auburn University. The second section includes selection of the student sample and body scan images, the instrument, and data collection procedures.

Original Sample and Data of Adolescent Girls

The sample of adolescent girls for this study was drawn from all available "tween" girl scans stored in the body scan collection at Auburn University. The database of adolescent scans was collected in two different locations: $[TC]^2$ in Cary, NC, in October, 2004, and Auburn, AL, in November, 2005, using the $[TC]^2$ NX12 body scanner. The total number of available scans was 151, broken down by age as seen in Table 8.

At the time of scanning, researchers measured the height and weight of each subject. These were used to calculate Body Mass Index (BMI) scores. Each of the 151 scans was printed and the subject's age, height, and BMI were recorded on the printout to categorize the groups.

Table 8

Breakdown of Sample Size by Age

Age	Sample Size
9	17
10	21
11	26
12	28
13	28
14	31

Total =151

In addition to scans, a questionnaire was used to collect data from the adolescent girls and their mothers. Each girl and her mother were provided with a separate questionnaire and were asked to respond to clothing behavior questions; these were examined in other studies (Lee, 2006). The girls' questionnaire also contained a section where each girl was asked to choose a figure that best represented her self-figure on Stunkard et al.'s (1983) figural scale from the nine drawings. Each mother was asked to provide their daughter's demographic information, including age and ethnicity. Body

scan images of adolescent girls, their BMI, self-identified figure, and ethnicity data were used to explore the body size perception of adolescent girls in this research.

Stimulus

A total number of 151 adolescent girls' body scans were obtained from the body scan collection in the Consumer Affairs Department at Auburn University. The breakdown of body scans by age is in Table 8. There were a total of 64 body scans representing 9-11 years old and a total of 87 body scans representing the 12-14 year old age group. The 87 body scan images included 24 African-Americans, 56 Caucasians, 3 Hispanics, and 3 Native Americans. Since the 12-14 year olds closely relate to the Stunkard et al.'s (1983) figural scale, which is an adult scale, this age group was chosen as the focus for this study.

The 87 body scan images of age group 12-14 years contained a total of 52 scans of normal size, 15 scans of overweight size, and 20 scans of obese size based on the BMI category. There were no underweight scans available in the database. The BMI ranges for each category were: normal (5^{th} percentile to less than 85^{th} percentile); overweight (85th to less than the 95th percentile); obese (equal to or greater than the 95th percentile). In these 87 scans, demographic information was unavailable for one normal size and one overweight girl. Therefore, a total of 85 scans, (51 normal, 14 overweight, and 20 obese) were useable. To balance the number of overweight scans, 14 normal and 14 obese scans were used. All 14 overweight scans were used in the stimulus; 14 normal and 14 obese scans were randomly selected by the researcher regardless of the girls' age, ethnicity and

BMI. A total of 42 body scan images were selected (see Table 12, Chapter IV) to represent the BMI categories (normal, overweight, and obese).

A number of research methodologies in the past have used frontal and side views of female subjects to study body image, size, and attractiveness. For example, Stunkard et al. (1983), Henss (2000), Rand and Rensick (2000), Singh (1993), and Tovee, Tasker, and Benson (2000) all used frontal views of female figures in their studies. Aghekyan (2005) used frontal views of female body scan images to study perceptions of body attractiveness by American and Russian female participants. Human bodies are three dimensional and mostly judged from many angles by the self and by others. People might perceive and evaluate side and front views of bodies in a different way. Farinah (2005) used both front and side views of female body scan images to study perceptions of size and attractiveness relative to BMI. A girl's side view may reveal parts of her body such as the bust, abdomen and derriere that may not be noticed clearly in a frontal view. Therefore, in this study, both frontal and side views were projected together on each slide to stimulate responses concerning size perception.

A total of 42 slides, with each slide depicting a frontal and side view of each subject's (adolescent girls) body scan (14 normal, 14 overweight and 14 obese subjects), were projected in a Power Point presentation (see Table 12, Chapter IV). Each slide containing side-by-side front and side view images was projected for 12 seconds. Subjects were not told that they were evaluating the same 42 images throughout the two sections; the images were randomized in each section to prevent presentation bias.

Written Instrument

An instrument (Appendix B) was developed for the female college students to record the following:

- Their perceptions of the adolescent girls' body sizes from the body scan images [as categorized by BMI (underweight, normal, overweight, and obese)] and
- Their perceptions of body sizes on Stunkard et al.'s (1983) nine figure scale. The body size rating was based on the scale's figures ranging from thin (1) to obese (9).

The first section of the instrument asked each female student to identify one figure on the scale that best represented the projected girls' body scan images from front and side views. This one question was repeated for each presented slide of body scan images. In the second section each female student was asked to select one of the four different body size categories (underweight, normal, overweight, and obese) for the projected girls' body scan. This question was repeated for each presented slide of body scan images. The third section was the demographic section. The respondents (students) were asked to self report their sex, age, and race. Since male students were in the class and extra credit was provided for participation, asking for sex allowed the elimination of male responses.

Student Sample

A sample of female students from Department of Consumer Affairs, Auburn University, was identified for this study. Female students enrolled in sophomore/junior level classes in the Department of Consumer Affairs were recruited by a process approved by Auburn University's Institutional Review Board. The goal was to involve a minimum of 100 female students. Extra credit was offered as an incentive to the participants.

Data Collection

The researcher provided a brief introduction describing the procedures for data collection in classes prior to the study. The response instrument (Appendix B) and the informed consent forms (Appendix A) were distributed. The instrument was passed out to all students in the class. Male students were allowed to participate but their responses were excluded from the study. Students were shown an image and given directions for responding to the two sections.

Each slide of front and side view images was evaluated twice. The 42 images shown to students were reordered for the two sections and projected on a large classroom screen in a PowerPoint slide show. Each slide of simultaneous front and side views images was projected for 12 seconds. Subjects were not told that they were evaluating the same set of images twice; the images were randomized in each section to prevent presentation bias. Subjects viewed each slide, and answered each question immediately and individually. The approximate calculated time for the administration of the questionnaire was 20-25 minutes.

Data Analysis

After the results were collected and coded, all the information was organized in Excel. The research questions were analyzed in the Statistical Package for the Social Sciences (SPSS- 16.0). Research questions were analyzed according to the plans described in the following section:

1. *Is there any difference between girls' self-identification of their body size based on a figural scale and others' (female students) identification of the girls' body size using the same figural scale?*

This question explored whether there was a significant difference between the girls' ratings of themselves and the student sample's ratings for the adolescent girls' based on the Stunkard et al.'s (1983) figural scale. Mean scores were calculated for others' (female students') identification of the girls' body size. A t-test for independent means was used to analyze if the difference was significant.

2. *What are the differences between the mean BMIs associated with self-figures selected by girls and the mean BMIs associated with figures identified by others (female students) for the girls' body sizes for each figure on the figural scale?*

Data analysis for this question included calculating the mean BMI for each figure on the figure rating scale selected by adolescent girls as their self-figure. The mean BMI was also calculated for each figure selected by others (female students) for all 42 adolescent girls' body scans. A descriptive analysis was done to see if there were any

differences between the mean BMIs of girls, who selected the same figure and the mean BMIs of the girls whom others identified for a figure.

3. *For each figure on the figural scale, what are the differences between the mean BMIs of Caucasian and African-American girls who select a figure?*

The mean BMI of Caucasian and African-American girls was calculated for each figure on the figural scale selected by them. For example, for all Caucasian girls and all African-American girls who selected figure 4 on the figural scale, the mean BMI was calculated for each ethnic category and then results were compared. After the mean BMI was calculated for each figure for each group, the values were tabulated in a table. A descriptive analysis was done to explore the differences.

4. *What are the mean BMIs and BMI ranges associated with the female student sample's classification of girls' body scans as underweight, normal, overweight and obese?*

The mean BMI was calculated for each body size category identified by the female students for the adolescent girls' body scan images. The results also provided a BMI range for each size category (underweight, normal, overweight, and obese) identified by the female student sample for adolescent girls. A descriptive analysis was done to explain this research question.

5. *What are the differences between the mean BMIs for each size category based on CDC standards and the mean BMIs for each size category based on the classification by female students?*

To answer this question, the mean BMI calculated for each body size category (underweight, normal, overweight, and obese) identified by the female students for the adolescent girls' body scan images in research question 4 was differentiated according to the ages of adolescent girls (12 years, 13 years and 14 years old). These mean BMI scores for each age group and each size category were compared to the CDC BMI scores for the same age group and size category. A descriptive analysis was done to see the differences.

Summary

This research aimed to explore the perceptions of self body sizes of a sample of adolescent girls and the perceptions of those girls by a sample of female students. The results from this study would help understand how adolescent girls perceive their body size, and it would allow their BMI scores to be linked to specific figure drawings to understand actual size calculated to a research standard. A sample of female college students from the Department of Consumer Affairs at Auburn University was used in this study. 3D body scan images of adolescent girls from Auburn University's database collection were used as stimuli. A written instrument was used to record the responses of female students.

CHAPTER IV. DATA PRESENTATION AND ANALYSIS

The purpose of this research was to explore young adolescent girls' perceptions of their own body size and older female students' perceptions of the adolescent girls' body size. The study made use of $[TC]^2$'s three dimensional body scanner by using scan images as stimuli for the student sample's perceptions. Data presented in this chapter reflect the two sets of perceptions of body sizes for a sample of adolescent girls aged 12-14. Simple and descriptive statistical analyses were used to analyze the research questions.

Sample and Procedures

Young Adolescent Sample

The original sample used in this study was drawn from the 151 tween girl scans stored in Auburn University's body scan collection. The database of tween scans was collected in two different locations: $[TC]^2$ in Cary, NC, in October, 2004, and Auburn, AL, in November, 2005, using the $[TC]^2$ NX12 body scanner. To determine the scans that would be used in this study, all 151 scans were divided into age groups, 9-11 and 12-14 year olds, in an attempt to cluster different developmental stages of growth. Scans of girls in the 12-14 year old age group were selected because this age group related most closely to Stunkard et al.'s (1983) adult figural scale. In girls, pubertal development

begins around the age of 12 years, and a girl's body starts taking shape as an adult female (Levine & Smolak, 2002); therefore the 12-14 year old age group of girls was selected. Sherman, Iacono, and Donnelly (1995) studied the development and validation of body rating scales for adolescent females. They developed two forms of body rating scales depicting adolescent females between ages 11 and 17 years and compared the response patterns of subjects and Stunkard et al.'s (1983) figure rating scale. They did not find evidence to suggest that adolescent girls had any difficulty rating themselves on the Stunkard et al.'s (1983) figure rating scale and found that for individuals at least 11 years old, the age appropriateness of the figural scale did not affect the response patterns. They suggested that researchers could have more confidence in using the Stunkard et al.'s (1983) figure rating scale in future body image related studies.

Using the CDC's BMI Percentile breakdowns, the selected scans were categorized into the following body sizes: normal, overweight, and obese. There were no underweight scans in the database. Only fourteen scans in the database were classified according to CDC standards as overweight. All fourteen overweight scans, having BMIs ranging from 22.2 to 27, were used. To hold constant the number of scans in each BMI category, 14 normal scans (of the total 51 normal scans) with BMIs ranging from 20.5 to 22.1, and 14 obese scans (of the total 20 obese scans) with BMIs ranging from 29.2 to 50.6 were randomly selected by the researcher regardless of the adolescent girls' age, BMI, and ethnicity. Thus, 42 scans (14 normal, 14 overweight, and 14 obese) were chosen for use as stimuli to represent 12-14 year old girls in this study (see Table 12, Chapter IV).

University Student Sample

A convenience sample was drawn from students in the Department of Consumer Affairs' sophomore, junior, and senior level classes at Auburn University, AL. Data were collected over a period of two weeks from October 27th to November 4th, 2008. One hundred and seven females participated in the study. Data collection was conducted in classrooms at the beginning or end of selected class sessions. The researcher made announcements of the study (Appendix A) in all the selected classes one lecture prior to the data collection. Students who participated in the study received extra credit as compensation. All students were provided with an informed consent (Information letter approved by IRB, Appendix A), and the purpose of the research was briefly explained to them. A response sheet (Appendix B) was distributed to record their answers. Students were instructed to rate body scans using Stunkard et al.'s drawings; directions were read aloud.

The selected body scan images were presented using a Power Point slide show; each slide was shown for 12 seconds. Each slide was shown in each of two sections. Students were told that they would be evaluating 12-14 years old girls' body scan images. In the first section, students were asked to choose a figure drawing on Stunkard et al.'s (1983) figural scale that closely resembled the projected body scan image; in the second section, students were asked to choose a body size category for the projected body scan image. Front and side views of each body scan image were shown simultaneously. Students were not told that they were evaluating the same images in the two sections; the

images were randomized in each section. Students viewed each slide, and immediately, individually answered each question. Students were also asked to provide their demographic information. The study took approximately 20 minutes.

Responses of the female students were entered in an Excel sheet for the two sections. When entering the responses and looking more closely at the data, the scores of six students were eliminated because there appeared to be illogical and unusual patterns to their responses. The determination was made that their responses could not be trusted to be valid. Thus, only 101 female students' responses were used for data analysis.

Demographic Profiles of 12-14 Year Old Subjects and University Student Evaluators

Demographic variables were coded individually for each sample group and are summarized in the following sections. The adolescent girls' demographic information included age, race, weight and height. The weight and height information was used to calculate their BMI. The female student sample's demographic information included their age and race.

Age of 12-14 Year Old Subjects

Table 9

Adolescent Girls' Age

Age	Frequency	%
12	9	21
13	13	31
14	20	48
Total	42	100

Of the girls' sample, 9 girls were 12 years old, 13 girls were 13 years old and 20 girls were 14 years old. The majority of the sample (n=42) was between ages 13 and 14; 31% of adolescent girls were 13 years old, and 48% were 14 years old (Table 9).

Race of 12-14 Year Old Subjects

Table 10

Adolescent Girls' Race

Race	%
Caucasian	60
African-American	36
Others (Hispanic, Asian, Native American & Puerto Rican)	4

From the percentages shown in Table 10, it is clear that among the sample (n=42) of adolescent girls, 60% were Caucasians, 36% were African-Americans, and 4% were other ethnicities. Of the nine 12 year olds, four were African-American and five were Caucasian. The thirteen 13 year old girls included three African-American, nine Caucasian and one Hispanic girl. Of the twenty 14 year olds, eight were African-American; eleven were Caucasian, and one girl was Hispanic.

Body Mass Index of 12- 14 Year Old Subjects

The metric formula for calculating the BMI is: Weight (lbs)/ Height (in)^2 x 703. The Center for Disease Control (CDC, 2007c) uses BMI percentile to decide Weight Categories for children (Table 11). Adolescent girls' body size categories, underweight, normal, overweight and obese, introduced earlier in this study, are defined in CDC size categories by percentile breakdowns as underweight, healthy weight, at-risk of overweight, and overweight.

Table 11

Weight Status Category for Children and Corresponding BMI Percentile

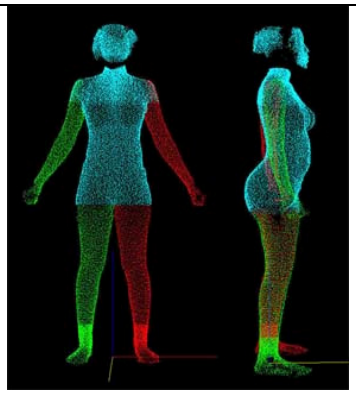
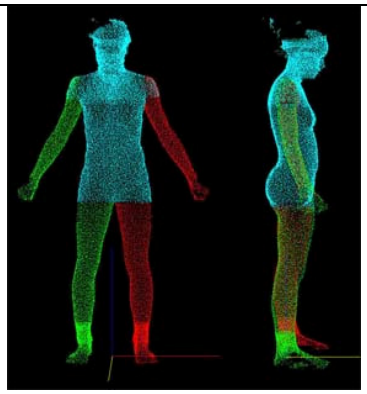
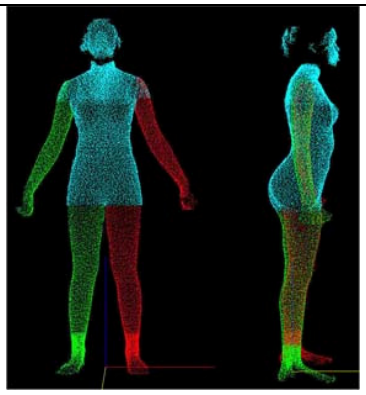
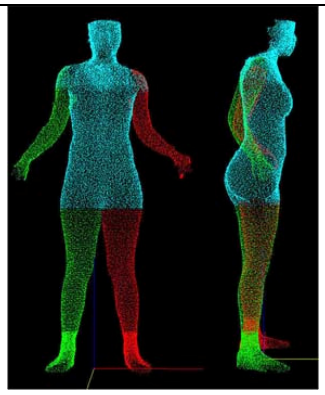
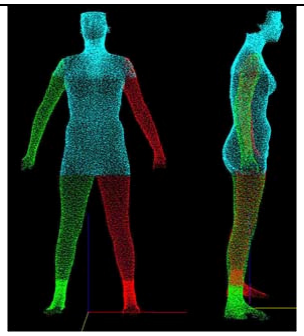
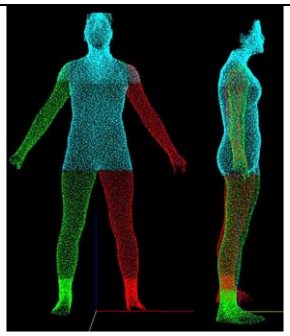
Weight Status Category & Percentile Range	Age 12	Age 13	Age 14
Underweight (Less than the 5th percentile)	Up to 14.8	Up to 15.2	Up to 15.8
Healthy weight (5th percentile to less than the 85th percentile)	14.9 – 21.6	15.3 – 22.6	15.9 – 23.2
At risk of overweight (85th to less than the 95th percentile)	21.7 – 25.2	22.7 – 26.2	23.3 – 27.2
Overweight (Equal to or greater than the 95th percentile)	Over 25.3	Over 26.3	Over 27.3

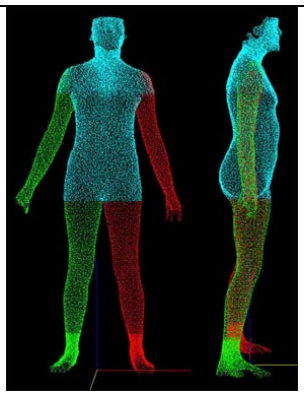
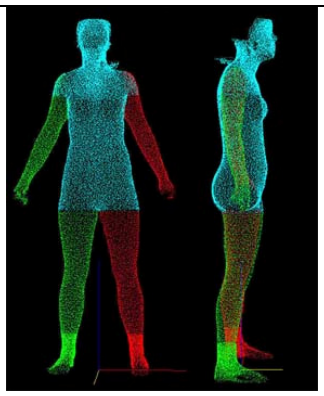
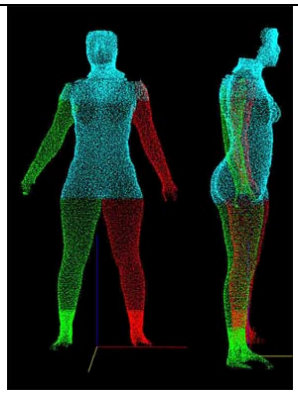
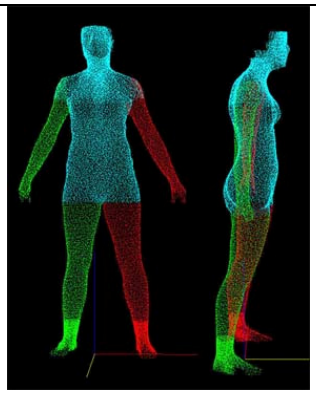
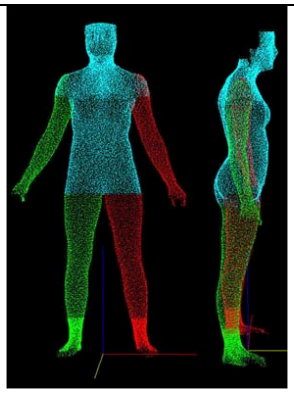
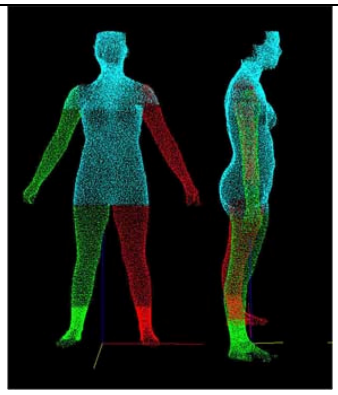
Note. Source- CDC (2007c)

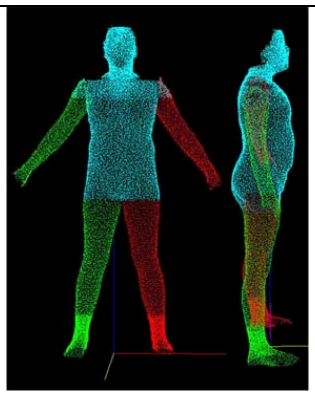
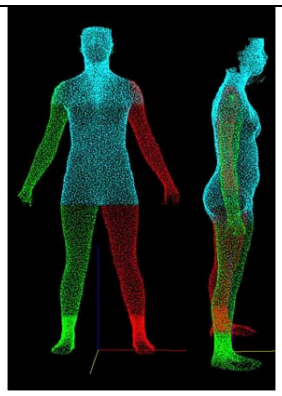
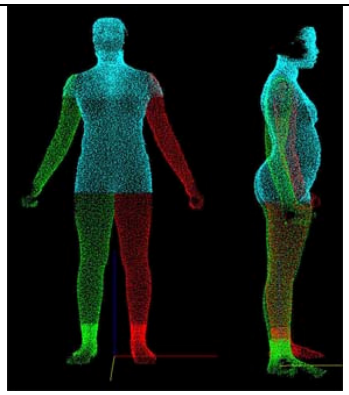
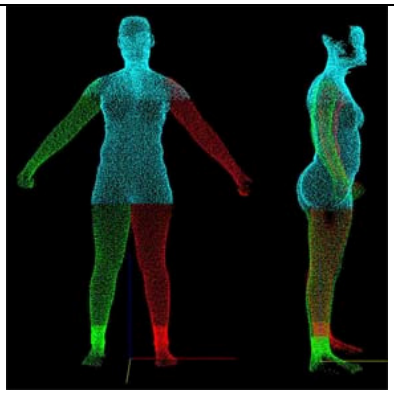
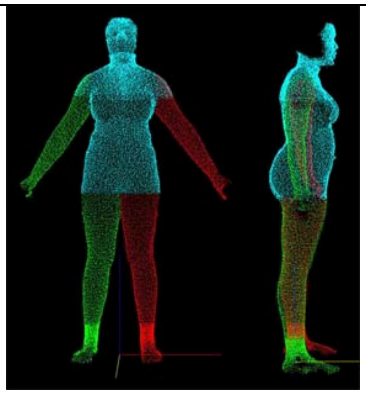
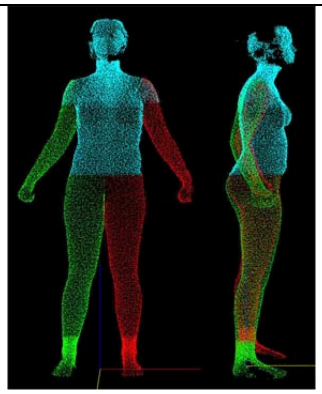
Of the original sample of body scan data (n=87) for 12-14 year old girls, a total of 42 girls' body scan images (14 normal, 14 overweight, and 14 obese) were selected by the researcher to present in the Power Point stimulus (see Table 12). No underweight scans were available in the database. Table 12 shows the 42 body scan stimuli.

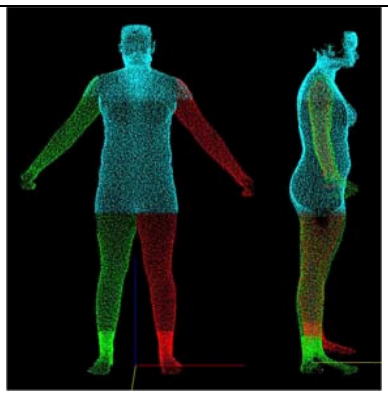
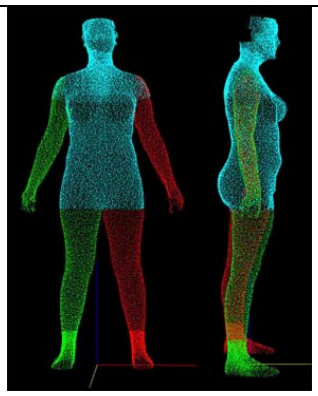
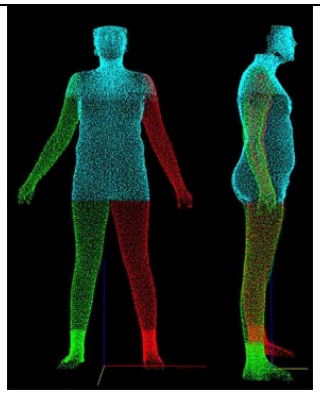
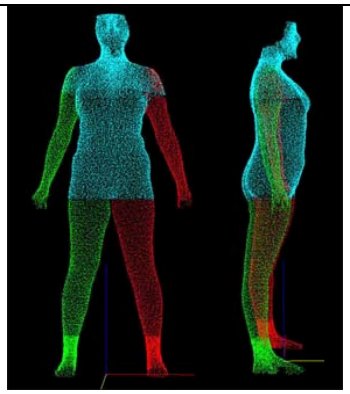
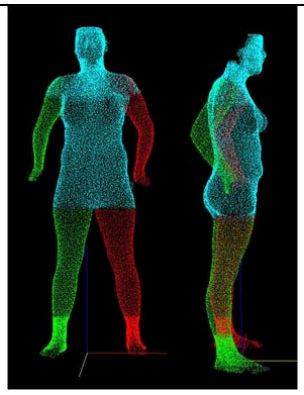
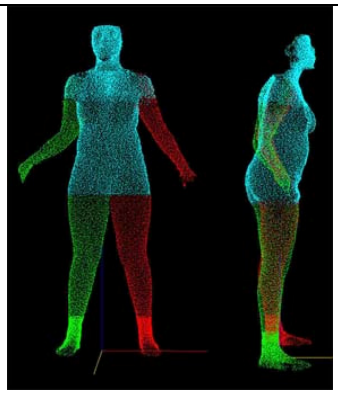
Table 12

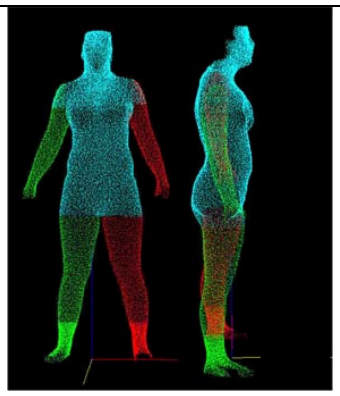
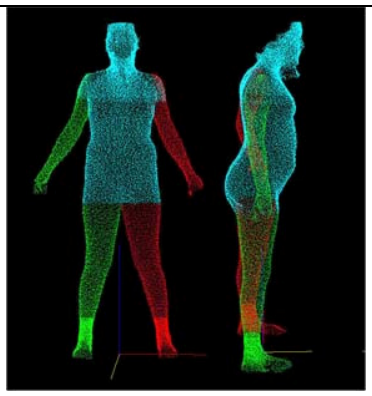
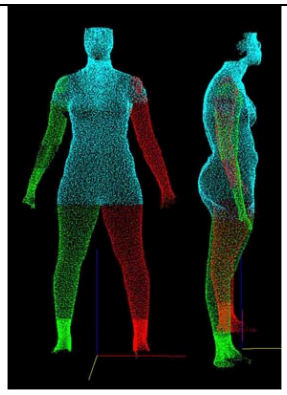
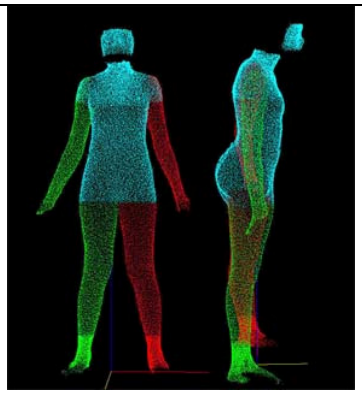
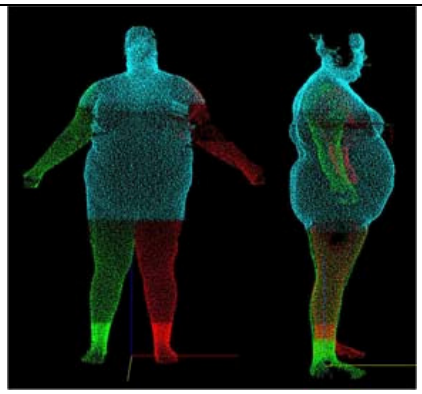
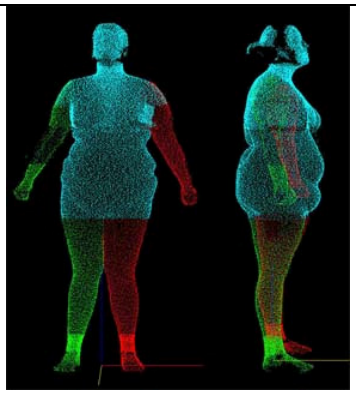
Body Scan Images of 12-14 Year Old Girls Selected for Stimuli

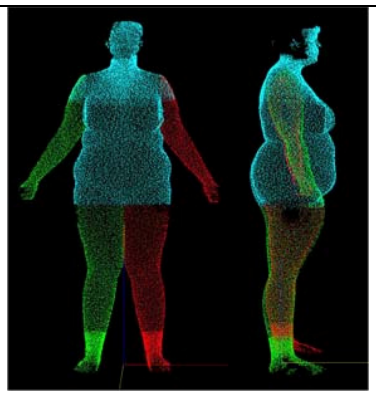
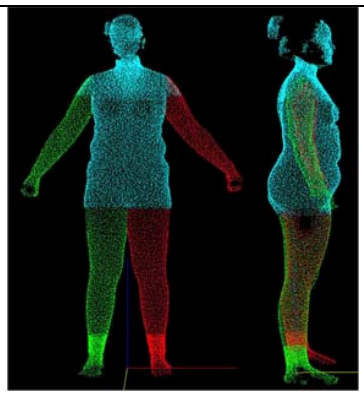
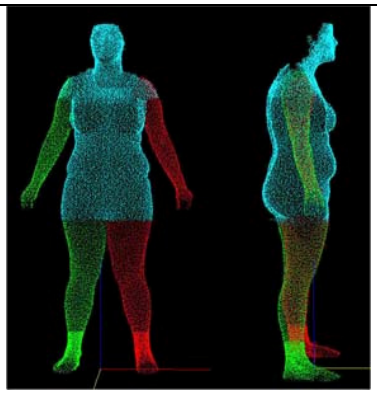
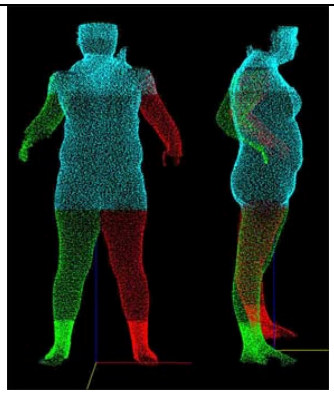
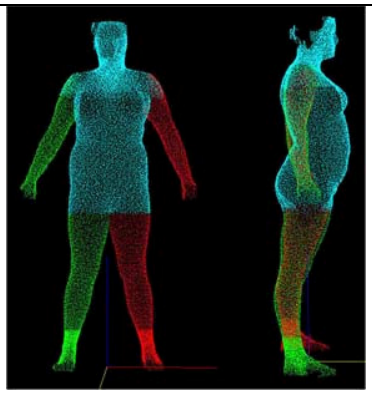
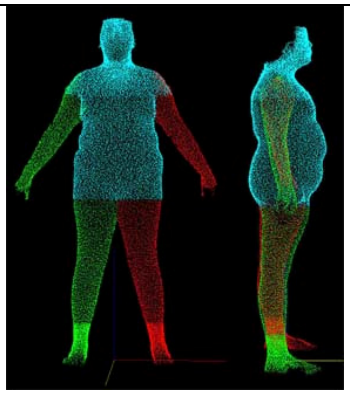
	
Normal, Age- 13, BMI- 22.1 Race- African-American	Normal, Age- 13, BMI- 20.8 Race- Caucasian
	
Normal, Age- 13, BMI- 20.5 Race- African-American	Normal, Age- 14, BMI- 22.1 Race- African-American
	
Normal, Age- 14, BMI- 20.7 Race- Caucasian	Normal, Age- 14, BMI- 20.8 Race- Caucasian

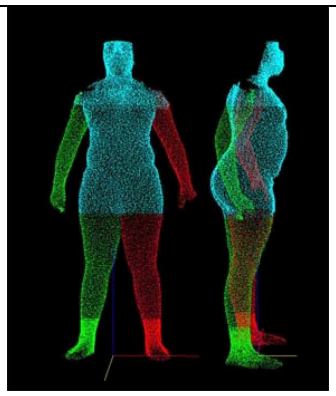
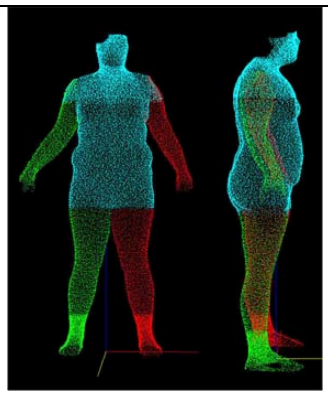
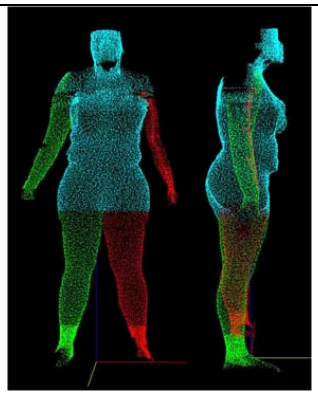
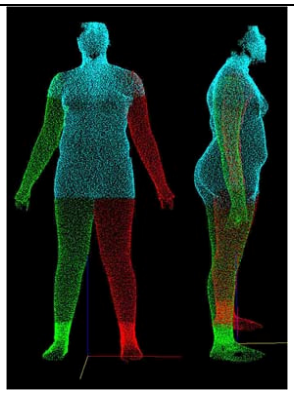
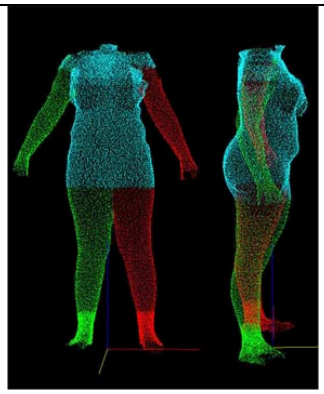
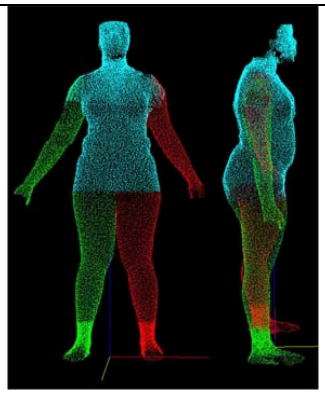
	
Normal, Age- 14, BMI- 21.1 Race- Caucasian	Normal, Age- 14, BMI- 20.6 Race- Caucasian
	
Normal, Age- 13, BMI- 21.1 Race- African-American	Normal, Age- 14, BMI- 22 Race- Caucasian
	
Normal, Age- 13, BMI- 21.8 Race- Caucasian	Normal, Age- 13, BMI- 20.6 Race- Caucasian

	
Normal, Age- 13, BMI- 20.9 Race- Caucasian	Normal, Age- 14, BMI- 21.5 Race- Hispanic
	
Overweight, Age- 14, BMI- 24.7 Race- African-American	Overweight, Age- 12, BMI- 24.4 Race- African-American
	
Overweight, Age- 14, BMI- 27 Race- African-American	Overweight Age- 13, BMI- 23.8 Race- Caucasian,

	
Overweight, Age- 13, BMI- 25.2 Race- Hispanic	Overweight, Age- 14, BMI- 26.7 Race- Caucasian
	
Overweight, Age- 12, BMI- 24.1 Race- Caucasian	Overweight, Age- 14, BMI- 23.6 Race- Caucasian
	
Overweight, Age- 14, BMI- 23.6 Race- Caucasian	Overweight, Age- 14, BMI- 26.1 Race- African-American

	
Overweight, Age- 12, BMI- 23.4 Race- Caucasian	Overweight, Age- 13, BMI- 23.2 Race- Caucasian
	
Overweight, Age- 14, BMI- 24.6 Race- African-American	Overweight, Age- 12, BMI- 22.2 Race- African-American
	
Obese, Age- 14, BMI- 50.6 Race- Caucasian	Obese, Age- 14, BMI- 40 Race- Caucasian

	
Obese, Age- 14, BMI- 39.5 Race- Caucasian	Obese, Age- 12, BMI- 29.2 Race- Caucasian
	
Obese, Age- 13, BMI- 31.1 Race- Caucasian	Obese, Age- 13, BMI- 31.2 Race- Caucasian
	
Obese, Age- 14, BMI- 30 Race- Caucasian	Obese, Age- 12, BMI- 33.2 Race- Caucasian

	
Obese, Age- 12, BMI- 30.8 Race- African-American	Obese, Age- 12, BMI- 32 Race- Caucasian
	
Obese, Age- 14, BMI- 32.8 Race- African-American	Obese, Age- 14, BMI- 32.2 Race- African-American
	
Obese, Age- 14, BMI- 31.8 Race- African-American	Obese, Age- 12, BMI- 31.8 Race- African-American

No underweight scans were presented as stimulus due to the lack of underweight scans in the database. Table 13 shows the BMI range and ethnicity of the stimulus scans.

Table 13

Age, BMI Range, & Size Category Distribution of Scans Presented in the Stimulus

	Normal	Overweight	Obese
Age 12	0	4 (2 Af-Am, 2 Cau)	5 (2 Af-Am, 3 Cau)
BMI range	0	22.2-24.4	29.2-33.2
Age 13	8 (3 Af-Am, 5 Cau)	3 (2 Cau, 1 His)	2 (Cau)
BMI range	20.5-22.1	23.2-25.2	31.1 and 31.2
Age 14	6 (1Af-Am, 4 Cau, 1 His)	7 (4 Af-Am, 3 Cau)	7 (3 Af-Am, 4 Cau)
BMI range	20.6-22.1	23.6-27	30-50.6

Note. Af-Am= African-Amercian, Cau= Caucasian, His= Hispanic

Of the 14 normal scans, there were eight 13 year old girls (3 African-Americans and 5 Caucasians) with BMIs of 20.5 to 22.1. In the normal size category there were no 12 year old girls, and only six were 14 year olds (four Caucasians, one Hispanic, and one African-American), whose BMIs ranged from 20.6 to 22.1. The 14 overweight scans included four 12 year olds (two Caucasians and two African-Americans) with BMIs between 22.2 and 24.4, three 13 year olds (two Caucasians and one Hispanic) with BMI range from 23.2 to 25.2, and seven 14 year old girls (three Caucasians and four African-Americans) with BMI range from 23.6 to 27. Of the 14 obese scans there were five 12 year olds (three Caucasians and two African-Americans) with BMI range from 29.2 to

33.2. There were only two 13 year old girls in the obese size category (both Caucasians) with BMI 31.1 and 31.2. The obese scans included seven 14 year olds (four Caucasians and four African-Americans) with BMI ranging from 30 to 50.6.

The instrument (Appendix B) was developed and used to investigate female students' perceptions of different body sizes, as categorized by BMI (underweight, normal, overweight, and obese). It explored their perceptions of adolescent girls' body size when viewing projected 3-D body scan images of adolescent girls using front and side views of each girl shown simultaneously. Data on perception was obtained from adolescent subjects' ratings of their own figures on the Stunkard et al.'s (1983) figural scale and female students' perceptions of body size of the same girls using the same figural scale. Female students also viewed the stimuli a second time and rated each image as underweight, normal, overweight or obese.

Age of Female Student Sample

Table 14

Female Students' Age

Age	Frequency	%
19	17	17%
20	22	22%
21	33	33%
22	23	23%
23	6	6%
Total	101	100%

The age of the student sample ranged from 19 to 23 years with a mean age of 21. Of the sample, 17 females were 19 years old; 22 were 20 years old; 33 were 21 years old; 23 were 22 years old, and 6 were 23 years old. The majority of the sample (78%) was aged 20-22 (see Table 14).

Race of Female Student Sample

Table 15

Female Students' Race

Race	%
Caucasian	95%
African-American	3%
Others (Hispanic, Asian, Native American & Puerto Rican)	2%

From the percentages shown in Table 15, it can be noted that 95% of the female student sample (N= 101) consisted of Caucasians, and the other 3% of African-Americans. Only 2% of the sample included other ethnic groups.

Analysis of Research Questions

Research Question 1: Is there any difference between girls' self- identification of their body size based on a figural scale and others' (female students) identification of the girls' body size using the same figural scale?

To answer this research question, female students viewed simultaneously the front and side views of girls' body scan images on a slide (see Figure 11) and chose a figure on the figural scale that closely resembled the body image (see Figure 12). During the body scanning activity for the adolescent girls, each girl was asked to choose a figure, using the same figural scale, which closely matched her own body size.

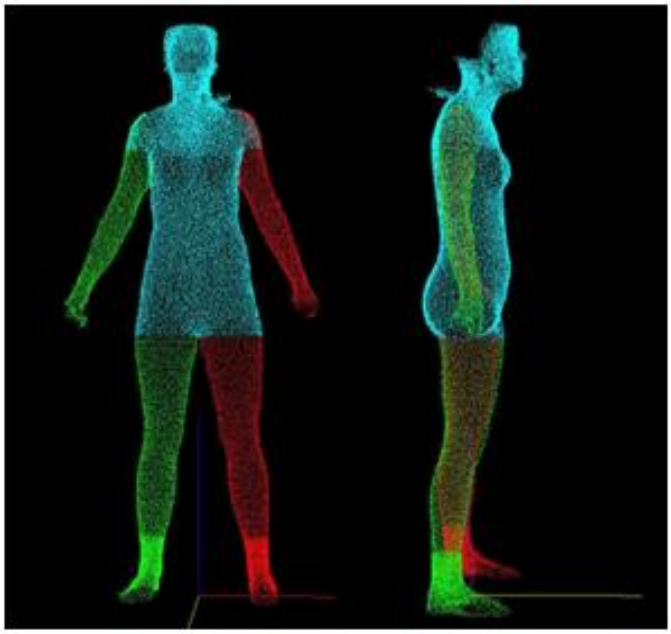


Figure 11: Body scan image of 14 year old girl.

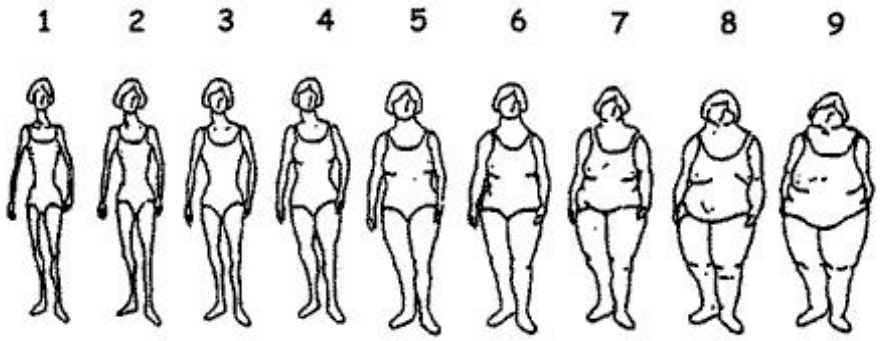


Figure 12: Figural scale developed by Stunkard et. al. (1983).

The data collection was conducted to determine how others (female students) perceived adolescent girls' body sizes on the Stunkard et al.'s (1983) figural scale (see Figure 12). The responses of female students' perceptions were recorded and analyzed statistically. Mean scores were calculated for others' (female students) identification of each adolescent girl's body size. A mean score was calculated for each figure on the Stunkard et al.'s (1983) figural scale that was identified by the female students (N= 101). The self-designated figural score of each adolescent girl was treated as a single score to compare with the student mean for each of those 42 girls.

Table 16

Mean Scores of Adolescent Girls' Self-Figure Ratings and Female Students' Mean of Figure Ratings for Each Adolescent Girl

Girls & Students	N	Mean Figure No.	Std. Deviation	Std. Error Mean
Adolescent Girls	42	4.11	1.04	.160
Female Students	42	5.06	1.24	.191

Table 16 presents the group statistics across all scans and all female students' responses and the mean score of the figures selected by adolescent girls and female students. These mean scores show that adolescent girls on average picked a smaller figure in their self-figure ratings ($M = 4.11$) than the female students identified on average for those girls ($M = 5.06$).

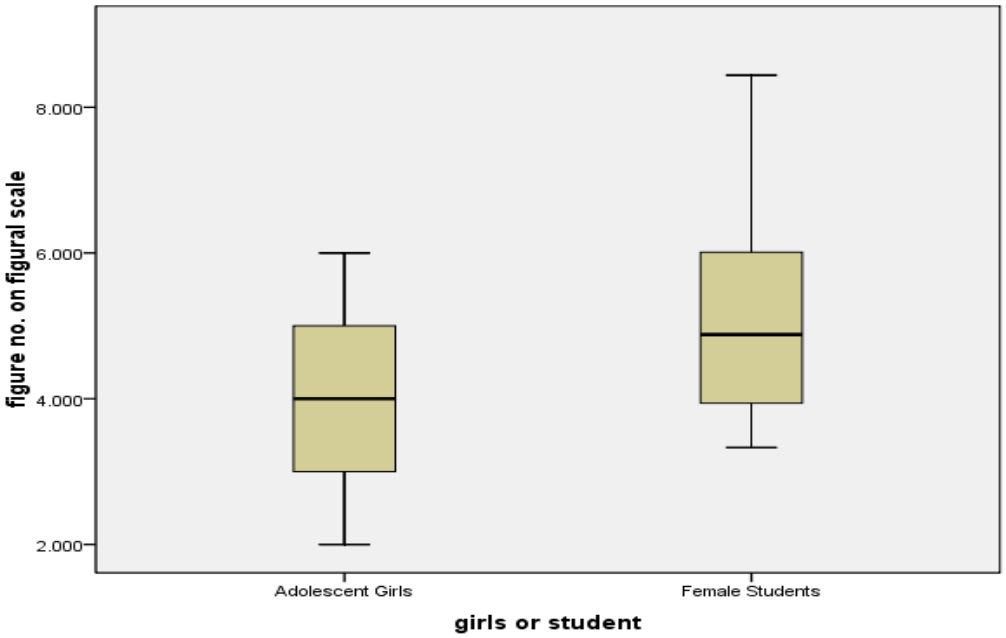


Figure 13: Box-Plot representing range of adolescent girls' self-figure ratings and female students' mean score ratings for the girls.

Figure 13 represents a box plot of the self-figure ratings of 42 adolescent girls and the mean score range of the figure ratings that female students identified for those 42 girls. The range for girls' self-figure rating was between figures 2 and 6 on the figural scale. The mean score range of female student ratings for those girls varied somewhere

between figures 3.33 and 8.44. A t-test for independent means was used to determine whether the difference was significant.

Table 17

Difference between Adolescent Girls Self Figure Ratings and Female Students' Ratings for Those Girls

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Figure no. on figural scale	Equal variances assumed	1.716	.194	-3.764	82	.000***	-.940

Note. Significant p values are noted by: *** $p \leq 0.001$, ** $p \leq 0.01$, *$p \leq 0.05$

Table 17 shows the mean difference and *p* value. Overall, the independent sample *t*-test was significant ($p \leq 0.001$). The mean difference between samples was -.940. Therefore, there was a significant difference between the adolescent girls' self ratings of their figure and female students' figure ratings for the girls' body scan images. The adolescent girls on average saw themselves as smaller than the female students did.

Research Question 2: What are the differences between the mean BMIs associated with self-figures selected by girls and the mean BMIs associated with figures identified by others (female students) for the girls' body sizes for each figure on the figural scale?

To answer this research question, mean BMIs were calculated separately for each figure on the figure rating scale; one mean was based on the adolescent girls' self-ratings, and the other mean was based on the female students' ratings. In each case and for each figure selected, a mean BMI was calculated using the actual BMI of the adolescent girls associated with that figure. A descriptive analysis was done to see if any differences existed between the two mean BMIs for each selected figure on the figural scale (see Table 18).

Table 18

Mean BMIs Associated with Self-Figure Ratings of Adolescent Girls and Figures Identified by Female Students for Those Girls on Figural Scale.

Figure No. on figural scale	Adolescent girls' self –figure ratings			Students' figure ratings for adolescent girls		
	Mean BMI	BMI Range	Frequency	Mean BMI	BMI Range	Frequency
1	0	0	0	0	0	0
2	21.85	21.5-22.2	2	21.22	20.5-23.8	35
3	21.80	20.5-24.7	10	21.54	20.5-29.2	86
4	24.33	20.6-32.2	15	22.46	20.5-31.8	101
5	30.54	23.6-40	11	24.90	20.6-39.5	101
6	38.17	30.8-50.6	4	28.91	20.7-40	101
7	0	0	0	33.53	21.1-40	99
8	0	0	0	41.22	24.7-50.6	92
9	0	0	0	48.38	27-50.6	47

Table 18 shows the mean BMIs associated with each figure on the figural scale selected by adolescent girls as their self-figure rating and identified by female students as the figure rating for those same girls. No adolescent girl identified herself as figures 1, 7, 8, or 9. No female student identified any adolescent girls as figure 1. The actual BMI

range for the 42 adolescent girls was 20.5 (lowest) to 50.6 (highest). Since no adolescent girl selected figure 1 for herself and no female students selected figure 1 for any adolescent girls, a difference for this figure could not be calculated. The mean BMI of the adolescent girls who picked figure 2 was 21.85. The mean BMI identified by others for figure 2 was 21.22. The mean BMI of the ten adolescent girls who picked figure 3 was 21.8, and the mean BMI associated with others' ratings was 21.54. The mean BMIs of the adolescent girls who picked figure 4, 5, and 6 were 24.33, 30.54, and 38.17 respectively. The mean BMIs identified by others for figures 4, 5, and 6 were 22.46, 24.90, and 28.91 respectively. Overall, no adolescent girl saw herself as larger than figure 6 on the figural scale, even if her BMI was high. Others identified adolescent girls as large as figure 9, and the mean BMIs associated with figures 7, 8 and 9 were 33.53, 41.22, and 48.38 respectively.

The results suggested differences between the mean BMIs of adolescent girls' self-figure ratings and the mean BMIs associated with the scans of girls that students identified for particular figures. Others more often appeared to have observed that overweight and obese girls' bodies were larger than figure 6 on the figural scale. For figures 2 and 3 the means of the girls' scans selected by students were slightly smaller than the means of the adolescent girls who picked those figures for themselves. For figures 4, 5, and 6, the students' means became increasingly smaller than the girls' means. The differences between the two groups for figures 5 and 6 were greater affected by no adolescent girl picking larger than figure 6, and the students picked up to a figure 9

for the adolescent girls. The students' means for figures 7, 8, and 9 increased as more students assigned the higher numbers to the largest scans.

Research Question 3: For each figure on the figural scale, what are the differences between the mean BMIs of Caucasian and African-American girls who selected a figure?

To answer this question, the mean BMI was calculated for each figure on the figural scale selected by Caucasian and by African-American girls in the adolescent sample. The BMI associated with each figure on the figural scale for each ethnic group (Caucasian and African-American) was collected and means were calculated, and tabulated in Table 19. There were 25 Caucasian, and 15 African-American girls' body scans in the 42 body scan images selected for the study. The BMI range for African-American girls was 20.5-32.8. The BMI range for Caucasian girls was 20.8-50.6.

Table 19

Mean BMI Score Associated With Each Self-Figure on the Figural Scale for Caucasian and African-American Girls

		Figure no. on Figural scale				
		2	3	4	5	6
Caucasian (n=25)	Frequency	0	6	9	8	2
	Mean BMI	0	21.18	23.65	30.55	45.1
	BMI Range	0	20.6- 22	20.6- 30	23.6- 40	39.6- 50.6
African-American (n=15)	Frequency	1	4	5	3	2
	Mean BMI	22.2	22.72	25.38	30.53	31.3
	BMI Range	22.2	20.5- 24.7	22.1- 32.2	27- 32.8	30.8- 31.8

The figures identified as their own body size on the figural scale by Caucasian girls were figures 3, 4, 5, and 6. No Caucasian girl identified figures 1, 2, 7, 8, or 9 from the figural scale as their own body size. Out of 25 Caucasian girls, six girls identified figure 3 as their own body size; nine girls identified figure 4; eight girls identified figure 5, and only two girls identified themselves as figure 6 on the figural scale. The figures identified as their own body size on the figural scale by all African-American girls were figures 2 thru 6. No African- American girl identified figures 1, 7, 8, or 9 from the figural scale as their own body size. Out of 15 African- American girls, only one girl identified

figure 2 as her own body size; four girls identified figure 3; five girls identified figure 4; three girls identified figure 5, and only two girls identified themselves as figure 6 on the figural scale.

Some differences were observed in mean BMI for figures identified by both Caucasian and African-American girls as their own body size. The most commonly selected figures were 3, 4, and 5. For figures 3 and 4, the African-American means were somewhat higher, although the ranges were not too different. For figure 5, the means were very similar. For figure 6, the mean BMI for the two Caucasian girls who selected the figure as a self rating was 45.1 because of their high BMIs. The two African-American girls (mean BMI 31.3; BMI range 30.8 to 31.8) who selected figure 6 had BMIs that were 7.8-19.8 points smaller than the Caucasian girls. No Caucasian girl saw herself thinner than figure 3 or larger than figure 6, and their BMI range (through figure 3 to 6) was 20.6 to 50.6. Only one African-American girl saw herself as thin as figure 2; her BMI of 22.2 was not the smallest BMI in either group. Similar to Caucasian girls, no African-American girl saw herself larger than figure 6. The BMI range for African-American girls (through figure 2 to 6) varied from 22.2 to 31.8. Overall, Caucasian girls with BMIs as high as 50.6 still rated themselves as figure 6, suggesting that they perceived themselves as thinner than their actual body size compared to African-American girls, who had BMIs as high as 31.8 but only saw themselves as large as figure 6 (See Figure 14 and Figure 15).

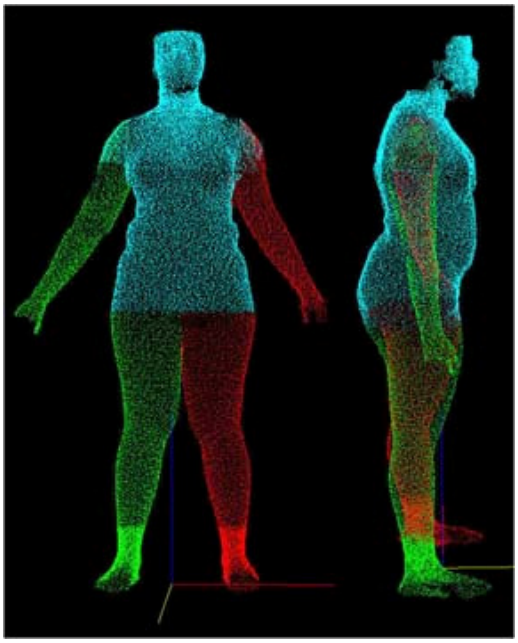


Figure 14: African-American girl's body scan with BMI 31.8 and figure 6 as self-figure

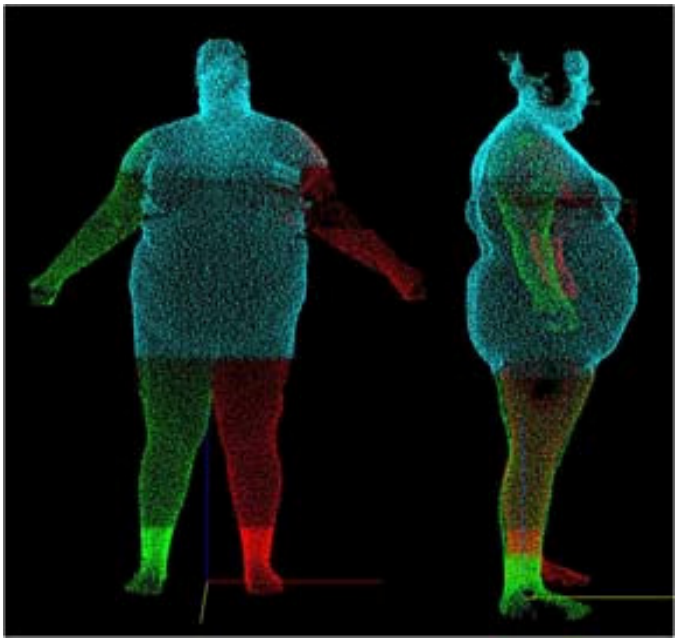


Figure 15: Caucasian girl's body scan with BMI 50.6 and figure 6 as self-figure

Research Question 4: What are the mean BMIs and BMI ranges associated with the female student sample's classification of girls' body scans as underweight, normal, overweight and obese?

To answer this question, mean BMI was calculated for each body size category identified by the female students for the adolescent girls' body scan images. A descriptive analysis was done to explain this research question. The results also provided a BMI range for each size category (underweight, normal, overweight, and obese) as identified by the female student sample for adolescent girls (See Table 20).

Table 20

BMI Scores Associated with Each Size Category Identified by Students for Adolescent Girls

Size Category	Frequency	Mean BMI associated with each size category selected by students for each adolescent girl's scan	BMI Range
Underweight	25	21.10	20.5-22
Normal	101	22.51	20.5-31.8
Overweight	101	28.97	20.6-40
Obese	101	35.31	23.4-50.6

Table 20 shows the mean BMI scores and BMI range associated with each size category identified by others (female students) for adolescent girls. Female students chose one size category for each body scan image that was presented on the slide show. Even though there were no underweight scans presented as stimuli, some students (N= 25) rated some scans as underweight. That mean BMI was 21.10, and the BMI range was 20.5 to 22. For the normal size category the mean BMI was 22.51; for the overweight category the mean BMI was 28.97, and for the obese size category the mean BMI was 35.31. It can be observed that the mean BMI resulting from students' selections increased from underweight to obese, with the smallest difference being between underweight and normal, perhaps because there were no actual underweight scans. Although the upper limit of the BMI ranges rose from the underweight to obese categories, the lower limits did not rise as much, moving only from 20.5 to 23.4 for the obese size category.

Research Question 5: What are the differences between the mean BMIs for each size category based on CDC standards and the mean BMIs for each size category based on the classification by female students?

To answer this question, the mean BMI calculated for each body size category (underweight, normal, overweight, and obese) identified by the female students for the adolescent girls' body scan images in research question 4 was differentiated according to the ages of adolescent girls (12, 13, and 14 years old). These mean BMI scores for each age group and each size category were compared to the CDC's mean BMI scores for the same age group and size category. A descriptive analysis was done to see the differences.

Table 21

Mean BMIs for Size Categories Based on CDC Standards and Others' (Female Students') Classification for Adolescent Girls

		Body Size Categories			
	Age	Underweight (Under 5th percentile)	Normal (6th to 84th percentile)	Overweight (85th to 94th percentile)	Obese (over 95th percentile)
CDC Mean BMI Values	12 Years	Up to 14.8	14.9 – 21.6	21.7 – 25.2	Over 25.3
	13 Years	Up to 15.2	15.3 – 22.6	22.7 – 26.2	Over 26.3
	14 Years	Up to 15.8	15.9 – 23.2	23.3 – 27.2	Over 27.3
Mean BMI Values Identified by Students	12 Years	0.00	23.18	30.52	28.82
	13 Years	21.20	21.44	25.86	27.52
	14 Years	21.06	23.13	29.98	42.53
BMI Ranges Identified by Students	12 Years	0	22.2 - 24.1	22.2 - 33.2	23.4 - 33.2
	13 Years	20.5 - 21.8	20.5 - 25.2	20.6 - 31.2	23.8 - 31.2
	14 Years	20.6- 22	20.6 - 31.8	20.7 - 40	27 - 50.6

Table 21 shows BMI means or ranges for each size category, for 12, 13 and 14 year old adolescent girls, including CDC standards and values calculated from female students' assignments of size category for the stimuli. There were no underweight scans, but since 25 students deemed some scans to be underweight, these values are included in Table 20. For 12 year old girls, the BMI score classified by the CDC as underweight is up to 14.8; no students identified any 12 year old girl as underweight. For 13 and 14 year old girls, BMI scores classified by the CDC as underweight are up to 15.2 and up to 15.8 respectively; for the girls with the same ages, the mean BMI scores of scans identified by female students as underweight were 21.20 and 21.06 respectively. Thus, these students incorrectly rated the 13 and 14 year old girls' images as underweight; the actual BMIs placed these girls on the upper side of the normal range.

The CDC BMI range for the obese category for 12 year olds was over 25.3 and the BMI range for same age and category identified by students was 23.4 - 33.2, meaning that some students rated some overweight scans as obese. This was also true for the 13 year old age group where the CDC's lower limit for obese is 26.3, but overweight scans as low as 23.8 were deemed obese by students. In the 14 year old category, where the BMI range classified by CDC is over 27.3, the BMI range identified by students was 27 - 50.6 (low BMI 27).

Overall the mean BMI scores for each size category identified by the female student sample were larger and sometimes much larger compared to the BMI ranges classified by Center for Disease Control (CDC). For 13 year olds, female students on average correctly identified the normal (mean BMI - 21.44), overweight (mean BMI-

25.86), and obese (mean BMI- 27.52) size. Students also (on average) correctly identified normal (mean BMI- 23.13) and obese (mean BMI 42.53) size for 14 year olds. In other cases, students inaccurately identified the sizes for adolescent girls; mean BMIs did not fall under the BMI range classified by CDC (for age 12, normal, overweight and obese; for age 13, underweight; for age 14, underweight and overweight).

CHAPTER V. SUMMARY, CONCLUSIONS, LIMITATIONS, AND RECOMMENDATIONS

This chapter summarizes the results of the study examining adolescent girls' self-perceptions of body size and older female students' perceptions of the girls' body sizes using body scans and a figural scale. It addresses conclusions, limitations, recommendations, and implications for future research.

Summary

Study Design

Respondents for this study included two different samples, adolescent girls 12-14 years old and female college students. The original sample of adolescent girls included 87 girls (aged 12-14 years) out of the 151 tween girls' body scans (aged 9-14) archived in the body scan database in the Department of Consumer Affairs at Auburn University. From the 87 girls' body scans, 14 normal, 14 overweight, and 14 obese body scans (n = 42) were selected for this study. Data associated with these body scans included the girls' self-figure ratings using Stunkard et al.'s (1983) figural scale, as well as their age, race and BMI score. The adolescent girls' sample for this study consisted of 12 year olds (21%), 13 year olds (31%), and 14 year olds (48%). The sample was characterized as 60% Caucasian, 36% African-American, and 4% Hispanic.

The female student sample (n = 101) was drawn from the Department of Consumer Affairs at Auburn University, AL. The students were enrolled in sophomore, junior, and senior level classes. The female student sample consisted of ages 19 (17%), 20 (22%), 21 (33%), 22 (23%), and 23 (6%). The majority of the female student sample was Caucasian (95%); only 3% were African-American, and 2% were of other ethnic groups. The ethnicity of the adolescent girls' sample was more reflective of general population demographics than was the student sample.

The instrument used for collecting student sample data consisted of a response sheet for recording answers associated with the body scan images that were used as stimuli; it was developed by the researcher. The 42 three-dimensional body scan images were captured in 2004 and 2005 using the $[TC]^2$ NX12 Body Scanner. The images were shown in a Power Point presentation as front and side views, side by side, to the student sample. In previous studies that focused on exploring issues related to body attractiveness and body size (Henss, 2000; Singh, 1993; Tovee et al., 2002), line drawings and color photographs of women were used as stimuli. Since privacy of the photographed women was an issue, the researchers blurred the faces of the women. In this study using body scan images, no scan was personally identifiable because the BMS software presents each body scan image in a point cloud format that is projected in primary colors on a black background. Facial features are not recognizable.

Most of the studies about body attractiveness and size considered BMI as a stronger predictor than body shape in determining women's physical attractiveness (Tovee et al., 1998; 1999; 2000; 2002). In this study, selection of a figure on a linear figural scale and of body size categories based on scores defined by the CDC for children (CDC, 2007c) were used to examine female students' perceptions of younger adolescent girls' body sizes. The body size categories for this study were underweight, normal, overweight, and obese. The actual BMI scores of the adolescent girls were calculated at the time of body scanning by recording their measured height and weight. Since there were no underweight girls in the database, the body scan image stimuli consisted of 14 normal, 14 overweight, and 14 obese images of 12-14 year old girls. The scans were shown randomly in no particular order of BMI or age. The same scans were shown in two sections of the data collection, with one section being for figural scale assignment and the other for size category assignment. Participants were not told that they were evaluating the same body scan images in both sections. They were told that they were evaluating 12-14 year olds.

Discussion and Conclusion

Self vs. Others' Perceptions

At the time of the body scanning activity of the adolescent girls, each girl was asked to rate her current figure on the figural scale. Female students viewed the body scan images of adolescent girls and rated their adolescent figures on the same figural scale (Stunkard et al., 1983). For research question 1, mean scores of figure numbers identified by students for each of the 42 girls were calculated and treated as a single score

for that girl's body scan. A t-test for independent sample and mean was done to see the difference between two sample's ratings. The result was significantly different. The mean scores for the adolescent girls' self-figure ratings (mean = 4.11) and students' figure ratings (mean = 5.06), suggested that female students saw girls' body size as one (out of nine) figure size larger than the girls' saw themselves on the figural scale.

Lee (2006) used this figural scale to study body image perceptions of normal and plus size mothers and their daughters, some of whom were in this sample. She found, on average, that the girls identified themselves as larger than the fourth figure (mean = 4.35); their mothers saw them as slightly larger than the fifth figure (mean = 5.10). Her results suggested that perceptions of body size of the girls differed, even between the individuals who were familiar with each other. The results from this study suggest that body size perception on a figural scale may differ, as individuals have different perspectives. Ratings of the figures by the female students in this sample were closer to the means of the mothers in Lee's (2006) sample than the adolescent girls.

For research question 2, the picks of figures by the adolescent girls picked one and female students were explored in a connection with BMI scores. Mean BMIs were calculated associated with each figure drawing on the figural scale for both samples. No adolescent girl saw herself as thin as figure no. 1; neither did they rate themselves larger than the 6^{th} figure. The actual BMI range of these girls was as low as 20.5 and as large as 50.6. The girls who had BMIs of 40 and 50.6 identified themselves as figures 5 and 6 respectively, suggesting that the obese girls saw themselves smaller than others would see them. The girls who had the lowest normal BMI, from 20.5 to 20.9, identified

themselves as figures 3 and 4 respectively. Thus, these girls more correctly identified themselves on the figural scale than did the largest girls.

None of the female students identified any adolescent girls as thin as figure drawing 1. For those girls who had the lowest normal BMIs (20.5 to 20.9), female students identified their bodies as figures 2 thru 7. For those girls who had the largest BMIs of 40 and 50.6, female students identified them as small as figure 6 through as large as figure 9. Thus, more of the students accurately identified the obese scans on the figural scale than the adolescents did. These findings also showed that the students identified a wide range of BMIs, in terms of what they see as that figure size. The differences in the mean scores for figures 1, 7, 8, and 9 between adolescent girls and female students were incomparable because no adolescent girl rated herself as these figures. For figures 2 thru 6, the mean BMI of adolescent girls' self-ratings were increasingly higher than the mean BMIs of female students' ratings for those girls.

The mean BMI scores associated with these figures were even larger than those found with adult research. Bulik et al. (2001) found the mean BMI scores (based on self-report) associated with each figure on the figural scale for a large sample of Caucasian adult women. In the current study, for figures 2 and 3, the mean BMIs of adolescent girls' and students' ratings were higher than the mean BMIs from Bulik et al.'s (2001) study of adult women. For figures 4, 5, and 6, the mean BMIs of girls' self ratings were higher, but the mean BMIs of students' ratings were lower than the adult women's mean BMIs found in Bulik et al.'s (2001) study.

In Bulik et al. (2001), data were based on self-reported heights and weights of adult Caucasian females for a very large sample (16, 278 females). For figure 1 on scale, the calculated mean BMI for adult women was 18.3, which, in actuality, is very close to being normal (BMI 18.5 to 24.9) according to the adult BMI categories (CDC, 2007c). According to their findings of mean BMIs for each figure on the figural scale, figure 1 represented underweight, figures 2 thru 4 represented normal, figures 5 and 6 represented overweight, and figures 7 thru 9 represent obese sizes for adult women. In this study students were told that they were evaluating 12-14 year old girls' body scan images. That knowledge may have changed their expectations of what the figures would look like. In general, results suggested that adolescent girls perceived themselves to be thinner on the figural scale compared to female students' ratings for adolescent girls.

There were 25 Caucasian, 15 African-American, and 2 Hispanic girls' body scans in the selected 42 body scan images. In research question 3, mean scores associated with each figure drawing selected by the Caucasian and the African-American girls were compared. No Caucasian girl saw herself thinner than figure no. 3. The one African-American girl who picked figure 2 had a higher BMI than several Caucasian girls who did not pick figure 2. Caucasian girls who picked figure 6 as their current figure had a higher mean BMI scores (mean = 45.1) than the mean BMI (mean = 31.3) of African-American girls who also picked figure 6. This suggested that African-American girls tended to see themselves as heavier than the Caucasian girls saw themselves. Nollen et al. (2006) studied black and white adolescents' body size preferences. Their results found that black girls perceived their body size as heavier than the expectations of their parents

or peers. However, Desmond, Price, Hallinan, and Smith (1989) found that black girls perceived themselves to be thinner than they actually were. The results from the current study represent a small sample, but indicate that more study is needed. Kumanyika, Wilson, and Guilford-Davenport (1993) reported that black women may perceived themselves as being overweight, but they still considered themselves to be physically attractive. These researchers suggested that overweight black women might accurately perceive their weight status.

Overall, adolescent girls' self-perceptions of their body size differed with others' perceptions on the figural scale. Lee (2006), in her study of body image perceptions of adolescent girls and their mothers, found that mothers, on average, saw their daughter slightly larger. In this case the others who judged girls' body sizes were their own mothers, not strangers, and they were looking at the actual girls, not the body scan images. In this study, obese girls particularly seemed to tend to perceive themselves smaller than others' perceptions. Perhaps this was because they did not want to think of themselves as being as large as they actually were, or perhaps these obese girls literally did not perceive themselves realistically. Female students might have been able to perceive adolescent girls' body scans, specifically the obese girls, more realistically on the figural scale because they could be more objective.

Others' Perceptions of Body Size relative to Standard Size Categories

The body scan stimulus in this study had an equal number of normal, overweight, and obese scans of adolescent girls. There were no underweight scans available for the stimulus. Research question 4 addressed what size category the students assigned the scans. The BMI ranges associated with each size category that female students could identify for adolescent girls' body scans were: underweight (20.5 – 22), normal (20.5 – 31.8), overweight (20.6 – 40), and obese (23.4 – 50.6). Twenty-five students perceived nine normal size scans as underweight. Students identified a wide range of BMIs for normal, overweight and obese categories. For normal BMI as low as 20.6, ten female students rated the scans as overweight; of the fourteen normal size scans, nine scans were perceived as overweight by 75 students.

These findings support the results of the study done by Farinah (2005). She studied the body size perceptions of female body scans by using 3D body scans with front and side views shown together and separately. She found that the majority of her subjects perceived underweight females as normal. In the current study, more than half of the female students perceived normal girls as overweight. Farinah (2005) found the best accuracy for size perception using the scans was showing front and side views together. That strategy was also used in this research. She found that a majority of subjects correctly perceived the normal, overweight and obese sizes when shown the front and side views together. In this study, a majority of students perceived overweight and obese scans nearly accurately.

The CDC defines BMI for children as age and gender specific, and it named the size categories (underweight, healthy weight, at risk of overweight, and overweight) somewhat differently than for adults, eliminating the word, obese. The size categories in this study were referred to as underweight, normal, overweight, and obese because these terms would be commonly used by and familiar to the students. Research question 5 addressed the accuracy of students' categorization in relation to the CDC standards. When asked to assign adolescent girls' scans a size, a majority of students inaccurately judged the size categories in relation to the CDC classifications by age. A majority of the students could most accurately perceive the normal, overweight, and obese sizes for 13 years old girls and nearly as accurately perceived the normal and obese sizes for 14 year old girls. This may be because students might have perceived these scans as adults more than the scans of the 12 year olds. Menarche in girls starts around the age of 12; the 13 and 14 year old adolescent girls had more likely advanced more in their sexual maturation and may have developed a more womanly figure. According to Daniels, Khoury, and Morrison (1997), the BMI and body fat relationship depends on the stage of sexual-maturation, gender, race and age. They found that for an equivalent BMI, girls have greater amount of body fat than boys, and whites have more body fat than blacks.

In summary, differences were found between adolescent girls' self-perceptions and female college students' perceptions of the girls' body sizes when choosing any of nine figures on a figural scale. Even though there were no underweight scans presented in the stimulus, students perceived some scans as underweight. Individuals' perceptions of adolescent girls' body sizes may differ because they have different perspectives,

depending on whether they know the subjects or are strangers. The findings suggested real variations in individuals' perceptual definitions of the terms underweight, normal, overweight, and obese.

Limitations

A figural scale and projected images of body scans were used to study body size perceptions. Selection of the 3D body scans presented had some possible limitations. In order to balance the adolescent girls' sample, the available number of overweight body scans limited the number of normal and obese scans which could be included. All available overweight scans were selected. The equivalent numbers of normal and obese scans were randomly selected by the researcher regardless of age, ethnicity and BMI, and this incorporated some very obese girls. Actual BMI in a few obese girls far exceeded a median range and could have skewed some mean results. No underweight scans were available to include in the stimulus. Also, no normal size 12 year old girls were selected for the stimulus due to the random method of selection.

Although the 3D body scan images were randomized in the stimulus, students evaluated the same images in two sections and possible recognition of previously viewed images may have affected responses in the second section. Students were told that they were evaluating 12-14 year old girls' body scan images. Knowledge of the age of the stimuli subjects may have influenced female students' expectations of what the girls would look like; they may have expected the girls to be thinner than they were. Students may have judged adolescent girls' bodies differently; some may have looked at bust size,

buttocks, thighs, or shoulders, while others may have looked at overall body shapes or waist-to-hip ratio.

The Stunkard et al.'s (1983) figural scale provided to students as a rating scale represented adult female figure drawings and could have caused confusion. The students may have found it difficult to estimate the adolescent girls' body size while viewing drawings that represented adult women. Drawings of pre-adolescent children would, however, also have been inappropriate since pubertal development generally starts around the age 12 in girls (Levine & Smolak, 2002). Lee (2006) found that 16 of the 19 girls in her sample (some of whom were part of this study's sample) had experienced menarche by age 12½.

Mean results from this study should be used cautiously given that some of the findings may have been skewed by the few subjects with very high BMIs, particularly in the middle range figures of the scale. Caucasian respondents were dominant in the female student sample; it was not balanced for African-Americans in similar proportions to the stimuli scans. A larger number of non-Caucasian female student respondents would have allowed an analysis of respondents' perceptions based on their ethnicity. A convenience sample of adolescents and female college students from a specific region of the U.S. does not allow findings to be generalized for a wider population. A limitation to this study may also be whether or not all students assessed carefully and thoughtfully.

Implications

This study's results suggested that adolescent girls and female college students perceived the same body sizes differently, and at least some of the college students equated normal weight as underweight, or, on the other end, as overweight or as obese. Understanding the perception of body sizes in our modern life will be valuable for academicians and clinical personnel in providing support for females' physical and emotional health at young ages. More study of body size perception should be encouraged in order to explore approaches to educating adolescents about what is a healthy size. Existing norms of female thinness serve as criteria for women's physical attractiveness. However, the obesity rate is increasing among adolescents, with increased physical and psychological health risks. Additional research with different ethnic groups would help broaden an understanding of this phenomenon. Together, these findings suggest the possibility for educational programs that concentrate on the exceptional view of adolescents as they strive to develop a realistic body image and healthy weight control practices.

Recommendations for Future Research

The findings of this study add to the body size perception literature, an important aspect of the larger body of study on adolescent girls' overall body image. Existing literature in the field of adolescent body image has been confined to the use of limited types of stimuli for research. Most of the studies have used two dimensional images, often of abstracted rather than real bodies. Although 3D body scan images of real adolescent girls were used in this study, they were presented as 2D frontal images in a

Power Point presentation. For further research in this field, use of visual equipment (e.g. computer, projector) with a software program to show and rotate images and provide a three dimensional presentation is recommended.

Future research is also recommended with larger and differentiated (in terms of gender and ethnicity) sample groups to provide a better understanding body size perceptions among adolescents. Research could be expanded to include perceptions of populations in different countries. This would enable researchers to compare and contrast the perceptions of adolescent body size in different cultures.

REFERENCES

Abramovitz, B. A., & Birch L. L. (2000). Five-year-old girls' ideas about dieting are predicted by their mothers' dieting**.** *Journal of the American Dietetic Association***,** *100*(10), 1157-1163.

Aghekyan, M. (2005). The role of body mass index and body shape in perception of body attractiveness: Cross- cultural study. Unpublished Master's Thesis, Auburn University, Auburn, AL.

Agras, W. S., & Kirkley, B. G. (1986). Bulimia: Theories of etiology. In K. D. Brownell and J. P. Foreyt (Eds.), *Handbook of eating disorders* (367-378). New York: Basic Books.

Armstrong, H. J. (1987). *Patternmaking for fashion designers.* (2nd ed.). New York: Harper Collins.

August, B. (1981). *Complete Bonnie August dress thin system.* New York: Rawson, Wade Publishers, Inc.

Barnett, H. L., & Keel, P. K. (2001). Body type preferences in Asian and Caucasian college students. *Sex Roles: A Journal of Research, 45*(11/12), 867-878.

Bubb, H. (2004). Challenges in the application of anthropometric measurements. *Theoretical Issues in Ergonomics Science*, *5*(2), 154-168.

Bulik, C. M., Wade, T. D., Heath, A. C., Ng, M., Stunkard, A. J., & Eaves, L. J. (2001). Relating body mass index to figural stimuli: Population-based normative data for Caucasians. *International Journal of Obesity, 25,* 1117-1524.

Brooks-Gunn, J., & Warren, M.P. (1985). The effects of delayed menarche in different contexts: Dance and non-dance students. *Journal of Youth and Adolescence*, *14,* 285-300.

Carter, J. E. L. & Heath, B. H. (1990). In Carter, J. E. L., & Heath, B. H., *Somatotype-Development and Applications.* Cambridge: Cambridge University Press.

Cash, T.F., & Pruzinsky, T. (1990). In Cash, T.F., & Pruzinsky, T. (Eds.), *Body Images: Development, Deviance, and Change* (pp. 20-24). N.Y.: Guilford Press.

Cash, T.F., & Pruzinsky, T. (2002). In T.F. Cash, & T. Pruzinsky, (Eds.), *Body Image: A Handbook of Theory, Research, and Clinical Practice.* N.Y.: Guilford Press.

Center for Disease Control (CDC). (2007a). *Fact sheet-National, multicultural campaign promoting healthy lifestyles among tweens*. Retrieved September 3, 2007, from http://www.cdc.gov/youthcampaign/pressroom/PDF/6.1.02-MulCulOutreachFactSheet.pdf

Center of Disease Control (CDC). (2007b). *BMI- Body Mass Index*. Retrieved September 3, 2007, from http://www.cdc.gov/nccdphp/dnpa/healthyweight/assessing/bmi/

Center of Disease Control (CDC). (2007c). *Growth Charts- United States*. Retrieved September 4, 2007, from http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/charts.htm

Cohn, L. D., Adler, N. E., Irwin, C. E., Millstein, S. G., Kegeles, S. M., & Stone,G. (1987). Body- figure preferences in male and female adolescents. *Journal of Abnormal Psychology, 96*, 276-279.

Collins, M. E. (1991). Body figure perceptions and preferences among preadolescent children. *International Journal of Eating Disorders, 10*, 199-208.

Connell, L. J., Ulrich, P. V., Brannon, E. L., Alexander, M., & Presley, A. B. (2006). Body Shape Assessment Scale: Instrument development for analyzing female figures. *Clothing and Textiles Research Journal, 24*(2), 80-95.

Cornell University. (2006). *Explore Cornell - The 3D Body Scanner - Glossary*. Retrieved October 19, 2007, from http://www.bodyscan.human.cornell.edu/scene5b96.html#bodyscanner

Crandall, C. S. (1988). The social contagion of binge eating. *Journal of Personality and Social Psychology, 55*, 588-598.

Curtis, A. (1991). Perceived similarity of mothers and their early adolescent daughters and relationship to behavior. *Journal of Youth and Adolescence*, *20*(3), 381-397.

Daniels, S. R., Khoury, P. R., and Morrison, J. A. (1997). The utility of body mass index as a measure of body fatness in children and adolescents: Differences by race and gender. *Pediatrics, 99* (6), 804-807.

Data Bank. (2007). *Child trends-Number of children*. Retrieved September 4, 2007, from http://www.childtrendsdatabank.org/indicators/53NumberofChildren.cfm

Desmond S, Price J, Hallinan C, & Smith D**.** (1989). Black and white adolescents' perceptions of their weight. *Journal of School Health, 59,* 353- 358.

Douty, H. I. (1954). Objective Figure Analysis. *Journal of Home Economics, 46*, 24-26.

Douty, H. I. (1963). Influence of clothing on perception of persons. *Journal of Home Economics, 55*, 197-202.

Douty, H. I. (1968). Silhouette photography for the study of visual somatometry and body image. Paper presented at the National Textile and Clothing Meeting, Minneapolis, Minnesota.

Douty, H. I., Moore, J. B., & Hartford, D. (1974). Body characteristics in relation to life adjustment, body image and attitudes of college females. *Perceptual and Motor Skills, 39,* 499-521.

Douty, H. I., & Brannon, E. L. (1984). Figure attractiveness: Male and female preferences for female figures. *Home Economics Research Journal, 13*(2), 122-137.

Farinah, S. (2005). Perceptions of the size, shape, and attractiveness of female body scans relative to body mass index. Unpublished Master's Thesis, Auburn University, Auburn, AL.

Fallon, A. E., & Rozin, P. (1985). Sex differences in perception of desirable body shape. *Journal of Abnormal Physiology, 94,* 102-105.

Featherstone, M. (1994). *Kultur, kropp, konsumtion*. Symposion, Stockholm.

Feldman, W., Feldman, E., & Goodman, J. T. (1988). Culture versus biology: Children attitudes toward thinness and fatness. *Pediatrics, 81*, 190-194.

Fitzgibbon, M. L., Blackman, L. R., & Avellone, M. E. (2000). The relationship between body image discrepency and body mass index across ethnic groups. *Obesity Research, 8*(8), 582-589.

Gardner, R. M., Friedman, B. N., & Jackson, N. A. (1998). Methodological concerns when using silhouettes to measure body image. *Perceptual and Motor Skills, 86,* 387-395.

Gardner, R. M. (2002). Body image assessment of children. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: A handbook of theory, research, and clinical practice* (pp. 127- 134). New York: Guilford Press.

Garner, D.M., & Garfinkle, P.E. (1980). Sociocultural factors in the development of anorexia nervosa. *Psychological Medicine*, *10*, 647-656.

Hamilton, L.H., Brooks-Gunn, J., & Warren, M.P. (1985). Sociocultural influences on eating disorders in female professional dancers. *International Journal of Eating Disorders, 4*, 465-477.

Heatherton, T. E., Mahamed, E. Striepe, M., Field, A. E., & Keel, P. K. (1997). A 10-year longitudinal study of body weight, dieting, and eating disorder symptoms. *Journal of Abnormal Psychology, 106*, 117-125.

Henss, R. (2000). Waist-to-Hip Ratio and female attraciveness: Evidence from photographic stimuli and methodological considerations. *Personality and individual differences, 28*, 501-513.

Istook, L.C., Simmons, K.P., & Devarajan, P. (2002). Female figure identification technique (FFIT) for apparel. *Proceedings of the International Conference on*

Fashion and Textiles. The New Frontiers-Design, Technology and Business. Hong Kong.

Jacobson, B. H., & DeBock, D. H. (2001). Comparison of body mass index by self-reported versus measured height and weight. *Perceptual and Motor Skills, 92*(1), 128-132.

Jackson, L. A. (2002). Physical attractiveness: A sociocultural perspective. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: A handbook of theory, research, and clinical practice* (pp. 13-21). New York: Guilford Press.

Kaiser, S.B. (1997). *The social psychology of clothing: Symbolic appearance in context 2nd* . New York: Fairchild Publications

Kumanyika, S., Wilson, J. F., & Guilford-Davenport, M. (1993). Weight related attitudes and behaviors of black women. *Journal of American Diet Association. 93,* 416-422.

Lee, S. (2006). Body image perceptions and clothing behavior issues for adolescent daughters and their mothers. Unpublished Doctoral Dissertation, Auburn University, Auburn, AL.

Levine, M. P., & Smolak, L. (2002). Body image development in adolescence. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: A handbook of theory, research, and clinical practice* (pp. 74-82). New York: Guilford Press.

Ma, L. (2003). Exploring apparel fit for women: Body shape and build in relation to fit problems, body cathexis and clothing benefits sought. Unpublished Master's Thesis, Auburn University, Auburn, AL.

Maloney, M. J., Maguire, J., Daniels, S.R., & Specker, B. (1989). Dieting behaviors and eating attitudes in children. *Pediatrics, 84*(3), 482-489.

Marin, G., & Marin, B. (1991). *Research with Hispanic populations*. Newbury Park: Sage Publications.

Murray, S. H., Touyz, S. W., & Beumont, P. J. V. (1995). The influence of personal relationships on women's eating behavior and body satisfaction. *Eating Disorders, 3* (3), 243-252.

National Center for Health Statistics (NCHS). (2007a). *Definitions: Body Mass Index (BMI)*. Retrieved September 6, 2007, from http://www.cdc.gov/nchs/datawh/nchsdefs/bmi.htm

National Center for Health Statistics (NCHS). (2007b). *Overweight*. Retrieved September 6, 2007, from http://www.cdc.gov/nchs/fastats/overwt.htm

National Health and Nutrition Examination Survey (NHANES). (2007). *Overweight prevalence*. Retrieved September 9, 2007, from http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/prevalence.htm

O'Brien, R., & Shelton, W. (1941). *Women's measurements for garment and pattern construction* (Miscellaneous Publication No. 454). Washington, DC: U.S. Government Printing Office.

Paeratakul, S., White, M. A., Williamson, D. A., Ryan, H. D., & Bray, G. A. (2002). Sex, race/ethnicity, socioeconomic status, and BMI in relation to self-perception of overweight. *Obesity Research, 10*(5), 345-350.

Powell, A. D., & Kahn, A. S. (1995). Racial differences in women's desires to be thin. *International Journal of Eating Disorders, 17*, 191 - 195.

Rand, C. S. W., & Resnick, J. L. (2000). The "Good Enough" body size as judged by people varying age and weight. *Obesity research, 8*(4), 309-316.

Rucker, C. E. & Cash, T. F. (1992). Body images, body size perceptions and eating behaviors among African-American and white college women. *International Journal of Eating Disorders, 12*, 291-299.

Ryan, M. S. (1966). *Clothing: A study in human behavior.* New York: Holt, Reinhart, and Winston.

Science, Nudes and Faces. (n.d.). Retrieved September 10, 2007, from http://photography.about.com/library/weekly/aa072902c.htm

Sheldon, W. H. (1940). *The Varieties of Human Physique*. NY: Harper.

Sherman, D., Iacono, W., & Donnelly, J. (1995). Development and validation of a body rating scale for adolescent females. *International Journal of Eating Disorders, 18*, 327–333.

Silverstein, B., & Perdue, L. (1988). The relationship between role concerns, preferences for slimness, and symptoms of eating problems among college women, *Sex Roles*, *18,* 101-106.

Simmons, K. P., & Istook, C. L. (2003). Body measurement techniques: Comparing 3D body scanning and anthropomentric methods for apparel applications. *Journal of Fashion Marketing and Management, 7*(3), 306-332.

Singh, D. (1993). Adaptive significance of female physical attractiveness: Role of waist-to-hip ratio. *Journal of Personality and Social Psychology*, *65*, 293-307.

Slade, P. D., & Russell, G. F. M. (1973). Awareness of body dimensions in anorexia nervosa: Cross-sectional and longitudinal studies. *Psychological Medicine, 3*, 188-199.

Smith, J. (2002, October 25). Retailers start to cater to "Tween" market of 6-to- 14-year olds. *Knight Ridder/ Tribune Business News*. Retrieved September 20, 2007, from http://www.accessmylibrary.com/coms2/summary_0286-7463251_ITM

Smolak, L. (2002). Body image development in children. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: A handbook of theory, research, and clinical practice* (pp. 65- 73). New York: Guilford Press.

Stunkard, A. J., Sorensen, T., & Schulsinger, F. (1983). Use of the Danish adoption register for the study of obesity and thinness. In Kety, S. S., Rowland, L. P., Sidman, R. L., & Matthysse, S. W. (Eds.), *Genetics of Neurological and Psychiatric Disorders* (pp. 115-120). New York: Raven.

Tantleff- Dunn, S., & Gokee, J. L. (2002). Interpersonal influences on body image development. In T. Cash and T. Pruzinsky (Eds.), *Body Images: A handbook of theory, research, and clinical practice* (pp. 108-116). New York: Guilford Press.

Thompson, J. K., & Gardner, R. M. (2002). Measuring perceptual body image among adolescents and adults. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: A handbook of theory, research, and clinical practice* (pp. 127- 134). New York: Guilford Press.

Tiggemann, M., & Pennington, B. (1990). The development of gender differences in body-size dissatisfaction. *Australian Psychologist, 25*, 306-313.

Tiggemann, M. (2002). Media influences on body image development, in T. Cash and T. Pruzinsky (Eds.), *Body image: A handbook of theory, research, and clinical practice* (pp. 91-98). New York: Guilford Press.

Thompson, J. K., Penner, L., & Altabe, M. (1990). Precedures, problems, and progress in assessment of body images. In T. Cash and T. Pruzinsky (Eds.), *Body image: Development, Deviance, and Change* (pp. 21-46). New York: Guiford Press.

Tovee, M. J., Reinhardt, S., Emery, J. L., & Cornelissen, P. L. (1998). Optimal BMI and Maximal sexual attractiveness. *The Lancet, 352*, 548.

Tovee, M. J., Maisey, D. M., Emery, J. L., & Cornelissen, P. L. (1999). Visual cues to female physical attractiveness. *Proceedings of the Royal Society of London, 266,* 211-218.

Tovee, M. J., Tasker, K., & Benson, P. J. (2000). Is symmetry a visual cue to attractiveness in the human female body? *Evolution and Human Behavior, 21*, 191-200.

Tovee, M. J., & Cornelissen, P. L. (2001). Female and male perception of female attractiveness in front-view and profile. *British Journal of Physiology, 92,* 391-402.

Tovee, M. J., Hancock, P. J. B., Mahmoodi, S., Singleton, B. R., & Cornelissen, P. L. (2002). Human female attractiveness: Waveform analysis of body shape. *Proceedings of the Royal Society of London B, 269,* 2205-2213.

Tselepis, T., & De Klerk, H. M. (2004). Early adolescent girls' expectations about the fit of clothes: A conceptual framework. *Journal of Family Ecology and Consumer Sciences, 32*, 83- 93.

U.S. Census Bureau. (2006). *Population Index*. Retrieved August 28, 2007, from http://www.census.gov/population/www/index.html

Web MD. (2007). Retrieved August 29, 2007, from http://my.webmd.com/content/article/46/2731_1657?z=2731_01647_6513_00_22

Willinge, A., Touyz, S., & Charles, M. (2006). How Do Body-Dissatisfied and Body-Satisfied Males and Females Judge the Size of Thin Female Celebrities? *International Journal of Eating Disorder, 39*, 576- 582.

APPENDIX A

INFORMATION LETTER AND ANNOUNCEMENT TO COLLEGE STUDENTS

Auburn University
Auburn University, Alabama 36849-5603

Department of Consumer Affairs
308 Spidle Hall

Telephone: (334) 844-4084
FAX: (334) 844-1340

(NOTE: DO NOT AGREE TO PARTICIPATE UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

INFORMATION LETTER for a Research Study entitled
"Comparing Self and Others' Perceptions of Adolescent Girls' Body Size Using Figural Stimuli and 3D Body Scans"

You are invited to participate in a research study comparing self-perceptions of adolescent girls' body sizes with the perceptions of a sample of female students viewing the body scans of the adolescent girls. The study is being conducted by Aarti Mahajan (Graduate Student), under the direction of Dr. Pamela Ulrich and Dr. Lenda Jo Connell, in the Auburn University's Department of Consumer Affairs. You were selected as a possible participant because you are a college student currently enrolled at Auburn University and are age 19 or older.

If you decide to participate in this research study, you will be asked to choose responses to visual stimuli; this typically takes 25 minutes and all information you provide will remain completely anonymous. You will begin by evaluating body scan images of adolescent girls'; there are two sections involved in rating your perception of these images. After you have rated these images, you will be asked to answer four demographic questions about yourself.

We assure you that participation in this study will put you at no physical or psychological risk other than the minimal inconvenience of completing the survey. All responses are treated as anonymous, and in no case will responses from individual participants be identified.

The data you provide will offer a better understanding of how realistically young adolescents can rate their figures based on a figure scale. All student participants will receive extra credit from the faculty for taking part in the study. Students, who decide to participate in this study, will be given a voucher for extra credit after they complete the survey. The students will be responsible to provide that voucher directly to their instructor to receive that extra credit. The researcher will not collect any of the vouchers and will keep the data anonymous. Students will need to check with their instructor to find out the value of extra credit.

Your participation is completely voluntary. You may withdraw from taking the survey without repercussion. However, after you have provided anonymous information, we will be unable to withdraw your data after participation since there will be no way to identify individual information. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Consumer Affairs, or the College of Human Sciences.

Any data obtained in connection with this study will remain anonymous. Information collected through your participation may be used to fulfill an educational requirement for the Master of Science Degree, published in a professional journal, and/or presented at a professional meeting.

If you have questions about this study please ask them now. If you have any questions later, the faculty advisors Dr. Lenda Jo Connell at connelj@auburn.edu (334- 844-3789) or Dr. Pamela Ulrich at ulricpv@auburn.edu (334- 844-1336) will be happy to answer them.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334)-844-5966 or e-mail at hsubjec@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE IF YOU WANT TO PARTICIPATE IN THIS RESEARCH PROJECT. IF YOU DECIDE TO PARTICIPATE, THE DATA YOU PROVIDE WILL SERVE AS YOUR AGREEMENT TO DO SO. THIS LETTER IS YOURS TO KEEP.

Investigator's signature	10/27/2008 Date	Co-Investigator	10/27/2008 Date
Aarti Mahajan		Dr. Pamela Ulrich and Dr. Lenda Jo Connell	
Print Name		Printed Name	

The Auburn University
Institutional Review Board
has approved this document for use
from 10/24/08 to 10/23/09.
Protocol # 08-248 EX 0810

ANNOUNCEMENT TO COLLEGE STUDENTS

The Department of Consumer Affairs in the College of Human Sciences is conducting a study about body size perceptions.

Students who participate will receive extra credit in this class. If you choose to participate, you will be asked to fill out a survey in the class that should take you about 25 minutes to complete. Your responses will be anonymous; you will be given a voucher that you will need to provide the instructor to receive the extra credit.

If you do not want to participate, there will be an alternate extra credit activity available, equivalent to the same time as the study for about 25 minutes. You will need toc heck with the instructor to find out the value of extra credit and any other alternate activity if you don't want to participate in this study.

If you have any questions please ask them now or contact the researcher Aarti Mahajan at mahajay@auburn.edu.

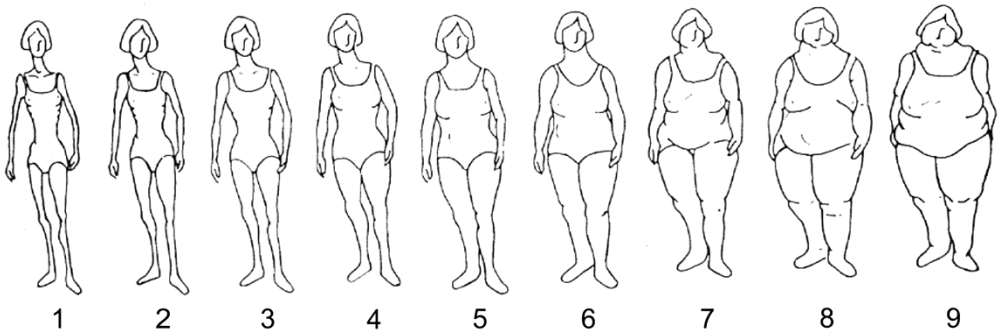
Thank you.

APPENDIX B

INSTRUMENT

Section I

Please review each body scan image projected on the screen. Using the following scale, review the figural images in the scale below and decide which image most closely resembles the body image projected in each scan, then place the number of the image in the figural scale in the appropriate place as each scan is shown. <u>For instance, if you view the scan and think it looks like figure 4, you would write 4 in the appropriate place provided.</u>



FIGURAL SCALE

Body Scan Image #	Looks like drawing #	Body Scan Image #	Looks like drawing #
1		22	
2		23	
3		24	
4		25	
5		26	
6		27	
7		28	
8		29	
9		30	
10		31	
11		32	
12		33	
13		34	
14		35	
15		36	
16		37	
17		38	
18		39	
19		40	
20		41	
21		42	

Section II

Please review each body scan image projected on the screen. Please circle the size category that you believe each scan would fall into. For instance, if you view the scan and think it looks like a normal size, you would circle NORMAL.

Circle the description that is best fit for the scanned image.

I think the person from scan # **1** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **2** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **3** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **4** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **5** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **6** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **7** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **8** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **9** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **10** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **11** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **12** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **13** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **14** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **15** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **16** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **17** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **18** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **19** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **20** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **21** is:	*Underweight*	*Normal*	*Overweight*	*Obese*

Section II (Continued)

Please review each body scan image projected on the screen. Please circle the size category that you believe each scan would fall into. For instance, if you view the scan and think it looks like a normal size, you would circle NORMAL.

Circle the description that is best fit for the scanned image.

I think the person from scan # **22** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **23** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **24** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **25** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **26** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **27** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **28** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **29** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **30** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **31** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **32** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **33** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **34** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **35** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **36** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **37** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **38** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **39** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **40** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **41** is:	*Underweight*	*Normal*	*Overweight*	*Obese*
I think the person from scan # **42** is:	*Underweight*	*Normal*	*Overweight*	*Obese*

SECTION III

- **Please answer the questions about yourself.**

I think I am:

1. Very Underweight
2. Somewhat Underweight
3. Normal Weight
4. Somewhat Overweight
5. Very Overweight

DEMOGRAPHIC INFORMATION:

- **Please answer the questions about yourself.**

Your Sex: Male____ Female_____

Your Age: ____

Your Ethnicity: _____ African-American
_____ Asian
_____ Caucasian
_____ Hispanic
_____ Native American
_____Other : Please Specify:_____

THANK YOU