THE EFFECTS OF 3D BODY REPRESENTATION AND SOMATOMORPHIC IMAGES ON SELF-ESTEEM

by

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ABSTRACT

There is new technology that is capable of creating 3D body representations of people that has not been examined in psychological research, especially in relation to body esteem. Does viewing a representation of your current body type and analyzing how far you are from your body ideal impact body esteem? Is viewing a 3D representation of one's body more impactful to body esteem than a 2D representation of one's body? Do males and females differ in their reactions to seeing themselves represented with a 3D image? Participants (N = 63) were college students from classes at Middle Tennessee State University. Participants were in two different body target groups, the somatomorphic group and the body scan group. Participants in both conditions completed a pre-test assessing one's body esteem. After completing the pre-test, all participants then got body scanned by the KX-16 body scanner. Participants then completed the post-test measure of body esteem after viewing a somatomorphic image or a copy of one's body scan image. The somatomorphic group did not view a copy of one's body scan image. The findings of this study are that participants body esteem drops after being presented with a body scan image or somatomorphic matrix. Also, being presented with a body scan image impacts body esteem more negatively than being presented with a somatomorphic matrix. Namely, the body scan image negatively affects overall body esteem and appearance body esteem. The major implication of this study is that using a 3D body scanner could have negative effects on one's self esteem and should be cautioned for anyone who could suffer from detrimental effects of low self-esteem. Also, this research guides the way to further 3D body scanning psychological research.

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CHAPTER ONE:

INTRODUCTION

Body image generally refers to the way people see, feel, think, and act concerning their body (Rutledge, Gillmor, & Gillen, 2013). Body image dissatisfaction refers to the extent of discrepancies between a person's perceived and ideal body shape (Murray & Touyz, 2012). Body image dissatisfaction has been shown to predict negative self-evaluations that can result in depression, eating disorders, low self-esteem, and health-compromising behaviors (Holsen, Kraft, & Røysamb, 2001, Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006, Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006, Stice & Bearman, 2001, Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999; Wertheim, Koerner, & Paxton, 2001).

This study will explore two important issues concerning body satisfaction. First, does a 3-dimensional (3D) representation of a person's actual body impact body satisfaction more than a 2-dimensional representation of different body types? Second, how is gender related to the reactions and effects of seeing a representation of one's body? While it is clear that culturally there is pressure to abide by certain characteristics such as social norms, gender roles, and physical characteristics, there is little research conducted on body image concerns in relation to 3D scans and gender. Very little research has been conducted exploring the connection between these topics and the importance of 3D body scanning.

In the following review of the literature, I will first examine internal and external factors that affect body image and psychological well-being. Next, I will review the gender differences in body image ideals. Last, I will review 3-Dimensional body scanning technology and the importance of 3D body scanning research.

Internal Factors Affecting Body Image and Well-Being

Extensive research literature has recognized significant relations between body image attitudes and psychosocial functioning and well-being. The sources of body image problems are multifaceted and include developmental, cultural, and interpersonal experiences as well as actual physical characteristics (Cash & Pruzinsky, 2002; Thompson & Smolak, 2002). A negative body image (i.e., body dissatisfaction) can have an adverse psychosocial impact on one's life, including disordered eating, depression, social anxiety and inhibition, and poor self-esteem (Cash, Jakatdar, & Williams, 2004).

Cash and Fleming (2002) investigated the positive and negative implications that result from dissatisfaction of body image on college women's quality of life. Participants reported that a more favorable body image was associated with higher body satisfaction, less body shame, less preoccupation with being or becoming fat, lower body surveillance, and less strongly internalized cultural beauty standards. The findings of this study suggest that disliking their bodies and having a negative body image negatively impacts the psychological well-being of women. It is apparent that depression and body dissatisfaction are frequently comorbid in women (Cash & Fleming 2002). However, limited studies have examined whether depression is correlated with body dissatisfaction or body image concerns in men (McCreary & Sasse, 2000).

Cash et al. (2004) investigated the relationship of body image on the quality of life of college women and men. They administered various surveys concerning body image, self-esteem, general expectancies of optimism and pessimism, social support, and abnormal eating patterns. For both women and men, better body image was associated with greater body image satisfaction, less body image distress, and less time evaluating one's body than people who have poor body image. Better body image was also positively correlated with more optimism, better

self-esteem, higher levels of perceived social support, and fewer dysfunctional eating attitudes. Men had significantly more positive body image than women did.

Svaldi, Zimmer, and Naumann (2012) investigated self-esteem and the level of attention paid to specific body parts. Participants with low self-esteem showed more attention to those body parts they were dissatisfied with than did those with higher self-esteem. Those who scored higher on self-esteem attended more to the body parts with which they were satisfied. Although correlational, these results suggest that differences in self-esteem may be a matter of focus – those who focus on the positive attributes about themselves may feel better about their bodies than those who focus on the negative attributes of their bodies, which could result in lower body esteem.

Research on eating restraint was conducted by Hoffmeister, Teige-Mocigemba, Blechert, Klauer, and Tuschen-Caffier (2010). Participants were recruited who scored lowest and highest on a measure of eating restraint. These participants were then scored on implicit self-esteem using the implicit associations test (IAT; Greenwald, McGhee, & Schwartz, 1998) before and after increasing the participants' awareness of their own body shape and weight through a mirror exposure of their body. Implicit attitudes are thought to rely on associative processes whereas explicit attitudes rely on propositional processes. The results showed that self-esteem was not affected by their body image when exposed to the mirror for unrestrained eaters. However, restrained eaters reacted with a significant decrease of self-esteem following the mirror exposure. Therefore, people who engage in weight concerned behaviors are likely to differ from their ideal body shape, and may experience lower self-esteem and body-esteem when exposed to their current body shape.

In summary, several kinds of internal factors can affect body image and well-being. A more favorable body image is associated with higher body satisfaction, less body shame, less preoccupation with being or becoming fat, lower body surveillance, and less strongly internalized cultural beauty standards, higher self-esteem, and attending more to the body parts with which people are satisfied (Cash & Fleming, 2002). Having a negative body image negatively impacts psychological well-being including disordered eating, depression, social anxiety and inhibition, and poor self-esteem, and paying more attention to body parts people are dissatisfied with than are those with higher self-esteem (Cash & Fleming, 2002). Restrained eaters may also experience implicit attitudes about their weight concern that could negatively affect their self-esteem when exposed to mirror images of themselves (Greenwald et al. 1998).

External Factors Affecting Body Image and Well-Being

In addition to internal factors, there are external factors that can affect body image and well-being. The effects of receiving body-related compliments from others are likely to be complex. These kinds of compliments have the potential to be either detrimental or enhancing depending on a multitude of interacting variables (e.g., number of compliments, personality of the recipient, perceived impact of the compliment, or whether or not the compliment is associated with reinforcement of societal appearance standards). For example, “You’ve lost weight; you look great!” conveys weight loss and enhanced appearance, and thus has the propensity to reinforce thin-ideal internalization (Tylka & Wood-Barcalow, 2015).

Due to a multitude of individual factors, positive or negative comments, societal pressures, and body image flexibility can impact one’s perception, suggesting that body image is not a stable trait (Tylka & Wood-Barcalow, 2015). Augustus-Horvath and Tylka (2011) found that perceived body acceptance by others correlated with women's body mass index and body

satisfaction. That is, lower body appreciation is not necessarily related to being heavier or not conforming to societal body ideals but rather related to not accepting one's body appearance due to an individual's perception. The societal pressures of weight stigma that individuals encounter negatively affect their perceptions of body acceptance by others, which then may create substantial roadblocks and barriers to body appreciation (Augustus-Horvath & Tylka, 2011; Tylka et al., 2014).

Research also shows that the amount of appearance-based compliments women received, such as "You are pretty," "You have a nice body," "You have pretty eyes," was related to body evaluation and body dissatisfaction (Calogero, Herbozo, & Thompson, 2009). A sample of 220 women completed self-report measures of appearance commentary, trait self-objectification, body-surveillance (close and frequent observations about one's body), and body dissatisfaction. Results indicated that all women reported higher body surveillance and more body dissatisfaction in association with feeling good about receiving appearance compliments (Calogero et al., 2009).

Taken together, lower body appreciation is not necessarily related to being heavier or not conforming to societal body ideals but rather related to not accepting one's body appearance due to their individual perception. Even receiving body-related compliments from others can be detrimental based on a multitude of factors that can impact one's perception. This implies that perception is not a stable trait and can be influenced by a multitude of internal or external factors.

Gender Differences in Body Image

In many Western societies, there is a great amount of value and external pressure placed on conforming to the cultural ideal of the thin body. For example, mass media contain images and messages portraying standards for female beauty that shape the perceptions girls have of their own bodies. Lubans and Cliff (2011) investigated gender differences in relation to height,

weight, physical strength, perceived body attractiveness, and physical self-perception. The results indicated that perceived body attractiveness appears to be the most predictive physical characteristic of self-worth among adolescent females. These authors note that the "thin ideal" internalization for girls can begin as early as nine years of age, and adolescent girls' perceived failure to reach a culturally ideal body shape is associated with low self-esteem.

On the other hand, to project masculinity in many cultures, men and boys must portray physical presence of power and strength. Perceptions of physical strength have been examined among boys and men, and results have shown these perceptions to relate strongly to physical self-worth just as perceived body attractiveness relates to self-worth in girls (Lubans & Cliff, 2011). Therefore, gender seems to be influential in shaping associations between physical self-perception and physical self-worth during adolescence.

Although body satisfaction for both boys and girls is lowest during early adolescence, gender differences in the levels of body satisfaction are persistent in that boys report greater body image satisfaction than girls (Holsen, Jones, & Birkeland, 2012). Early adolescent girls have reported experiencing higher levels of body dissatisfaction in relation to increasing weight, whereas boys showed increased levels of body dissatisfaction for being either overweight or underweight (Eidsdottir, Kristjansson, Sigfusdottir, Garber, & Allegrante, 2013).

After early adolescence, gender differences diverge in developmental patterns. For boys, body satisfaction increased into the later years of adolescence (Bearman, Presnell, Martinez, & Stice, 2006, Cole et al., 2001, von Soest & Wichstrøm, 2009) presumably because as males mature, the male physique is capable of gaining more muscle to achieve the muscular ideal associated with masculinity. Not only obese but also exceedingly slim pubertal boys may be rejected by peers and consequently excluded to engage in physical activity because they are

viewed as less skilled in sport activities (Cumming et al., 2011). As a result, thin boys have the potential to develop concerns that their bodies differ from the culturally muscular masculine ideal. Therefore, boys may engage in efforts to improve their muscularity to fit the ideal.

For girls, physical maturity commonly deviates from the thin ideal connected to femininity. Even though research indicates that adolescent females report higher levels of body dissatisfaction than males, body dissatisfaction tends to decline during the high school years among girls (Bearman et al., 2006, Crespo, Kielpikowski, Jose, & Pryor, 2010, Eisenberg, Neumark-Sztainer, & Paxton, 2006, Espinoza, Penelo, & Raich, 2010, Ohring, Graber, & Brooks-Gunn, 2002).

When girls reach adolescence, they experience a marked increase in adipose tissue contents and body mass index levels, in turn leading to more negative body image (Lubans & Cliff, 2011). The increase in body fat during puberty may cause discomfort during physical activity (Cumming et al., 2011), which may consequently lead to decreased levels of physical activity and manifest even higher levels of negative body image as weight increases.

By adulthood, women and men experience similar concepts and ideas of body image (Tylka & Wood-Barcalow, 2015). For example, body appreciation is associated with physical activity, health-related behaviors, and overall well-being equally for U.S. college women and men (Gillen, 2015). However, there are some differences in women and men's levels of body appreciation. Older men (i.e., mid-50s) reported similar levels of body appreciation as older women, however college-aged men reported higher levels of body appreciation than college aged women (Tylka & Wood-Barcalow, 2015). Therefore, during early adulthood college men’s levels of body appreciation are higher than college women’s, but after early adulthood men’s and women’s body appreciation equals out as they age.

The male body dissatisfaction rate has increased by 187% at the end of the 20th century, up from 15% in 1972 and 43% in 1997 (Bozard, 2013). For men, portraying masculinity in numerous cultures is a physical presence of power and strength, and physical related activities have been identified as a setting for young males to express their masculinity (Lubans & Cliff, 2011). Bozard (2013) reported that male college students believed their bodies should have an average of 25 pounds more muscle and eight pounds less fat to meet their perceived ideal male physique. He found that body dissatisfaction may be related to this conformity to masculine ideals. The quest for muscularity and physical strength has been observed among both boys and men. Consequently, it appears that men perceive physical strength as more strongly related to physical self-worth compared to women (Lubans & Cliff, 2011). In a qualitative analysis, men reported that muscularity was a way to demonstrate masculinity and was connected with a variety of social, mental and physical health benefits (Morrison, Morrison, & Hopkins, 2003). Additional evidence has shown that men and boys tend to see themselves as thinner and less muscular than they really are (McCreary & Sasse, 2000). Markland and Ingledew (2007) reported that many individuals experience a large discrepancy between real and ideal body image. Such discrepancies could result in either giving up efforts toward changing body mass and reducing physical activity, or engaging in activities aimed at achieving desired body shape (Lubans & Cliff, 2011).

Negative consequences can stem from the differences between one's perception of one's body characteristics and one's ideal body characteristics. If people's ideal masculinity or femininity and physical characteristics are not close to their actual masculinity or femininity and physical characteristics, it may lead to stress due to gender role strain and gender role conflict. These issues could, in turn, lead to negative psychological consequences such as eating

pathology, excessive exercise, steroid use, depression, and low self-esteem (Brown & Graham, 2008; Murray & Touyz, 2012).

Expectancy violation theory suggests that expectations drive behavior and thoughts that are anticipated of a particular outcome or setting (Burgoon, Newton, Walther, & Baesler, 1989). These behaviors and thoughts derive from social norms that drive expectancies in gender, culture, or setting. Violations of these expectancies can threaten one's thoughts or change one's behavior. Whether or not these expectancies are violated and how the outcome is viewed (positive or negative) is dependent on how much these expectancies have been threatened to an individual. The further the expectations are from the outcome, the greater threat this will pose on an individual. Expectancy violation can also be exhibited in how far the perception of one's current body type from one's ideal body type.

Exercise may provide an outlet for women and men to channel any negative feelings they have resulting from viewing thin-ideal media. It is also likely to reduce state self-objectification (the transient evaluation of appearance based on perception of others) because it focuses attention away from how the body looks and on what it can do (Prichard & Tiggemann, 2012). Also, exercise itself has consistently been shown to lead to increases in state mood (current mood at that moment) cross-culturally and also has numerous benefits for both physical and psychological well-being (Prichard & Tiggemann, 2012).

In summary, throughout adolescence and into adulthood, men and women have different concepts of ideal bodies shaped by gender influences. Perceptions of physical strength perceptions for boys and men to achieve the muscular ideal relate strongly to physical self-worth just as perceptions of the thin ideal and body attractiveness relate to self-worth in girls and women (Lubans & Cliff, 2011). Men and boys perceive themselves as thinner and less muscular

than they really are due to the muscular ideal. This perception of a gap between one's body perception and ideal characteristics can lead to expectancy violations that could result in negative consequences such as giving up efforts toward changing body mass to achieve a desired body shape and reducing physical activity (Lubans & Cliff, 2011). Exercise is the most apparent solution to help combat these negative feelings. Exercise can reduce self-objectification stemming from the thin ideal and muscular ideal and also the gap between one's body perception and ideal characteristics through focusing on what a body can do rather than what it looks like.

3-Dimensional Body Scanning Technology

3D body scanning technology has been used to take quick measurements of each body part to generate an exact representation of a person's body shape. There has been limited research on how 3D body scanning technology has been used to address body image issues. However, this technological capability is relatively new and there have been previous studies involving the development of 3D body measurement technology. Researchers (Connell, Ulrich, Brannon, Alexander, & Presley, 2006; Simmons, Istook, & Devarajan, 2004a) have used 3D body scanning technology to develop tools to analyze different facets of the body including size, build, shape, and posture of women.

Researchers have been trying to develop tools that permit 3D scans to be matched or related to traditional body shapes or 2D images. Connell et al. (2006) used adult female body printed scans (front and side views) to develop the Body Shape Assessment Scale (BSAS). The BSAS made it possible to develop software that can take measurements of body parts in 3D. These measurements are developed through landmark coordinate data to describe nine classifications of whole and component body parts through visual analysis. Whole body classifications include body build, body shape, front torso shape, and posture; components were

hip shape, shoulder slope, bust prominence, buttocks shape, and back curvature. A software program was then built based off the whole and component body parts to classify female scans based on BSAS categories. The BSAS has the capability of measuring body mass index, body measurements, and weight. Research has been done using the BSAS to examine the relationship between body shapes and variables including body mass index (BMI), age, and ethnicity. (Alexander, 2003).

The Female Figure Identification Technique (FFIT; Simmons, Istook, & Devarajan, 2004b) and the BSAS (Connell et al., 2006) used coordinate data and algorithms to analyze 3D body scan data and convert them to 2D body shapes. Whereas the FFIT is based on 3D form and actual body measurements and algorithms to identify the different body shapes, the BSAS applied 2D visual analysis to differentiate the body shapes. Azouz, Rioux, Shu, and Lepage (2006) applied clustering techniques from 3D body scan data to a sample of 300 men to develop a methodology for identifying contributors and variations in body form.

The body scanner is capable of taking measurements of body parts through millions of data points that are filtered as related or unrelated data points that represent an individual's body. The actual technology for 3D scanning is concisely described by Cottle (2012): "The Textile Clothing Technology Corporation's ([TC]2) KX-16 body scanner uses infrared technology to obtain raw point cloud data that represent a subject's form ([TC]2, 2011). Up to one million data points are generated per individual scan. The KX-16 software filters unrelated data points (i.e., noise), resulting in approximately 144,000 digital X, Y, Z data points per scan" (p.10).

The 3D body scanner uses statistical human body form classification associated with 3D body scans to develop more than just the standard somatomorphic builds (a 2 dimensional representations of a spectrum of body types) used to describe body builds, size and shape. Recent

studies have used 3D scans to classify 2D shapes but not classified 3D body form data clustering. 3D body scanning technology has been suggested as exhibiting the accurate landscape of human shape variations (Azouz et al., 2006) rather than just generalized body shapes. Preprocessed point cloud data are converted into a normalized format which gives each participant's data file a common X,Y, Z spatial point of origin and an identical number of data points (Costa & Cesar, 2001). The representation of the X, Y, Z spatial points is then converted into each participant's data file to an avatar mesh. Data points are distributed in 215 slices of the torso, each slice is an ellipse that represents the circumferences of the body ([TC]2, 2011).

The 3D body scanner cannot only measure the human body but also has the potential to indicate whether an individual is physically active. Physical activity is often identified through various anthropometric measures (Jackson, Howton, Grable, & Collins, 2006; Kang, Marshall, Barreira, & Lee, 2009). This technique clusters whole and component human body forms within a sample and compares the identified clusters to certain physical activity measurements. Therefore, the 3D methodology is capable of comparing variations in the body form clusters over time through longitudinal study to examine a physical activity intervention. Because some health risk factors are related to human body form types (Flegal & Graubard, 2009), the human body form clustering could provide a methodology to pair with research into human health risks in fields like cardiology, endocrinology, oncology, and psychology to examine health risks.

3D body scanning is important because this technology is becoming readily available to the public and may be implemented in technology products. While this technology may make tasks such as measuring one's body a quicker and easier task, it could pose potential risks that are not considered due to lack of research. These risks need to be minimized for potential future

users so that people who use the body scanner will not experience negative effects without being aware of the potential risks.

An individual's body perception could stem from the exposure of themselves in a mirror from only an angle that is standing straight forward. 3D body scanning technology has the capability to expose participants to every angle of their body. This could violate people's perception or expectation of themselves and this could in turn experience negative consequences such as lowered levels of body esteem. The 2D images of body shapes are presented in the way most people look at themselves in the mirror, in a straight forward front facing position. Therefore, people who view a 3D body scan image may experience more expectancy violations than someone who views a 2D representation of their body.

In summary, there has been limited research on how 3D body scanning technology has been used to address body image issues. The 3D body scanner uses statistical human body form classification associated with 3D body scans to develop more than just the standard somatomorphic builds used to describe the human body. 3D body scanning technology has been used to take quick measurements through millions of data points through X, Y, Z spatial points of each body part to generate an exact representation of one's body form. This technique clusters human body forms within a sample and compares the identified clusters to certain physical activity measurements and could provide a methodology to pair with research into human health risks. It is important to investigate the potential risks and negative consequences that people experience after using 3D body scanning technology. Therefore, this research could help implement a protocol for people using 3D body scanning technology to prevent potential risks such as lowered body esteem.

Statement of the Problem and Hypotheses

Research on body perception and body image satisfaction reveals several general findings. Lower levels of body appreciation are related to not accepting one's body appearance due to a variety of factors, including one's individual perception. Body dissatisfaction is not only related to being heavier or not conforming to societal body ideals but can also be subject to perceptual factors. These perception factors can drive a more favorable body image that is associated with positive psychological well-being. People's well-being can include higher body satisfaction, higher self-esteem, and focusing more attention to the body parts with which they are satisfied. However, perception can also drive a negative body image which can diminish psychological well-being. These negative perceptions impact individuals by focusing more attention to body parts they are dissatisfied with and hurting self-esteem. Restrained eaters may also experience implicit attitudes about their weight concern that could negatively affect their self-esteem when exposed to mirror images of themselves (Greenwald et al. 1998).

Previous research suggests that body image perception is not a stable trait and can be influenced by a multitude of internal or external factors. One of these factors includes perceptions shaped by gender because men aim to achieve the muscular ideal just as women aim to achieve the thin ideal and body attractiveness (Lubans & Cliff, 2011). Due to the muscular ideal, men and boys perceive themselves as thinner and less muscular than they really are. The gap between one's body perception and ideal characteristics could result in negative consequences such as giving up efforts toward changing body mass or giving up efforts to attain a desired body shape (Lubans & Cliff, 2011). Exercise can help reduce self-objectification internalized from the thin ideal, muscular ideal, and the gap between one's body perception and ideal characteristics. Exercise may allow men to perceive themselves as more muscular and

closer to their body ideal, and allow women to perceive themselves as thinner and closer to their body ideal.

People who engage in weight-concerned behaviors are likely to differ from their ideal body shape, and they will experience lower self-esteem when exposed to their current body shape (Augustus-Horvath & Tylka, 2011). Implicit and explicit attitudes may impact self-esteem and body-esteem following mirror exposure, which is an accurate representation of one's body (Hoffmeister et al., 2010). Individuals with low self-esteem show more attention to those body parts they were dissatisfied with than those with higher self-esteem (Svaldi et al., 2012). Negative consequences can stem from the differences between one's perception of one's body characteristics and one's ideal body characteristics (Lubans & Cliff, 2011). A negative body image negatively impacts psychological well-being and perception (Cash & Fleming, 2002). A multitude of individual factors, positive or negative comments, societal pressures, and body image flexibility can impact one's perception. This suggests that body image is not a stable trait (Tylka & Wood-Barcalow, 2015).

In past research, girls experienced higher levels of body dissatisfaction in relation to increasing weight, whereas boys showed increased levels of body dissatisfaction for being either overweight or underweight (Eidsdottir et al., 2013). Perceptions of physical strength for boys and men to achieve the muscular ideal relate strongly to physical self-worth, just as perceptions of the thin ideal and body attractiveness relate to self-worth in girls (Lubans & Cliff, 2011). Due to internalized cultural beauty standards shaped by gender influences, perception of body characteristics can also present negative consequences such as men and boys perceiving themselves as thinner and less muscular than they really are due to the muscular ideal (Lubans & Cliff, 2011). However, women also have a stronger internalization of beauty standards than men.

3D body scanning technology makes quick measurements through millions of data points through X, Y, Z spatial points of each body part to generate an exact representation of a person's body form into an avatar mesh. The avatar representation of the body could differ from people's perception of their body or their body ideal and, therefore, make people aware of the gap between their body perception and ideal characteristics. Because body image perception is not a stable trait, this awareness of actual and ideal body perceptions in turn could lead to negative consequences including negative body image and lowered body-esteem. Also, because some individuals may experience body dissatisfaction, they may focus more attention to parts of their body with which they are dissatisfied. Because there is limited research on 3D body scanning technology in relation to body image issues, people who have used the body scanner could suffer from body dissatisfaction. The purpose of this study will be to examine changes in body esteem after participants view their 3D body scanned image or rate their 2D body on a somatomorphic matrix. The somatomorphic matrix is a 2D continuum of different body silhouettes with varying levels of fat and muscle.

The somatomorphic matrix group will simply think about their body shape, analyze body diagrams, and determine their body type and how much they differ from their ideal body type, which may result in negative consequences. However, this group will not have to face accurately represented body features that they are potentially dissatisfied with. The 3D body scan group will be presented with their actual body dimensions and see their accurately represented body features that may exhibit body features that are not normally seen. Participants will not only see how much they differ from their ideal body shape but may also focus on which specific body parts need to change. The accuracy of the representation of the body scan image may also change the perceptions of individuals and may result in lowering body esteem. This is because the

differences between their current body type and their ideal body type are more apparent in exactly what needs to change when viewing a 3D body scan image.

My design is a 2 (Image Type: 2D/3D) X 2 (Time: pre/post) X 2 (Gender) mixed factorial, with body esteem scores as my DV. This means that I have 7 possible effects to consider.

Hypothesis 1 (Image Type main effect): Participants will respond more negatively (report lower body esteem scores) after seeing the 3D scan compared to the 2D image. The rationale is that the 3D body image representation is a more accurate representation and, therefore, will force the participants to focus on body parts with which they are potentially dissatisfied.

Hypothesis 2 (Time: Pre/Post main effect): Participants will report drops in their body esteem after being presented with an image of their body, regardless of condition. The rationale here is that, merely seeing or thinking about one's body type/appearance will have a negative effect on how participants feel about their body, everything else being equal.

Hypothesis 3 (Gender main effect): No gender main effect is expected. There is no reason, a priori, to assume that women and men differ in their body esteem scores, ignoring any pre/post and image type effects.

Hypothesis 4 (Image Type X Time interaction): Participants' drop in body-esteem from pre to post will be greater for those viewing the 3D compared to the 2D image. I have made the argument that viewing a 3D scan should be more impactful than viewing the 2D due to the accuracy of the body representation.

Hypothesis 5 (Image Type X Gender interaction): The effect of image type (3D scan compared to the 2D) on body esteem will be greater for women than men. There is rationale that 3D body scans are a more accurate representation of their bodies and women have stronger

internalizations of beauty compared to men. Therefore, female participants should show larger 3D/2D body esteem differences than male participants.

Hypothesis 6 (Time X Gender interaction): The pre/post effect (more negative body esteem from pre to post) will be greater for women than men. There is research that women have stronger internalizations of beauty compared to men. I am expecting that female participants will be affected more negatively by viewing the body images than will male participants.

Hypothesis 7 (Image Type X Time X Gender interaction): The larger 3D pre/post effect will be magnified with female participants compared to male participants. There is rationale that 3D body scans are a more accurate representation of their bodies, women have stronger internalizations of beauty compared to men, and there are gender differences in ideal body types.

CHAPTER TWO: METHOD

Participants

Undergraduates were recruited from classes at Middle Tennessee State University that already require body scanning for a future class assignment. Participant's demographics included 49 female and 14 males (N = 63) ranging from 18-29 years of age (M = 20.13, SD = 2.386).

Participants were 18 years or older. The only exclusion criterion for participants is if they have previously seen a 3D body scan of themselves. There needed to be 30-40 participants for this study. Potential participants were warned not to volunteer if they have serious body image issues, have been clinically diagnosed as depressed, have been clinically diagnosed with an eating disorder, or they suspect that they have any of these disorders. This study could have resulted in depression, eating disorders, low self-esteem, and health-compromising behaviors because of poor evaluations of their bodies (Holsen, Kraft, & Røysamb, 2001). They were warned so that they can choose to not participate, to prevent potential harm to any participants.

Materials

The MTSU standard consent form was used (See Appendix A). Participants received two copies of the consent form. One of the consent forms were signed and handed back and the other was for the participant to keep for contact information. The consent form included information about what and where the procedure took place, and included information about the body-scanner ([TC]2 KX 16). After signing the consent form, participants completed pre-assessment. This assessment include a measure of body esteem as well as demographic items.

Body Esteem Scale for Adolescents and Adults (BESAA). The BESAA (Mendelson, Mendelson, & White, 2001) is a 21-item measure of body esteem. Participants rate each item using a 5-point scale (1 =*Never*, 5 =*Always*). Sample items include "I like what I see when I look

in the mirror" and "I wish I were thinner." The possible overall range of scores is 23-115, with higher scores indicating higher body self-esteem. Subscales of this measure include: appearance (general feelings about appearance), attribution (attributions of positive evaluations about one's body and appearance to others), and weight (weight satisfaction) with an overall test-retest reliability coefficient $r = 0.66$ (Moon, 2002). Sample items for appearance include "I wish I looked better" and "I'm as nice looking as most people." The possible range of appearance scores is 10-50, with higher scores indicating higher body self-esteem. The appearance subscale has been shown to have very high internal consistency: Cronbach's $\alpha = .92$ (Mendelson et al., 2001). Sample items for attribution include "Other people consider me good looking" and "I think my appearance would help me get a job." The possible range of attribution scores is 5-25, with higher scores indicating higher body self-esteem. The attribution subscale has been shown to have very high internal consistency: Cronbach's $\alpha = .81$ (Mendelson et al., 2001). Sample items for weight include "I am satisfied with my weight" and "I am preoccupied with trying to change my body weight." The possible range of weight scores is 8-40, with higher scores indicating higher body self-esteem. The weight subscale has been shown to have very high internal consistency: Cronbach's $\alpha = .94$ (Mendelson et al., 2001). By using this measure, I can assess which aspects of body-esteem are affected by the body scanner or the somatomorphic matrix.

The *somatomorphic matrix* (SM; Gruber, Pope, Borowiecki, & Cohane, 2000) is a body image assessment that allows analysis of the individual's body image in relation to known body composition values. In the somatomorphic matrix, participants were asked to circle which body type is closest to their current body type and to indicate their desired body type (body ideal). The SM was developed through photographs and body composition data obtained from

anthropometry. Every illustration is based on photographs taken from an array of different body types. A graphic artist constructed the images, using reference photographs of actual men (Gruber et al., 2000). Each illustration was calculated from anthropometric measurements to indicate body fatness and muscularity. On the fatness axis, the images begin at a percentage of body fat of 40% (a very obese man) and decrease in increments to a minimum of 4% (approximately the minimum figure attainable in men) and increases in increments of more muscle (Pope et al., 2000). Using these photographs as a guide, a graphic artist prepared 15 body drawings, arranged in a matrix, representing 7 levels of fat and 7 levels of muscularity and one median body with no muscle or fat. In the SM measure, the top row indicates a spectrum of men's body types and the bottom row indicates a spectrum of women's body types (see Figure 1). The SM contains values for the physique which participants perceive as ideal or the physique that participants equate with themselves (current physique) (Kagawa, Kerr, Dhaliwal, Hills, & Binns, 2006). Subsequent studies (Cafri, Roehrig, & Thompson, 2004) have found that the test retest reliabilities for the somatomorphic matrix are a generally acceptable level of .70. This measure allowed participants to think about their current body type and their ideal body type without directly looking at their exact body representation. I can analyze if just thinking about their body causes people to focus attention to the parts they are dissatisfied with and causes them

to experience lowered body-esteem.

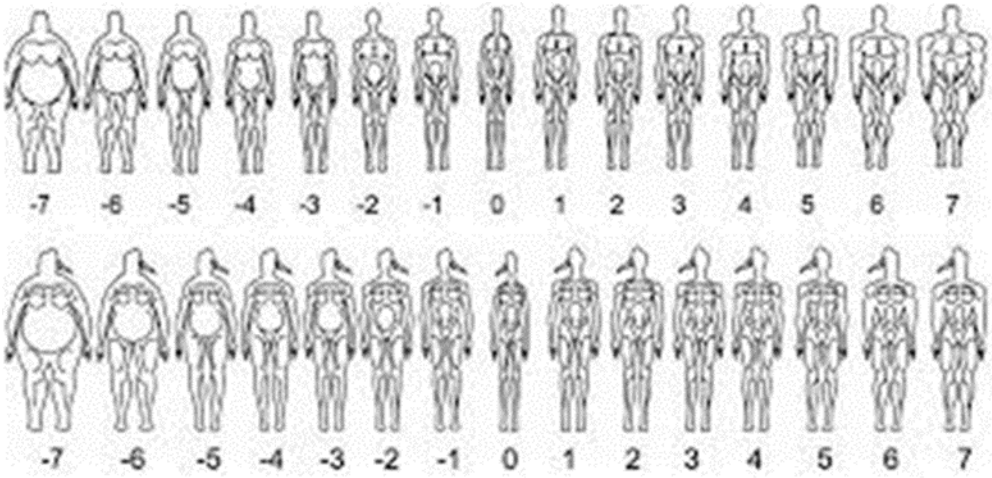

Figure 1. Somatomorphic Matrix

3D Body Scanner. The 3D body scanner ([TC]2) KX-16 used statistical human body form classification associated with 3D body scans to measure body measurements and BMI and used clustering techniques from 3D body scan data to a sample of 300 males to develop a methodology for identifying contributors and variations in body form. 3D body scanning technology has been suggested as exhibiting the accurate landscape of human shape variations rather than just generalized body shapes.

The ([TC]2) KX-16 body scanner uses white light technology to obtain raw point cloud data that represent a participant's form ([TC]2, 2011). Up to one million data points are generated per individual scan, which only takes approximately 30 seconds to complete. The KX-16 software filters unrelated data points (i.e., noise), resulting in approximately 144,000 digital X, Y, Z data points per scan. Preprocessed point cloud data are converted into a normalized format which gives each participant's data file a common X, Y, Z spatial point of origin and an identical number of data points. The representation of the X, Y, Z spatial points is then converted into each participant's data file to an avatar mesh (see Figure 2).

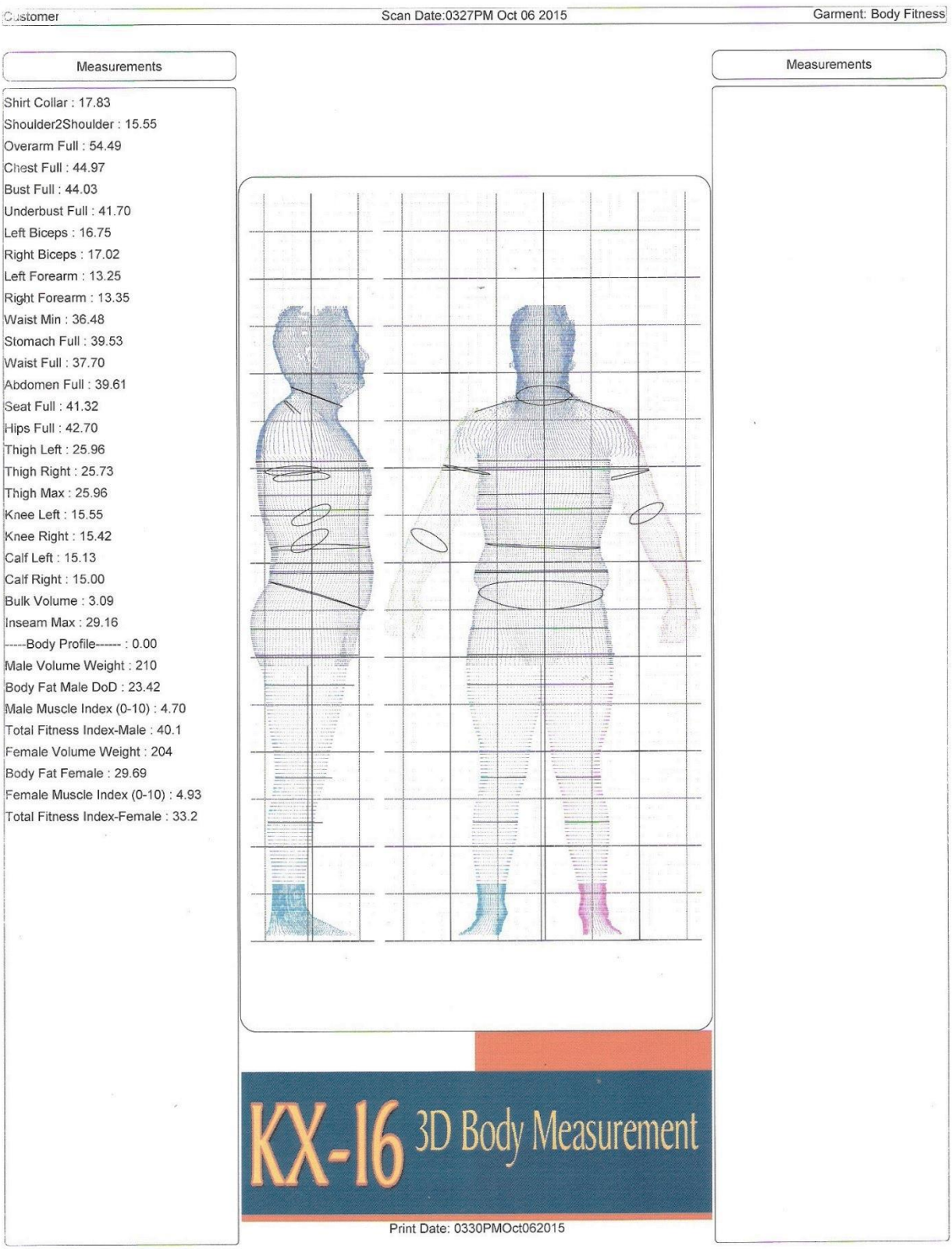

Figure 2. Body Scan Image

Data points for one's torso were generated into 215 slices: each slice is an ellipse that represented the circumferences of the body. Neither somatomorphic nor body scan images were scored or analyzed for accuracy of selection of body type. Rather, participants' presence in one of the other conditions (see below) were used to analyze if the two treatments differentially affect the body-esteem scores.

Procedure

The class was tested in their usual classroom at their usual times. The instructor informed their class to wear tight fitting clothes. If participants did not have tight fitting clothes, they could not participate. Participants received the two consent forms. They signed and dated the consent form (see Appendix A), one for them to give back to me, and one for them to keep for contact information. They were randomly assigned to one of two groups. One half of the classroom got the somatomorphic matrix group survey packet and the other half got the body scan group survey packet. They were then introduced to my study (see Appendix C). Participants filled out the pre-BESAA only.

Participants were informed that there are two different conditions. If they were in the *somatomorphic matrix condition*, they were informed that they would need to be body scanned after completing the pre-BESAA. The participants then lined up outside of the testing room to be body scanned one at a time once they finished the pre-test BESAA. They were discouraged from talking while they waited to have their scan completed. Next, participants were informed that their hair needed to be tied up if it is longer than the base of their neck. There was a hair tie in case participants did not have one. Participants stepped into the body scanner. The body scanning process took about 30 seconds to complete. While scanning, a computer-generated female voice

instructed the participant when the body scanning has started and to stand in a relaxed pose with arms beside hips.

Following completion of the body scan, each participants in the somatomorphic matrix condition received a spectrum of different body types (the somatomorphic matrix). Participants were then asked to circle which body type is closest to their current body type and to draw over the body type they picked to indicate their desired body type (body ideal). Then they were asked to complete the post BESAA.

The *body scan condition* participants were informed that they would see a piece of paper that says "place body image here" after completing the BESAA, and needed to be body scanned before answering the rest of the packet. The participants then lined up outside of the testing room to be body scanned one at a time once they finished the pre-test BESAA. Next, participants in this group were informed that their hair needed to be tied up if it is longer than the base of their neck. Participants stepped into the body scanner.

Following completion of the body scan, each participants in the body scan condition received their own body scanned image printed on a piece of paper (see Figure 2). Participants were then escorted individually back into the classroom and were asked to draw on the body scan diagram or somatomorphic image to indicate their desired body type (body ideal) by drawing over their printed body image. After indicating their body shape preference, participants filled out the post-BESAA. After everyone completed their packet, the packets were collected. This procedure took approximately 15 minutes to complete for each participant. They were thanked for their time. Participants were asked if there are any questions, which were answered. Finally, both groups were verbally debriefed together.

CHAPTER THREE: RESULTS

Descriptive Statistics

Table 1 shows the means and standard deviations for pre BESAA and post BESAA in the somatomorphic matrix group as well as the body scan group. The sample reported somewhat lower means of body esteem for each subscale and for each total compared to published norms for this measure (Mendelson, Mendelson, & White (2001).

Table 1 *Descriptive Statistics for Image Type and Time*

	Soma				Scan			
	Pre		Post		Pre		Post	
	M	SD	M	SD	M	SD	M	SD
Appearance	33.73	7.48	33.82	7.04	35.07	8.51	31.77	11.85
Attribution	16.76	3.09	16.64	3.18	17.00	3.35	16.40	4.71
Weight	25.48	8.30	25.36	7.47	26.67	7.33	25.27	9.08
Total (N = 63)	75.97	16.17	75.82	14.71	78.73	17.26	73.43	24.13

Inferential Statistics

Hypothesis 1 stated that participants would report lower ratings of body esteem after seeing the 3D body scan compared to the 2D somatomorphic image. This prediction was not supported. The soma group was slightly higher than the scan group at the post-test assessment, but this difference was not statistically significant ($t(61) = .478$, $p = .634$).

According to Hypothesis 2, I expected that participants would report drops in their body esteem after being presented with a body image, regardless of condition. As expected, participants' total body esteem scores dropped after participating in the protocol regardless of condition ($t(62) = 2.37$, $p = .021$) (see Table 2). The pre-post difference was also significant for the BESAA appearance subscale ($t(62) = 2.42$, $p = .019$). Thus, there was good support for Hypothesis 2.

Table 2 *Descriptive Statistics for Hypothesis 2- BESAA and Time (N = 63)*

	Pre		Post	
	M	SD	M	SD
Appearance	34.37	7.95	32.84	9.61
Attribution	16.87	3.20	16.52	3.95
Weight	26.05	7.81	25.32	8.2
Total	77.29	16.62	74.68	19.64

According to Hypothesis 3, I expected no gender main effect. As expected, there were no gender differences on the body esteem scores for the pre-test ($t(61) = -.892$, $p = .376$) and post-test measures ($t(61) = -1.487$, $p = .142$).

Hypothesis 4 stated that participants' drop in body-esteem from pre to post would be greater for those viewing 3D body scan images compared to 2D somatomorphic images. As predicted, the drop in participants' total body-esteem scores from pre to post was larger for the 3D scan group than for the soma group ($F(61,1) = 5.939$, $p = .018$) (see Table 1). Figure 3 also presents these data to illustrate the nature of the interaction. The BESAA appearance subscale also showed a significant interaction ($F(61,1) = 8.051$, $p = .006$). That interaction took the same

form as depicted in Figure 3 with the total scores. The weight and attribution subscales did not show a significant interaction. Thus, there was good support for Hypothesis 4.

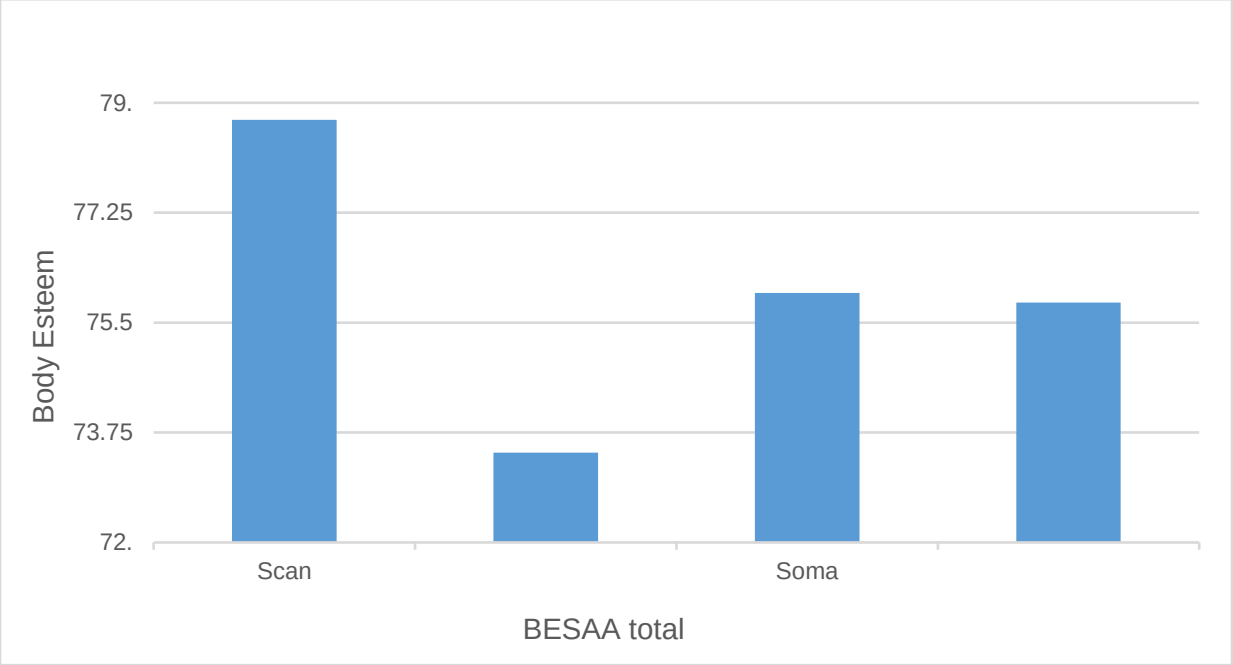

Figure 3. Body Esteem for Image and Time

Hypothesis 5 stated that the 3D body scan image would negatively impact women's body esteem more than men compared to the 2D somatomorphic image. There was no significant interaction between gender and image type ($F(1,59) = .560$, $p = .457$). Thus, there was no support for Hypothesis 5.

According to Hypothesis 6, I expected that women would experience a larger drop in body-esteem scores from pre to post than would men. This prediction was not supported. There was no interaction between time and gender ($F(1,61) = 2.687$, $p = .106$).

Finally, according to Hypothesis 7, I expected a larger drop in body-esteem scores from pre to post for 3D body scan image in women than in men. The predicted 3-way interaction was also not supported ($F(1,59) = 1.197$ $p = .278$). However, there was a trend towards what I predicted. In particular, women's body-esteem scores in the body scan condition compared to the

somatomorphic condition dropped from the pre-test (M = 79.45, SD = 14.44) to post-test (M = 72.71, SD = 21.72), whereas men's scores in the body scan condition compared to the somatomorphic condition stayed fairly the same from pre-test (M = 76.00, SD = 27.53) to post-test (M = 76.33, SD = 34.58).

CHAPTER FOUR: DISCUSSION

There have been no psychological research studies conducted in relation to 3D body scanning and body esteem. This is relatively new technology and has limited examination in psychological research. The present study compared participants' changes in body esteem after being scanned in a three dimensional body scanner or rating one's self on a somatomorphic matrix. The results suggested that being presented with and analyzing one's body through a somatomorphic matrix or a 3D representation of one's body will negatively impact one's body esteem. Also, the body scan group was more dissatisfied with their overall body esteem and appearance than the soma group from post-test than the pre-test.

There was no support for hypothesis 1, that participants responded more negatively after seeing the 3D scan compared to the 2D image. Although the somatomorphic group's body esteem was higher than the 3D body scan group, there was not enough difference among the groups. Since there was a trend but no significance, it could be due to a small sample size. If there had been more participants, there may have been enough power to see significant differences among the groups.

I found support for hypothesis 2, that the participants' post-test scores indicated they were more dissatisfied with their overall body esteem than at the pre-test regardless of condition. Therefore, merely seeking and thinking about one's body and how much it deviates from their ideal had a negative effect on how participants feel about their body. Even though the somatomorphic matrix group may not be presented with their bodies like the body scan group, they still thought about their current body and ideal body shape which is also hypothesized to lower body esteem from pre to post. Brown and Graham, (2008) and Murray and Touyz, (2012)

showed that negative consequences can stem from the differences between one's perception of one's body characteristics and one's ideal body characteristics. If one's ideal masculinity or femininity and physical characteristics are not close to their actual masculinity or femininity and physical characteristics, it may lead to negative psychological consequences such as low self-esteem, giving up efforts toward changing body mass and reducing physical activity, or engaging in activities aimed at achieving desired body shape (Lubans & Cliff, 2011). Body ideal may include the thin ideal internalization for girls or muscular ideal for boys. Girls experience body dissatisfaction in relation to increasing weight, whereas boys show body dissatisfaction for being either overweight or underweight, and usually see themselves as thinner and less muscular than they really are (Eidsdottir, et al, 2013; McCreary and Sasse, 2000). The body scanner shows features of an individual's body that are not normally seen in a mirror or everyday life, such as the angles of the body, or the body represented in a mesh grid outline that was presented in the printout given to the participants. Therefore, these body scan print outs may result in lowering body esteem.

I did not find support for hypothesis 3, that that women and men differ in their body esteem scores, ignoring any pre/post and image type effects. However, it was predicted that there would be no reason for men and women to have different levels of body esteem before analyzing their bodies. This actually helps support my other hypotheses because this shows that the change in body esteem are due to the manipulation of the experiment and not due to external factors.

I found support for hypothesis 4, that the body scan group would score lower and see larger differences in body esteem than the somatomorphic matrix group. Namely, the body scan image negatively affects overall body esteem and appearance body esteem. This effect may be exhibited because the somatomorphic matrix group would only have to think about their body

shape instead of being presented with a visual representation of their actual body dimensions. The body scan group saw their actual body features and thought of how to change their current body shape, rather than just thinking about their body shape and analyzing body diagrams.

Participants in the somatomorphic matrix condition may think that they are thinner than they actually are, or pick a body type that is not a good representation of their actual body type, and will not have to face actual body features that they are dissatisfied with. Also, individuals may not think of the qualities that they are dissatisfied with when analyzing these body types on the somatomorphic matrix. The lack of detail in the somatomorphic matrix in turn will not impact body esteem as much as the body scan group. Svaldi, Zimmer, and Naumann (2012) showed that participants with low self-esteem showed more attention to those body parts they were dissatisfied with than did those with higher self-esteem. The participants who scored higher on self-esteem were likely to attend more to the body parts they were satisfied with. The dissatisfied body parts are more likely to show up in the body scan group, but not in the somatomorphic matrix group, and, therefore, having a greater impact on body esteem scores in the body scan group, rather than the somatomorphic matrix group.

I found no support for hypothesis 5, which states that the effect of image type on body esteem will be greater for women than men. This was likely due to not having a large enough sample size to see gender differences. There were only 14 males compared to the 49 females in this study. Although there were more female than male participants, the sample size would need to include more males as well as females in order to analyze gender differences in body esteem. I also did not find support for hypothesis 6 which states that the pre/post effect will be greater for women than men. This was also likely due to the same issues in hypothesis 5. By not having a large enough sample size, there is no way to analyze gender differences.

There was no support for hypothesis 7 that, larger 3D pre/post effect will be magnified with female participants compared to male participants. Although there was a small sample size, there was a trend in what I predicted. The means of the somatormophic group practically stayed the same from pre to post for males and females. However, the 3D body scan group reported lower esteem on the post-test than the pre-test for females compared to males. This was predicted because the 3D representation of one's body is more accurate and therefore people may focus on the parts of their body they are dissatisfied with. However, women have stronger internalizations of beauty compared to men, and therefore would impact body esteem much more.

Despite the previous literature and findings, research on 3D body scanning is still a new concept and there is little to no research on this topic. The effects of a 3D body scanner could be potentially negative and need to be assessed in order to prevent negative consequences to future participants in 3D body scanning research. In summary, the results of this study could give insight to 3D body scanning and improve situations that involve 3D body scanning.

Limitations and Future Implications

One limitation in my study was that the sample size was small and in that small sample, there were over three times as many women than men. This difference in gender sample size might account for the lack of significant results. Also, there were many people who have been body scanned before as part of a class project from previous semesters. This exposure could allow one's body esteem to not be impacted as heavily.

Another limitation was that there are always individual differences among sample sizes. Participants in the somatomorphic matrix group may have inaccurately rated themselves as having a more desirable current body type than they actually have. This may not have had as much of an impact on body esteem when participants compare their inaccurate current body type

to their ideal body type. To address this concern for future research, one could compare their current body type in the somatomorphic matrix, and compare it to their 3D body scan. Another way to eliminate this is to have someone else also rate their current body type.

Implications for future research should include more variables such as ethnicity, sexuality, gender identity, and narcissism, to access exactly which individuals have lowered body esteem since there is virtually no research related to 3D body scanning effects on self-perceptions.

Also future research should speculate different experimental psychological research designs to include 3D body scanning into psychological research. For example, having participants manipulate their 3D image in order to compare to their actual body image or choose among different targets the one that they think is closest to their actual scan. This could give a more precise measure of how far one's current body type deviates from their ideal body type. Another potential design could include looking at one's body scanned image from multiple angles and indicating their body esteem. This would skew one's perception of their body because people normally view their body in a frontal view in the mirror with little exposure to how one's body looks from angles not normally viewed by individuals. Engaging in a more extended viewing of one's actual body shape should have demonstrable effects on the person's body esteem. Future research is open to investigating many different variables related to 3D body scanning, including body esteem since 3D body scanning literature is so limited. If further research is conducted using 3D body scanning, new uses, perhaps in fitness, body esteem, or other psychology studies, could be discovered.

Conclusion

Viewing a 3D body scanned image does have an effect on overall body esteem and appearance compared to a 2D image. The weight and attribution subscales did not impact body esteem as did the overall body esteem and appearance subscale. This is likely due to analyzing one's appearance in the study through 3D body scans and somatormorphic matrices, and not what others think about them or their weight. Although weight and attribution are also factors that likely impact body esteem, this study did not provoke these thoughts when analyzing one's body in the study. Also being presented with a somatomorphic matrix or their body scanned image allows participants to analyze and indicate which qualities they do not like resulting in lower body esteem. Rating current and ideal body type on a somatomorphic matrix does not appear to affect changes in body esteem over time. People conducting and using 3D body scanners should acknowledge the fact that there are potential psychological risks when viewing their scanned body image. Also, because there are a wide variety of uses and because this technology is new, there is practically no limits to what kinds of studies could be designed around 3D body scanning technology. New research could lead to a new area of study in psychological research as well as other areas of academia in order to facilitate people's appearance. The fact that people can see a 3D representation of their body instead of a 2D can impact the awareness and perception of one's body by seeing angles that are not normally seen in the mirror but can be seen by other people. The use of 3D body scanners in this way could be used to gain more body esteem when using it for exercising or dieting purposes in order to see exactly where they have improved on the body parts one may be dissatisfied with instead of simply using 2D pictures or a traditional weighing scale. Therefore, these methods of use could be enlightening not only in research but also used as a tool to improve one's body esteem.

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APPENDICES

APPENDIX A

PARTICIPATION CONSENT FORM

Informed Consent

Middle Tennessee State University

Project Title: The Effects of 3D Body Scanner Images and Somatomorphic Images on Perception

Purpose of Project: Comparing the two body type diagrams (scanner vs somatomorphic scale) in how they affect body esteem. This study will asssess if the more detailed grid-based body scanner image changes self-image more/less than the somatomorphic scale.

Procedures: After completing a consent form, participants will be asked to take a standard psychological survey about body self-esteem to measure body esteem. Participants will be prepared by being asked ahead of time by the instructor to wear their own form fitting street clothes on the day scanning will take place, and will be body-scanned with a [TC]2 NX 16 scanner. It will take about 30 seconds to take the scan. While scanning, a computer-generated female voice will instruct the participant when the body scanning is starting and to stand in a relxed pose with arms beside hips. Following completion of the body scan, each participant will recieve their own body scanned image printed on a piece of paper. There is no personal identifying information on this paper and no recordings are kept electronicallly. Participants will then be asked to draw on the diagram to indicate their desired body type (body ideal). After indicating their body shape preference, participants will then asked the body esteem survey again. They will be thanked for their participation, ask if they have any questions, answer those if any, and escort them out of the room.

A control group will not be scanned. Participants will be presented with a consent form. After signing the consent form, the participants will be asked a questionnaire to measure body esteem, just like the scan group. Participants will then be presented with a standard somatomorphic diagram with different body types and will be asked to indicate which body type is closest to their current body type, and to indicate their desired body type (body ideal). Participants will then be asked the body esteem questionnaire again and then will be debreifed. This procedure should only take approximately 15 minutes to complete for each participant. They will be thanked for their participation, ask if they have any questions, answer those if any, and escort them out of the room.

Risks/Benefits: The potential benefits to science and humankind that may result from this study are to help psychologists and individuals understand the effects of a 3D body scanner and the resulting perception of an individual after being exposed to these images. There is little to no information on 3D body scanning and thus could provide insight to 3D body scanner literature leading to more research in this area. Participation is no more risk than getting scanned in a body scanner required by TSA at the airport. There is minimal risk in this research study.

Confidentiality: All efforts, within reason, will be made to keep the personal information in your research record private but total privacy cannot be promised. Your information may be shared with MTSU or the government, such as the Middle Tennessee State University Institutional Review Board, Federal Government Office for Human Research Protections, or representatives from the Tennessee department of education, or if you or someone else is in danger or if we are required to do so by law.

Principal Investigator/ Contact Information: Hayden LaFever 931-529-1745 or hal2x@mtmail.mtsu.edu. If needed contact Dr. Kendrick 615-898-2134 or psyskip@mtsu.edu

Participating in this project is voluntary, and refusal to participate or withdrawing from participation at any time during the project will involve no penalty or loss of benefits to which you might otherwise be entitled. All efforts, within reason, will be made to keep the personal information in your research record private but total privacy cannot be promised, for example, your information may be shared with the Middle Tennessee State University Institutional Review Board. In the event of questions or difficulties of any kind during or following participation, you may contact the Principal Investigator as indicated above. For additional information about giving consent or your rights as a participant in this study, please feel free to contact the MTSU Office of Compliance at (615) 494-8918.

APPENDIX B

RESEARCH SCRIPT

Give consent form.

Thank you for participating in my study. In order to participate you will need tight fitting clothes. The survey will contain items that assess feelings and perception of body image. You will be randomly assigned to get a 3D body scan of your body or fill out a somatomorphic matrix.

One of the consent forms is for you to keep and one is for me. Please be sure to give me a signed copy.

Distribute the somatomorphic matrix and body scan packets randomly among the class.

Everyone will need to go ahead and fill out the first questionnaire.

Wait until everyone is finished

Once you get to the page that says "place body image here" and you will need to come to room 205 (in the LRC) to be body scanned.

Body scanner instructions:

"If your hair is longer than the base of their neck, you will need to put it up. The scanner needs to see a clean neck to get accurate measurements."

"When you are ready to be scanned, step into the scanner."

Make sure the curtain is closed.

"It will take about 30 seconds to take the scan. While scanning, a lady's voice will be instructing you about what is happening."

When the scan is over, we will ask the participant to wait to make sure the scan is good.

Print body scanned image and give to participant and ask them to go back to the classroom.

"This is for you to write on. With a pencil or pen, draw on top of the body scanned image to indicate your ideal body type, or indicate your current body type and draw over the selected image to indicate your ideal body type and answer the last questionnaire"

Debriefing

Thank you for participating in my study. The survey you completed contains items that assess feelings and perception of body imaging through a 3D scanner or somatomorphic matrix. Body shaming has been a problem in the past, but now people have come to realize that the diversity of body shapes is what makes everyone unique individuals.

Your responses to these survey items will be kept confidential. Researchers will be instructed to store data files containing this information in a secure location. If you have any questions about the nature of this study now or for any reason at all at a later point, contact Hayden LaFever hal2x@mtmail.mtsu.edu

APPENDIX C

INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

IRB
INSTITUTIONAL REVIEW BOARD
Office of Research Compliance,
010A Sam Ingram Building,
2269 Middle Tennessee Blvd
Murfreesboro, TN 37129

MIDDLE TENNESSEE STATE UNIVERSITY

IRBN007 – EXEMPTION DETERMINATION NOTICE

Tuesday, March 15, 2016

Investigator(s): Hayden LaFever (PI) and Skip Kendrick (FA)
Investigator(s') Email(s): *hal2x@mtmail.mtsu.edu; skip.kendrick@mtsu.edu*
Department: Psychology

Study Title: ***The effects of 3D body scanner images and somatomorphic images on self esteem***
Protocol ID: **16-1178**

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXEMPT** review mechanism under 45 CFR 46.101(b)(2) within the research category *(2) Educational Tests* A summary of the IRB action and other particulars in regard to this protocol application is tabulated as shown below:

IRB Action	EXEMPT from furhter IRB review***	
Date of expiration	NOT APPLICABLE	
Participant Size	50 (FIFTY)	
Participant Pool	**MTSU Students (adult)**	
Mandatory Restrictions	Informed consent and administer debriefing statement	
Additional Restrictions	NONE	
Comments	NONE	
Amendments	**Date** 3/15/2016	**Post-Approval Amendments** NONE

***This exemption determination only allows above defined protocol from further IRB review such as continuing review. However, the following post-approval requirements still apply:

- Addition/removal of subject population should not be implemented without IRB approval
- Change in investigators must be notified and approved
- Modifications to procedures must be clearly articulated in an addendum request and the proposed changes must not be incorporated without an approval
- Be advised that the proposed change must comply within the requirements for exemption
- Changes to the research location must be approved – appropriate permission letter(s) from external institutions must accompany the addendum request form
- Changes to funding source must be notified via email (irb_submissions@mtsu.edu)
- The exemption does not expire as long as the protocol is in good standing
- Project completion must be reported via email (irb_submissions@mtsu.edu)

- Research-related injuries to the participants and other events must be reported within 48 hours of such events to compliance@mtsu.edu

The current MTSU IRB policies allow the investigators to make the following types of changes to this protocol without the need to report to the Office of Compliance, as long as the proposed changes do not result in the cancellation of the protocols eligibility for exemption:

- Editorial and minor administrative revisions to the consent form or other study documents
- Increasing/decreasing the participant size

The investigator(s) indicated in this notification should read and abide by all applicable post-approval conditions imposed with this approval. Refer to the post-approval guidelines posted in the MTSU IRB's website. Any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918 within 48 hours of the incident.

All of the research-related records, which include signed consent forms, current & past investigator information, training certificates, survey instruments and other documents related to the study, must be retained by the PI or the faculty advisor (if the PI is a student) at the sacure location mentioned in the protocol application. The data storage must be maintained for at least three (3) years after study completion. Subsequently, the researcher may destroy the data in a manner that maintains confidentiality and anonymity. IRB reserves the right to modify, change or cancel the terms of this letter without prior notice. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board
Middle Tennessee State University

Quick Links:

Click here for a detailed list of the post-approval responsibilities.
More information on exmpt procedures can be found here.