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# COMPARISON OF TWO BODY WEIGHT SCREENINGS OF SELF-CONSCIOUS EMOTIONS AND COPING

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# ABSTRACT

Novel technologies are currently being utilized in fitness and clinical settings. However, there is not much research to examine the emotional responses to such screenings.

PURPOSE: To examine the group differences between the FIT3D and DXA protocol on emotional responses and the differences between weight classifications.

METHODS: The Body and Appearance-related Self-conscious Emotions Scale and WEIGHTCOPE were used to assess self-conscious emotions and intention to utilize 10 different weight-related coping strategies following the scans. Motivation was measured by a 10-point Likert scale measuring motivation pre and post scans.

RESULTS: There were no differences in motivation, affective response, or intention to cope between the FIT3D and DXA groups. However, participants self-reported higher motivation to lose weight. Coping responses did differ between BMI classifications.

CONCLUSIONS: Health care providers can utilize these individual differences to aid in their clients and patients health journey.

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# INTRODUCTION

As we know, obesity is an epidemic in today's society resulting in many health problems, some even chronic: such as, coronary heart disease, type 2 diabetes mellitus, various types of cancers, gallstones, and disabilities (Moyer, 2012). Accordingly, weight loss, diet and exercise can prevent and treat many of these diseases (Lee et al., 2012; Moyer, 2012; Taylor et al., 2004; Thomson, et.al, 2014). Unfortunately, more than an estimated one-third of Americans, or 78.6 million, are classified as obese (Ogden, Carroll, Kit, & Flegal, 2014), less than half of adults (48%) meet physical activity recommendations (CDC, 2014), and in 2010, 13.1% and 8.9% did not meet the fruit and vegetable intake recommendations, respectively (Moore, 2015). These findings encourage a better understanding of motivational aspects of weight control efforts.

## Weight Screenings

Screening for overweight and obesity have been endorsed as an important strategy for weight management (Moyer, 2012), with the anticipation that such screenings will increase awareness and trigger motivation to create healthy lifestyle changes (e.g. increased physical activity, healthier diet).

Accordingly, the majority (83%) of participants who have lost and maintained at least 10% of their weight for more than one year have reported a trigger to

inspire weight loss. Those triggers consist of medical triggers (i.e. being told by a doctor to lose weight), reaching an all-time high in weight, and seeing a picture or reflection of themselves compared to those who reported having no triggering event who did not lose as much nor kept the weight off (Wing, & Phelan, 2005). Thus, medical and fitness settings are aimed at capitalizing on the proposed motivation that can come from such screenings, however little is known about the complexities and variation in responses to such screenings (e.g. Faries, Espie, Gnagy, & McMorries, 2015).

## Dissatisfaction and Emotional Responses

Self-perceived body image, or the interpersonal representation of a person's outer appearance (Thompson, Heinberg, Altabe, Tantleff-Dunn, 1999), can provide insight into the variation seen in responses to common weight- or body-related screenings, especially in women. First, many women, even those who are normal weight, not only view themselves heavier than they actually are, but they also desire a smaller figure than they currently have (Millstein et al., 2008). Also, women having a higher BMI were significantly associated with body

dissatisfaction and their desire to lose weight to meet their ideal body (Millstein et al., 2008; Heywood & McCabe, 2006). There are three different dimensions of body dissatisfaction (weight/shape, muscle, and body parts), and women who portrayed at least one of these indications subsequently had motivation to lose weight (Heywood & McCabe, 2006).

Weight and body-fat testing have also been shown to produce an increase in general, negative affective responses and decrease in positive affective responses, especially in those who were told they were above desired ranges for body fat (Faries, Boroff, Stults-Kolehmainen, & Bartholomew, 2011). Ogden and Evans (1996) used fictional height-weight charts, and found those allocated to the overweight group experienced an increase in depression and decrease in self-esteem, while those allocated to the normal weight group reported improvements in these measures. It is then possible that weight- or body-related screenings could impact feelings of dissatisfaction, along with other affective responses.

## Body-related Self-conscious Emotions

Of particular interest here are body-related self-conscious emotions, which refer to self-conscious emotions (i.e. shame, guilt, pride) that can be evoked with awareness or self-evaluation of one's body or appearance (Castonguay, Sabiston, Crocker, & Mack, 2014; Tangney & Tracy, 2012). Body-related shame

refers to those who experience painful emotions due to them failing to meet social standards (Castonguay, Brunet, Ferguson, & Sabiston, 2012), for example, feeling shame because that individual is overweight. Body-related guilt refers to a negative emotion that stems from regret over a particular behavior (Castonguay, Brunet, Ferguson, & Sabiston, 2012), the individual may feel guilty for eating too much pie over the holiday break and gaining weight. Shame regarding one's weight has been shown to be a significant negative predictor of problem-focused engagement coping, while weight-related guilt, was a significant positive predictor (Conradt et al., 2008). In addition, shame, but not guilt, appears to mediate the relationship between one's body weight and their self-esteem, indicating that experiencing such emotions due to one's body weight has important implications on one's self-esteem (Pila et al., 2015). Although, both shame and guilt appear to increase as one's discrepancy between actual and ideal weight increases (Castonguay, Brunet, Ferguson, & Sabiston, 2012). Thus, it is feasible to consider that body-related shame and guilt could occur in response to weight screenings and associated discrepancy awareness, in addition to having differential effects on motivation, coping, and behavioral responses.

Pride refers to a positive feeling or emotion resulting from a person engaging in socially valued behaviors (Castonguay et al., 2014). For example, an individual considering one's self as an 'exerciser" because they have lost weight

in the past or go to the gym regularly. Also, pride appears to decrease as one's perceived discrepancy between their actual and ideal weight increases (Castonguay et al., 2012). However, both authentic and hubristic pride could occur in relation to awareness of one's body (Castonguay et al., 2014). Body-related authentic pride reflects specific, controllable achievements and behavior, such as being satisfied with eating healthy to maintain one's weight. Body-related hubristic pride reflects uncontrollable and global aspects of self that express grandiosity and superiority to others, such as believing oneself has a "great body". Both authentic and hubristic pride should be considered when examining responses to weight related testing's due to the coping responses that could stem from the previous emotions.

## Coping Responses

Thus, weight- and body-related testing can act as a stressor, leading to efforts to cope with the emotional responses and perceived discrepancy in one's view of her body. For example, Faries and Bartholomew (2015) created a 38-item measure with 10 of the following coping responses from women: Physical Activity, Healthy Eating, Suppressed Eating, Supplement Use, Self-Regulation, Camouflage, Positive Reframing, Comfort Foods, and Social Support (via WEIGHTCOPE). With the WEIGHTCOPE, Faries and Bartholomew (2015) found that these 10 coping responses can either help 'deal with' the perceived problem

or weight (problem-focused coping) or the emotions (emotion-focused coping). In other words, since there are multitudes of ways to cope, this might or might not include healthy behaviors or perceptions. Physical activity, healthy eating and positive reframing are behaviors that health care providers and fitness professionals should be encouraging in their patients. Yet, some of these coping behaviors such as disengagement, avoidance, camouflaging, supplement use, cut intake, and comfort foods could be considered not so healthy coping strategies that fitness professionals would not want their clients to use. With this model health care professionals can help intervene on those clients based on the coping strategy they relate too encouraging other healthy behaviors.

Exercise has been found to positively associate with body dissatisfaction (BD) and the motivation to improve muscle toning, while also being used as a strategy to also lose weight (McDonald & Thompson, 1992). In addition, women living in westernized societies might feel pressured to uphold an ideal physique that includes being attractive, thin, and having muscle tone (Grogan, 2008), which can lead to motivation to uphold these standards. Thus, such pressure could motivate women to utilize other weight loss and control methods other than exercise or healthy eating. For example, previous research has found that women utilize dieting and dietary restraint methods to lose weight as well (Heywood & McCabe, 2006). From a motivational standpoint, individual variation in avoidance (i.e. withdrawal or disengage from a stimulus) versus approach (i.e.

engaging in a stimulus) motivational states has also been found to occur following common weight-related testing (Faries, Kephart & Jones, 2014). Thus, experiences with weight-related triggers are complex (Faries, Espie, Gnagy & McMorries, 2015), and requires further research to elucidate the responses and coping to such triggering events.

## Screening Technology

Screening technology has moved beyond common body weight testing, to other methods that produce visual imagery to hopefully assist in the triggering experience. Dual-energy x-ray absorptiometry (DXA) has been previously used, and provides an x-ray image of one's soft tissue (Figure 1). However, even though the body fat screening experience can produce negative affective responses, previous research has found no differences in responses between participants who saw their soft tissue image and those who did not see their image (Faries, Boroff, Stults-Kolehmaine, Bartholomew, 2011). In other words, it appears that the negative affective response came from finding out one's specific body fat level, alongside a weight classification, rather than seeing the image. Perhaps, because DXA images are an x-ray image and not a common image that a woman would see in everyday life. Thus, it is possible that greater differences could be found with real-life images as standards for comparison.

For example, fitspiration is an online trend that is designed to inspire women to take on healthier lifestyles through exercise and healthy food imagery. Tiggerman and Zaccardo (2015) investigated the effect of fitspiration images on women's body image, and found that acute exposures to these images increased negative mood and body dissatisfaction yet had a positive effect on inspiration to pursue healthy goals. These results suggest a complex relationship between body-related triggering events, perceived dissatisfaction, and subsequent motivation for health behavior.

Despite the limited research on individual responses to such testing, alongside how such screenings can act to trigger positive behavior change, the advancement of relevant technology continues to grow – especially the technology that provides images of the individual patients. Of interest here is the Fit3D Proscanner (FIT3D), which produces a three-dimensional body image for the client or patient to observe (Figure 1), complete with circumference measurements. This innovative technology makes it easy to bring in participants or clientele to be scanned for weight loss screening and tracking, thus is becoming popular in medical and fitness environments.

Despite the potential of providing visual feedback of one's own body image, little research has been conducted to determine potential influences on emotional and coping responses, especially in comparison to the more commonly prescribed DXA technology (image + body composition feedback).

Therefore, the importance of knowing how our clients respond to weight screenings can help health care providers intervene on those who are currently obese, as well as help prevent patients who are currently overweight or normal weight from becoming obese. In addition, practitioners can better recognize triggers in their clientele, how they respond or cope, and how they can help lead them towards a healthy and safe lifestyle change. Thus, the purpose of this study was to examine emotional, motivation, and weight coping responses between the DXA imaging and protocol and the FIT3D images within a sample of adult women.

# METHODS

## Participants

Sixty-eight adult (≥ 18 years of age) women of many ethnicities, and of various weight classifications, including normal weight (NW; *n* = 31; BMI <25), overweight/obese (OWOB; *n* = 37; BMI >25.1) classifications were recruited for this study. For both groups, participants were recruited from the student recreational center, kinesiology classes, and psychology classes. The in-person recruitment presentation was an overview of the study, and what was going to be required upon participation. Exclusion criteria included < 18 years of age, women who were pregnant, and those who have been previously scanned by the FIT3D or DXA. No women were excluded. After containing consent, we examined 68 women, ages 19 to 27 years old (21.28 ± 1.97 years) with a BMI of (25.95 ± 5.30kg/m$^2$), and a body fat percentage (BF%) of (.34 ± .07%). Participant descriptives are shown in Table 1.

## Instruments

### Affective responses

Affective responses was measured by the 10-item positive affect negative affect schedule (PANAS; Watson, Clark, & Tellegen, 1988). Five items assess positive affects (PA) and negative affects (NA), respectively, on a 1 (very slightly

or not at all) to 5 (extremely) Likert-type scale. Participants were asked to rate their feelings at that particular moment in time.

Self-conscious emotions

Self-conscious emotions was measured by using the 15-item body and appearance-related self-conscious emotions scale (BASES, Castonguay et al., 2014), which assesses shame (e.g. I have felt ashamed of the way I look), guilt (e.g. I have felt guilty that I do not do enough to improve my appearance), authentic pride (e.g. I have felt proud of the effort I place on maintaining my appearance), and hubristic pride (e.g. I have felt proud that I am more attractive than others). Following each respective DXA or FIT3D scan, participants were asked to indicate how often they experienced the 15 different statements on a 5-point scale (*1 = never, 2 = rarely, 3 = occasionally, 4 = frequently, 5 = always*). Average scores of shame, guilt, authentic pride, and hubristic pride were calculated and analyzed.

Motivation

Three separate items were used to assess motivation. All participants were asked how motivated they are to lose weight, lose fat, and maintain weight/fat in the next 6 months on a 10-point Likert-type scale. The Likert scale ranged from 1 (not motivated at all) to 10 (completely motivated) (Befort et al., 2006).

Coping responses

Coping responses were measured by the 38-item, 10-factor WEIGHTCOPE measure (Faries & Bartholomew, 2015), which assesses 10 different coping factors in women following a weight- or body fat-related discrepancy or triggering situation. For this study, participants were asked on their intention to cope in various ways following their body-related scan. Physical Activity (e.g. turn to exercise or physical activity) refers to coping by increasing one's physical activity level. Healthy Eating (e.g. limit eating sweet, high-fat foods) refers to coping through healthier eating and food choices. Suppressed Eating (e.g. eat less than you probably should) describes coping by suppressing and decreasing food intake in an unhealthy manner. Supplement Use (e.g. use weight loss supplements) describes coping through use of weight loss supplements or medication to aid in food cravings and weight loss. Self-Regulation (e.g. make a plan of action to lose weight) describes coping by monitoring, strategizing or planning to regulate behaviors. Camouflage (e.g. use clothing to help hide weight from others) describes coping by making efforts to hide or disguise one's weight through the use of clothing. Positive Reframing (e.g. look for something good in what is happening) describes coping by seeing the situation in a positive light, to maintain positive views of oneself. Comfort Food (e.g. eats to help yourself feel better) describes coping by emotional-focused coping by consumption of palatable snack foods. Disengagement (e.g. give up trying to deal with your weight) describes coping by avoiding efforts to

lose weight. Finally, Social Support (e.g. seek emotional support from others) describes coping by seeking emotional/venting reason from others about weight. Average scores for each factor were utilized for all analyses.

## Design

All design and procedures were reviewed by the Institutional Review Board before data collection begins. Participants were asked to attend a single, 30-minute session across two private, adjacent labs. In a between-subjects design, participants were randomly assigned to receive prescribed feedback from either the FIT3D (image only, *n* = 32) or DXA (image, BMI, weight classification, lean mass in pounds, and fat mass in pounds, *n* = 32), although both were assessed in all participants. Both groups were asked to complete pre- and/or post-scan measures of affect, and post measures of body-related self-conscious emotions, motivation to lose weight/fat or to maintain weight/fat, and variation in coping intentions.

## Procedures

Following informed consent, self-reported measures were assessed in the following order: PA, NA, motivation to lose weight, lose fat and to maintain weight/fat, age, ethnicity, pregnancy status, and relationship status. Participants were then asked to change into an outfit that is conducive to the manufacturer

suggestion for use of the FIT3D. Specifically, clothing that fits snuggly to the body provides the best image, such as a pair of spandex athletic shorts and a wireless sport bra. Participants could have used the clothes they have brought, or can use athletic, spandex shorts provided by the researchers. Each participant was given a private, locked room to change clothes in.

Once changed, body weight (lbs) was measured on a calibrated balance scale, and height (in) was measured on a stadiometer. Body mass index (BMI) was calculated from these two measurements. Next, participants were provided instructions regarding the DXA scan, and helped to lie supine on the scanner bed. The researcher then adjusted the participant according to the DXA recommended positioning before starting the scan. Once positioned correctly the researcher started the scan, which took approximately 6-7 minutes. When the scan was finished the participant was instructed to remain in place, until the ranges of interests (ROIs) were adjusted as recommendation by manufacturer instructions.

After the participant has been scanned by the DXA, participants were given a robe to cover up, while relocating to the FIT3D lab. They then were given instructions on how to correctly get positioned on the Fit3D including, hair up in a bun, foot positioning, handle gripping, and to stand with tall posture. When ready, the participant pressed both buttons on the handles at the same time and held them down during the 45-second scan. When finished, with the FIT3D scan the

participant was able to go back into the locked room to change into their original clothing. During this time, the FIT3D takes approximately 3-5 minutes to process the scan results, and provide the body image.

DXA group

At this time, those assigned to the DXA group were provided with their results, including their x-ray image scan, BMI, weight classification, total body mass (lbs), total body fat percentage (BF%), total body fat mass (lbs), total body lean mass (lbs). Participants were then provided 1-minute to examine these results. Following this 1-minute period, participants were re-assessed on self-reported PA, NA, and motivation to lose weight, to lose fat, and to maintain weight/fat. They also were asked to complete the BASES for current self-conscious emotional state, and the WEIGHTCOPE measure to clarify their intent to cope in various ways.

FIT3D group

Those assigned to the FIT3D Proscanner group were then provided with their three-dimensional image, providing the participants 1-minute to examine their image with access to use the rotational accessory on the computer. Following this 1-minute period, participants were re-assessed on self-reported PA, NA, and motivation to lose weight, lose fat, and maintain weight/fat. They were also asked to complete the BASES for current self-conscious emotional state, and the WEIGHTCOPE measure to clarify their intent to cope in various

ways. During all of these measures the participants were allowed to refer back for their image if needed while completing the measures.

Upon completion of all scans and measures each participant was debriefed of the study, and was free to consult with the researcher about any questions or concerns.

## Research Questions and Statistical Analysis

RQ1. How does the FIT3D screening compare to the standard screening of DXA analysis, in regards to emotional responses (PA, NA, and self-conscious emotions [guilt, shame, pride])?

RQ2. How does the FIT3D screening compare to the standard screening of DXA analysis, in regards to motivation to lose weight, lose fat, and maintain weight?

RQ3. How does the FIT3D screening compare to the standard screening of DXA analysis, in regards to variation in coping responses?

RQ4. Do the responses in question s #1-3 differ between weight classifications?

Independent Variables

1. Screening Group
    - FIT3D Proscanner
    - DXA Scan
2. Weight Classifications

- Normal weight (NW): BMI > 25 kg/$m^2$, *n* = 31
- Overweight/obese (OWOB): BMI < 25.1 kg/$m^2$, *n*= 37

Dependent Variables

1. PA, NA (via PANAS)
2. Body-related self-conscious emotions: authentic pride, hubristic pride, guilt, shame (via BASES)
3. Motivation to lose weight, lose fat, and to maintain weight within the next 6 months
4. Coping responses: Physical Activity, Healthy Eating, Cut Intake, Supplement Use, Self-Regulation, Camouflage, Positive Reframing, Comfort Foods, Social Support (via WEIGHTCOPE)

## Hypotheses

H1: There will be a difference in affective response (PA, NA) and self-conscious emotions between those receiving the DXA scan versus the FIT3D.

H2: Motivation to lose weight, lose fat, and to maintain weight within the next 6 months

Between those receiving the DXA scan versus the FIT3D.

H3: There will be a difference in coping responses: Physical Activity, Healthy Eating, Cut Intake, Supplement Use, Self-Regulation, Camouflage, Positive Reframing, Comfort Foods, and Social Support (via WEIGHTCOPE) between those receiving the DXA scan versus the FIT3D.

H4: There will be differences in research questions #1-3 among weight classifications (NW versus OW/OB) between those receiving the DXA scan versus the FIT3D.

## Statistical Analysis

Q1/H1: Two repeated-measures factorial ANOVAs will be used to examine if there are group differences in affective responses (PA and NA, respectively) from pre to post. Separate independent t-tests will be used to determine group differences between each of the proposed self-conscious emotions: authentic pride, hubristic pride, guilt, and shame.

Q2/H2: Two repeated-measures factorial ANOVAs will be used to examine if there are group differences in motivational responses to lose weight, lose fat and to maintain weight/fat, from pre to post.

Q3/H3: Separate independent t-tests will be used to examine if there are group differences in each of the following coping responses: Physical Activity, Healthy Eating, Cut Intake, Supplement Use, Self-Regulation, Camouflage, Positive Reframing, Comfort Foods, and Social Support (via WEIGHTCOPE).

Q4/H4: Change scores for PA, NA, and motivation, alongside body-related self-conscious emotions and coping factor scores will be used as dependent variables within separate 2 x 2 (BMI classification by screening group) factorial ANOVA.

# RESULTS

## Positive and Negative Affect

Overall, participants had moderate-high PA (3.41 ± 1.61) and low NA (1.60 ± .64) at the pre-measure (range = 1-5; Table 2). The repeated-measures factorial ANOVA did not reveal a significant main effect of time with change in PA (Wilks' Lambda = .95, $F(1, 66) = 3.46$, $p > .05$, $\eta_p^2 = .05$). Also, there was not a significant interaction between groups and time (Wilks' Lambda = .98, $F(1, 66) = 1.17$, $p > .05$, $\eta_p^2 = .02$) (Table 2). Similarly, with NA, the repeated-measures factorial ANOVA did not reveal a significant main effect of time (Wilks' Lambda = .99, $F(1, 66) = .58$, $p > .05$, $\eta_p^2 = .009$), nor a statistically significant interaction between groups and time (Wilks' Lambda =.99, $F(1, 66) = .09$, $p > .05$, $\eta_p^2 = .001$).

## Body and Appearance-related Self-Conscious Emotions

Overall, participants experienced low-moderate levels of shame, guilt, authentic pride, and hubristic pride, but these emotions did not differ between FIT3D and DXA groups (Table 3). Specifically, separate independent t-tests found no statistically significant mean group differences in shame ($t(66) = .73$, $p$

> .05) guilt (t(66) = 1.85, $p$ > .05), authentic pride (t(66) = -.075, $p$ > .05) and hubristic pride (t(66) = -.057, $p$ > .05).

## Motivation

On average, participants had moderate-high levels of pre-motivation to lose weight and maintain weight, and slightly higher motivation to lose fat (Table 4). Only motivation to lose weight slightly increased from pre to post (6.85 ± 2.72 to 7.55 ± 2.60). Specifically, repeated-measures factorial ANOVA revealed a significant main effect of time on change in motivation to lose weight (Wilks' Lambda =.82 $F$(1, 66) = 14.85, $p$ = .000, $\eta_p^2$ = .184), but no significant interaction between groups (Wilks' Lambda =.999, $F$(1, 66) = .043, $p$ > .05, $\eta_p^2$ = .01). However, there was a significant between-subjects effect (F = 4.14, p < .05), with the DXA group maintaining a higher motivation at both pre- and post-measures. The main effect of time on motivation to lose fat (Wilks' Lambda =.994, $F$(1, 66) = .421, $p$ > .05, $\eta_p^2$ = .006) and interaction between groups (Wilks' Lambda =.980, $F$(1, 66) = 1.35, $p$ > .05, $\eta_p^2$ = .020) were non-significant. Similarly, there was not a significant main effect of time on motivation to maintain weight/fat (Wilks' Lambda =.993, $F$(1, 66) = .437, $p$ > .05, $\eta_p^2$ = .007), nor a significant interaction between groups (Wilks' Lambda =.999, $F$(1, 66) = .056, $p$ > .05, $\eta_p^2$ = .001).

## WEIGHTCOPE

Overall, participants had the highest intention to cope via physical activity, healthy eating, self-regulation, and positive reframing (Table 5). Low to moderate intention was self-reported for all other coping factors. Separate independent t-tests revealed no FIT3D versus DXA group differences in most WEIGHTCOPE factors: Physical activity ($t(66) = -.09$, $p > .05$), cut intake ($t(66) = .90$, $p > .05$), self-regulation ($t(66) = -.44$, $p > .05$), camouflage ($t(66) = .91$, $p > .05$), disengagement ($t(66) = -.65$, $p > .05$), positive reframing ($t(66) = -.71$, $p > .05$), comfort food ($t(66) = -.29$, $p > .05$), and social support ($t(66) = -1.02$, $p > .05$). Healthy eating was one factor to indicate a small, yet statistically significant mean difference between groups ($t(59.8) = .51$, $p = .01$), with the FIT3D group with a slightly higher mean intention (5.88 ± .88) than the DXA group (5.75 ± 1.31). Also, there was another small mean difference in supplement use between groups ($t(60.35) = -1.52$ $p = .03$), with the DXA group there was a slightly higher mean intention to cope with supplement use than the FIT3D group (1.98 ± 1.50 versus 1.51 ± 1.01, respectively).

## Effect of Weight Status

The 2 x 2 (BMI classification by screening group) factorial ANOVAs revealed several main effects of BMI classification on various outcome variables

(Table 6). Concerning body and appearance-related self-conscious emotions, means for shame (Wilks' Lambda = 12.98, $F = 15.98$, $p < .01$, $\eta_p^2 = .20$), guilt (Wilks' Lambda = 9.35, $F = 11.53$, $p < .01$, $\eta_p^2 = .153$), and authentic pride (Wilks' Lambda = 13.45, $F = 21.3$, $p < .01$, $\eta_p^2 = .25$) were significantly different between NW and OW/OB groups.

Concerning coping responses (Table 6), intention for suppressed eating did significantly differ between BMI classifications (Wilks' Lambda = 19.27, $F = 17.17$, $p < .01$, $\eta_p^2 = .21$), as well as intention to engage in supplement use (Wilks' Lambda = 7.49, $F = 4.80$, $p < .05$, $\eta_p^2 = .070$), camouflage (Wilks' Lambda = 22.29, $F = 8.54$, $p < .01$, $\eta_p^2 = .12$), and comfort food (Wilks' Lambda = 6.57, $F = 4.95$, $p < .05$, $\eta_p^2 = .07$).

All other outcome variables, including mean change in PA, change in NA, hubristic pride, motivation to lose weight, motivation to lose fat, motivation to maintain weight/fat, and other coping factors were not significantly different between BMI classifications. No significant interactions of BMI classification and body scan group were found across all outcome variables.

# DISCUSSION

The purpose of the present study was to examine mean differences between affective and motivational responses, alongside differences in body and appearance-related self-conscious emotions (i.e. shame, guilt, pride) and coping responses between women randomly assigned to a DXA body composition or FIT3D Proscanner group. Understanding differences in responses between these two technologies could guide future research and practitioners, whose goal is to motivate positive weight control behaviors.

## Affective Responses

Our first hypothesis of a mean difference in PA and NA between the screening groups was not supported. Specifically, participants held moderate-high PA and low NA at the pre-measure, and there was no significant change from pre to post, overall, or between screening groups. The hypothesis that there could be a change in PA and NA was based on previous research using the DXA scan (Faries, Boroff, Stults-Kolehmainen, & Bartholomew, 2011), who found a statistically significant decrease in PA between participants classified as normal BF% or high BF%, and a significant increase in NA in those classified as high BF% only.

However, even though no significant differences were found, the present results do partially corroborate these previous findings. Specifically, Faries et al., (2011) found a slight, average decrease in PA of -.30 to -.40 units on the 1 to 5 scale. Similarly, participants in the present study classified as OW/OB self-reported a mean decrease in PA of -.32. In addition, change in NA in those classified as OW/OB within the present study (+.16) were similar to Faries and colleagues (2011). The lack of statistical significance could have been due to our utilization of a smaller sample size.

In summary, however, both the DXA and the FIT3D scanning information were not enough to promote a statistically or clinically significant increase in PA or decrease in NA within the present sample. The implications of such findings do not fully support previous endorsement of weight-related screenings for obesity management (Moyer, 2012) and theories of self-regulation (e.g. Carver & Scheier, 2001) that suggest a change in affect should relate to motivation to reduce the perceived weight-related discrepancy. As noted in the limitations (see below), women participating in this study volunteered and many were recruited from the campus recreation center, thus could have held a level of knowledge and/or interest in the testing treatments. Subsequently, the affective responses could have been dampened within the present sample. Future research should strongly consider this issue, while exploring novel ways of assessing weight-related screenings in those who might commonly avoid such screenings or health

care due to weight-related concerns (e.g. Drury, Aramburu, & Louis, 2002). In addition, questions could be formulated to determine why women classified as OW or OB might not have the theorized affective response to such testing.

## Body and Appearance-related Self-Conscious Emotions

Body and appearance-related self-conscious emotions describe emotions (i.e. shame, guilt, pride) that can be evoked with awareness or self-evaluation of one's body or appearance (Castonguay et al., 2014; Tangney & Tracy, 2012). The present study sought to determine if there would be differences in such emotions following either the DXA or FIT3D scan. In summary, we found that participants experienced low-moderate levels of shame, guilt, authentic pride, and hubristic pride. Also, these emotions did not differ between FIT3D and DXA groups. However, individuals classified as OW/OB self-reported more shame and guilt, but less authentic pride than those classified as NW. Similarly, previous research has found body weight discrepancies between actual and ideal BMI were positivity linked to body related shame and guilt (Castonguay et al., 2012). Pila and colleagues (2013) also found that individuals categorized as OW/OB reported more body-related guilt and shame than individuals categorized as NW, supporting our findings of low-moderate levels of shame and guilt in both groups. We also found that BF% was correlated with feelings of shame ($r = .64$, $p < .01$) and guilt ($r = .56$, $p < .01$). Thus, along with our findings, there appears to be

support for the positive relationship between body weight with and shame and guilt.

## Motivation

Following the screening process, results indicated a significant main effect of time intention to lose weight, but not intention to lose fat or maintain weight/fat in the next 6 months. In addition, this change was not different between FIT3D and DXA groups, however there was a difference between subjects effect, where those assigned to the DXA group had higher motivation to lose weight. According to Heywood & McCabe (2006), there are three different dimensions of body dissatisfaction (weight/shape, muscle, and body parts), and women who portrayed at least one of those subsequently had more motivation to lose weight. Our present research could support importance of body dissatisfaction and an increase in motivation to lose weight due to the DXA image presented to that particular group. Also, the DXA group received BMI, weight classification, body fat percentage, lean mass and fat mass, which could have influenced motivation responses. Future researchers could provide results from both the DXA and FIT3D, and examine potential variation in responses.

There were no significant differences in motivation between BMI classifications, with both groups having higher motivation to lose weight post scans, thus not supporting our hypotheses of significant group differences.

“Other research has shown that a higher BMI in women was significantly associated with body dissatisfaction, alongside a desire to lose weight in order to meet an ideal body-” (Heywood & McCabe, 2006; Millstein et al., 2008). Interestingly, the present results do not support these findings, but suggest that women can have a higher BMI, but not be motivated to lose weight. Although we are unable to make a conclusion with the present data, a post-hoc analysis revealed that pride and disengagement coping might be a reason. Specifically, motivation to lose weight was regressed on all variables of interest in a stepwise regression. Only two predictor variables remained, intention to cope through disengagements and authentic pride. Both of these variables held a negative effect on motivation to lose weight ($\beta$ = -.33 and $\beta$ = -.32, respectively), and predicted a statistically significant 23% of variation in motivation ($p < .001$). Thus, it is possible that the potential motivation received from these weight-related screenings were dampened by the pride one held in her weight and appearance efforts, as well as the intention to cope by disengaging from the situation. Of course, these findings are speculative, and not a part of our original hypotheses, thus should be further explored with future research.

## Coping

As seen in Table 5, participants generally reported higher intention (> 5, range = 1 to 7 scale) to cope via more physical activity, healthier eating,

increased self-regulation, and positive reframing. All of these coping responses are considered as more positive and productive forms of weight control coping behaviors (Faries & Bartholomew, 2015). Unable to support our original hypothesis, we found no differences in any coping factor between the FIT3D and DXA groups, except for nominal differences in healthy eating and supplement use. The minimal difference in means of the nature of these coping intentions, most likely supports random variability. However, the intention to cope through suppressed eating, supplement use, camouflage, and comfort food did significantly differ between BMI classifications, regardless of screening group.

Suppressed eating is considered a negative, problem focused coping behavior (Faries & Bartholomew, 2015). In the present study, the OW/OB held higher intentions to use suppressed eating as a coping factor than in the NW group. This coping mechanism is not ideal for patients or clients, in the sense that we do not want those skipping meals, suppressing their hunger, and eating less than they know is right. Yet, previous research supports that such dieting and dietary restraint are used as methods to lose weight in women (Heywood & McCabe, 2006).

Supplement Use, also considered a negative problem focused coping behavior that is not ideal for those who are trying to lose weight in a healthy manner. Higher intentions to use this coping mechanism were found in our overweight/obese groups than our normal weight groups. Supplements are highly

marked and are easily accessible, which makes is easy for those looking for weight loss solutions to result in these “magic pills”. Supplement use is considered using supplements or medication to aid in weight loss or food cravings (Faries & Bartholomew, 2015). Health care providers should encourage some of the other positive, problem solving behaviors such as healthy eating instead of focusing on a quick fix through supplementation.

Participants classified as OW/OB held higher intentions to cope using Camouflage than those in the NW classification, and support previous findings (Faries & Bartholomew, 2015). Camouflage behaviors are seen as efforts to disguise or hide ones weight through the use of clothing. This in support, Faries and Bartholomew (2015) also found positive correlations with camouflage and BMI, body shame and surveillance. There were also negative correlations with camouflage and weight satisfaction and body shape satisfaction. Researchers and health care providers should consider these relationships with future investigations and when designing interventions for patients.

Using Comfort Food is a form emotional-focused coping where this behavior results in consuming snacks to help themselves feel better (Faries and Bartholomew, 2015). We found that those who were classified as NOW had higher intentions to utilize comfort food as a coping mechanism than those who were overweight/obese. These results do not support the findings of Faries and Bartholomew (2015), who found those who were classified as obese had higher

intentions to cope with comfort food than the normal weight participants. However, other research with fit, normal weight participants found comfort food consumption nearly quadrupled following body composition testing (Faries, Kephart, & Jones, 2015). Thus, it is possible that the participants in the present study were more similar to those in the later study, and choose to cope using comfort food. Future research could examine the unique use of comfort food in patients and clients classified as either normal weight or overweight.

## Limitations

Other limitations than those previously mentioned are noted here. First, our sample was relatively small, and thus unable to detect small, yet statistically significant differences – as previously mentioned with change in NA. We had many participants who were classified as OW according to BMI standards (> 25 $kg/m^2$), but could have been athletes, weight lifters, or generally fit individuals. However, our participants, on average, who were classified as OW or OB were also in higher body fat categories (Gallagher et al., 2000), thus although more fit, (and possibly more muscular) women could have been part of this study, in general, our sample would also be classified as 'over fat'. Future research should screen physical activity level or fitness for exclusion criteria or a comparison group, especially since aerobic fitness can moderate the relationship between

body weight and health or mortality risk concerns (Blair & Church, 2004; Loprinzi et al., 2014).

Many participants were recruited from the student recreational center on campus, as well as those from kinesiology classes who either practiced or learned about healthy lifestyle behaviors. As a result there may be specific characteristics of this sample that influenced the present results (e.g. knowledge, interest), as well as limiting generalizability to other populations. The researchers did notice that many participants made more meaningful comments during the testing session that showed an increase effort and motivation, which however, did not align well with their assessment results. Interestingly, the researchers, who also work at the student recreation center, witnessed many participants attend the gym more often, and ask for workout plans – common behavioral outcomes of increased motivation. Thus, there are limitations to the specific measures used in this study. Future research should examine such issues, as well as pursue more inclusive methodologies, such as qualitative methods, to further explore and capture a more vivid role of emotions, feelings, motivation, and coping related to weight- and body-related testing.

## Conclusion

In conclusion, the purpose of this study was to examine the differences between two weight related screenings. The present study found that there were

individual differences in BMI weight classifications for both the FIT3D and DEXA groups. Although a larger sample size in all BMI classifications could elucidate more differences within coping intentions, motivation, as well as self-conscious emotions. Understanding these differences could help health care professionals intervene when necessary and better indorse healthy lifestyle behaviors.

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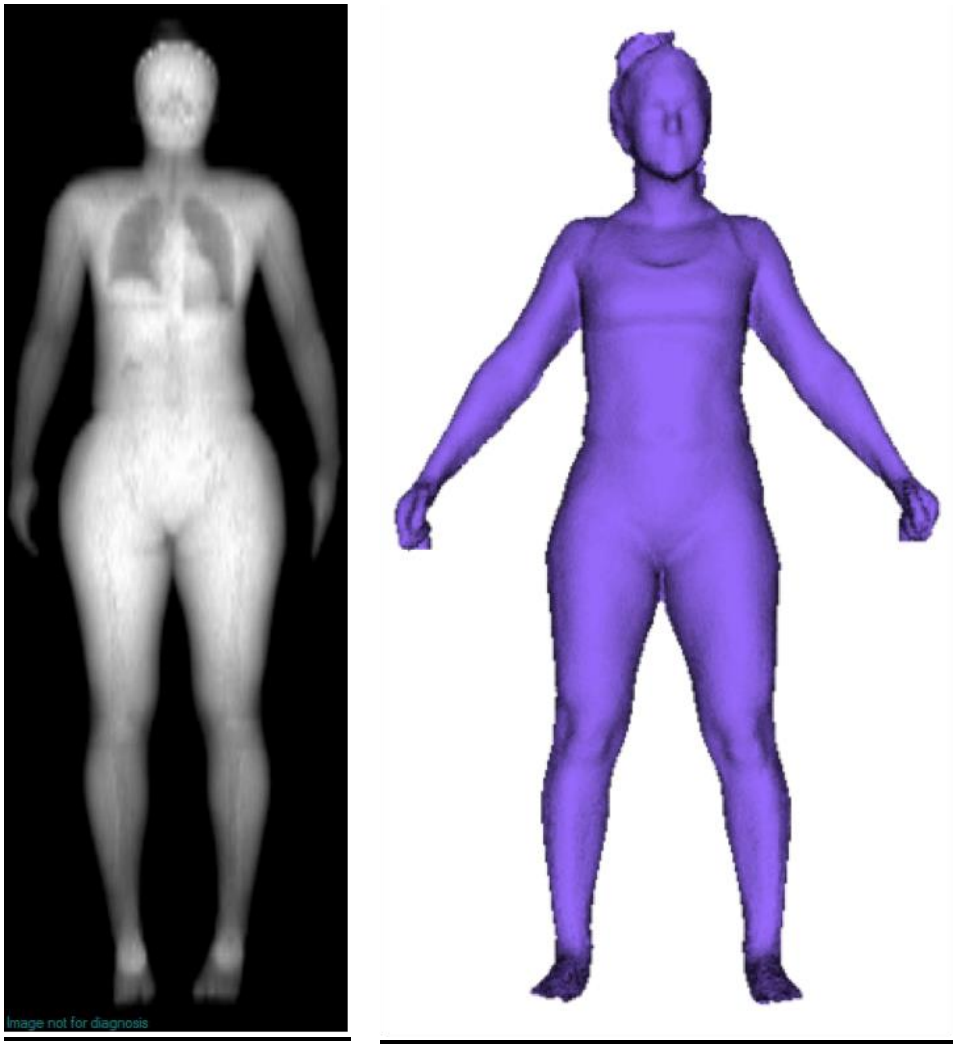


*Figure 1*. DEXA image (left) and FIT3D Proscanner image (right) for the same participant.

Table 1. Participant Descriptive by Group (Means ± Standard Deviations)

| | Variables | | | |
|---|---|---|---|---|
| Group | Age (years) | Weight (lbs) | BMI (kg/m$^2$) | Body Fat (%) |
| FIT3D (*n* = 33) | | | | |
| Normal Weight | 22.4 ± 1.92 | 132 ± 12.7 | 21.9 ± 1.75 | 29.05 ± 4.12 |
| Overweight/Obese | 22.7 ± 1.7 | 172.3 ± 29.3 | 28.9 ± 5.0 | 37.76 ± 4.54 |
| Total | 22.4 ± 1.8 | 155.2 ± 30.9 | 25.9 ± 5.2 | 33.93 ± 6.14 |
| DEXA (*n* = 35) | | | | |
| Normal Weight | 19.8 ± 1.22 | 130 ± 13.8 | 21.6 ± 1.6 | 29.51 ± 4.89 |
| Overweight/Obese | 20.5 ± 1.68 | 173.6 ± 30.25 | 29.9 ± 4.51 | 39.96 ± 5.64 |
| Total | 20.2 ± 1.5 | 152.6 ± 32.1 | 25.9 ± 5.4 | 34.88 ± 7.43 |

Table 2. Positive Affect and Negative Affect Pre and Post. Mean ± Standard Deviation

| | Variables | |
|---|---|---|
| Groups | Pre | Post |
| PA | | |
| FIT3D | 3.14 ± .97 | 3.00 ± 1.00 |
| DEXA | 3.66 ± 2.02 | 3.17 ± .91 |
| Total | 3.41 ± 1.61 | 3.09 ± .95 |
| NA | | |
| FIT3D | 1.51 ± .58 | 1.61 ± .88 |
| DEXA | 1.67 ± .69 | 1.72 ± .89 |
| Total | 1.60 ± .64 | 1.66 ± .88 |

Table 3. Body and Appearance-related Self-conscious Emotions Scale. Mean ± Standard Deviation

| (*n*= 68) | | Variables | | |
|---|---|---|---|---|
| Groups | Shame | Guilt | Authentic Pride | Hubristic Pride |
| FIT3D | 2.62 ± 1.07 | 3.14 ± 1.00 | 2.71 ± .96 | 2.53 ± .88 |
| DEXA | 2.44 ± .91 | 2.71 ± .93 | 2.73 ± .86 | 2.54 ± .94 |
| Total | 2.53 ± .98 | 2.92 ± .98 | 2.72 ± .90 | 2.54 ± .91 |

Table 4. Pre and Post Changes in Motivation (Mean ± Standard Deviation)

| (*n*= 68) | Variables | |
|---|---|---|
| Groups | Pre | Post |
| Lose Weight | | |
| FIT3D | 6.24 ± 2.90 | 6.91 ± 2.91 |
| DEXA | 7.43 ± 2.44 | 8.20 ± 2.10 |
| Total | 6.85 ± 2.72 | 7.55 ± 2.60 |
| Lose Fat | | |
| FIT3D | 8.00 ± 1.84 | 8.30 ± 1.84 |
| DEXA | 8.60 ± 1.80 | 8.50 ± 2.20 |
| Total | 8.30 ± 1.80 | 8.40 ± 2.02 |
| Maintain | | |
| FIT3D | 6.40 ± 2.52 | 6.60 ± 2.66 |
| DEXA | 6.50 ± 2.40 | 6.60 ± 2.91 |
| Total | 6.44 ± 2.42 | 6.57 ± 2.77 |

Table 5. Group Differences in Coping Responses via WEIGHTCOPE (Mean ± Standard Deviation)

| | Groups | | |
|---|---|---|---|
| Coping Factors | FIT3D | DEXA | Total |
| Physical Activity | 6.21 ± .84 | 6.23 ± .72 | 6.22 ± .77 |
| Healthy Eating | 5.88 ± .88 | 5.75 ± 1.31 | 5.81 ± 1.12 |
| Suppressed Eating | 4.02 ± 1.15 | 3.76 ± 1.20 | 3.88 ± 1.17 |
| Supplement use | 1.51 ± 1.01 | 1.98 ± 1.50 | 1.75 ± 1.30 |
| Self-Regulation | 5.40 ± 1.50 | 5.53 ± 1.15 | 5.50 ± 1.31 |
| Camouflage | 2.93 ± 1.90 | 2.55 ± 1.50 | 2.74 ± 1.70 |
| Disengagement | 1.65 ± .75 | 1.77 ± .80 | 1.71 ± .77 |
| Pos. Reframing | 4.95 ± 1.68 | 5.21 ± 1.17 | 5.10 ± 1.44 |
| Comfort Food | 2.40 ± 1.16 | 2.50 ± 1.19 | 2.42 ± 1.17 |
| Social Support | 3.45 ± 1.70 | 3.86 ± 1.60 | 3.66 ± 1.65 |

Table 6. Means ± standard deviation for affective, motivation, and coping (i.e. WEIGHTCOPE) variables between BMI classifications

| | Groups | | | | | |
|---|---|---|---|---|---|---|
| | FIT3D | | DEXA | | Total | |
| | NW | OW/OB | NW | OW/OB | NW | OW/OB |
| Affect Change[a] | | | | | | |
| PA | .13 ± .70 | -.32 ± .55 | -.61 ± 2.61 | -.40 ± .55 | -.28 ± 1.99 | -.35 ± .55 |
| NA | -.23 ± .66 | .34 ± .88 | -.08 ± .61 | .16 ± .77 | -.15 ± .62 | .25 ± .82 |
| BASES | | | | | | |
| Shame | 2.03 ± .80 | 3.04 ± 1.07 | 2.05 ± .60 | 2.80 ± 1.01 | 2.05 ± .70* | 2.93 ± 1.03* |
| Guilt | 2.74 ± .86 | 3.43 ± 1.02 | 2.30 ± .60 | 3.01 ± 1.03 | 2.50 ± .74* | 3.30 ± 1.03* |
| Authentic Pride | 3.14 ± .77 | 2.40 ± .97 | 3.30 ± .50 | 2.22 ± 0.82 | 3.21 ± .63* | 2.31 ± .89* |
| Hubristic Pride | 2.82 ± .82 | 2.31 ± .88 | 2.65 ± .97 | 2.44 ± 0.93 | 2.72 ± .89* | 2.40 ± .89* |
| Motivation Change[a] | | | | | | |
| Lose Weight | .93 ± 1.27 | .47 ± 1.07 | 1.05 ± 2.16 | .44 ± 1.29 | 1.00 ± 1.78 | .45 ± 1.17 |
| Lose Fat | .43 ± .75 | .21 ± 1.03 | -.65 ± 2.12 | .44 ± .98 | -.16 ± 1.71 | .32 ± 1.00 |
| Maintain Weight | .50 ± .94 | -.05 ± 1.22 | .17 ± 1.81 | .00 ± 2.30 | .32 ± 1.5 | -.03 ± 1.80 |
| WEIGHTCOPE | | | | | | |
| Physical Activity | 6.12 ± 1.00 | 6.30 ± .72 | 6.35 ± .58 | 6.11 ± .72 | 6.25 ± .80 | 6.20 ± .77 |
| Healthy Eating | 5.75 ± .81 | 5.98 ± .94 | 5.60 ± 1.60 | 5.91 ± 1.00 | 5.65 ± 1.30 | 5.95 ± .96 |
| Suppressed Eating | 3.34 ± 1.15 | 4.51 ± .90 | 3.30 ± 1.06 | 4.24 ± 1.15 | 3.30 ± 1.10* | 4.38 ± 1.01* |
| Supplement Use | 1.11 ± .21 | 1.80 ± 1.25 | 1.64 ± .81 | 2.30 ± 1.88 | 1.41 ± .66* | 2.04 ± 1.60* |
| Self-Regulation | 5.02 ± 1.70 | 5.70 ± 1.25 | 5.31 ± 1.20 | 5.75 ± 1.13 | 5.20 ± 1.41 | 5.71 ± 1.20 |
| Camouflage | 2.17 ± 1.17 | 3.50 ± 2.14 | 2.04 ± 1.11 | 3.04 ± 1.65 | 2.10 ± 1.13* | 3.30 ± 1.91* |
| Disengagement | 1.80 ± .86 | 1.55 ± .66 | 1.80 ± .85 | 1.75 ± .77 | 1.80 ± .84 | 1.64 ± .71 |
| Positive Reframing | 5.30 ± 1.74 | 4.72 ± 1.64 | 5.15 ± 1.02 | 5.25 ± 1.33 | 5.21 ± 1.40 | 4.98 ± 1.50 |
| Comfort Food | 2.88 ± 1.01 | 2.02 ± 1.15 | 2.66 ± 1.41 | 2.30 ± .95 | 2.80 ± 1.23* | 2.14 ± 1.05* |
| Social Support | 3.86 ± 1.80 | 3.15 ± 1.61 | 3.66 ± 1.50 | 4.05 ± 1.71 | 3.75 ± 1.61 | 3.60 ± 1.70 |

*Statistically significant interaction between BMI classifications, BASES = body and appearance-related self-conscious emotions

[a]Post mean – pre mean

# VITA

After completing her work at Rowlett High School in Rowlett, Texas, in 2010, Rachel Nanez entered Stephen F. Austin State University, Nacogdoches, Texas in August, 2010. She received the degree of Bachelor of Science from Stephen F. Austin State University in May, 2014. In August 2014, she entered the Graduate School of Stephen F. Austin State University and accepted a Graduate Assistantship for the department of Campus Recreation for Aquatics and Safety and received the degree of Master of Science in May of 2016.

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APA

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