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Evaluating the potential roles of body dissatisfaction in exercise avoidance

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The student author and the program of study committee are solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

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ABSTRACT

Body dissatisfaction is experienced by individuals in all weight classes and has been linked with poor mental and physical health outcomes in both women and men. Exercise interventions are a common tool used to improve body dissatisfaction, but their impact is relatively small. Reasons for this small impact might include high rates of attrition and difficulty in recruiting those who are most sedentary in the first place, or who *avoid* exercise (at most high-risk/high-need). The present study evaluates the extent to which exercise avoidance mediates the association of body dissatisfaction with exercise frequency and whether perceived embarrassment, exercise fatigue, and exercise self-efficacy explain the association of body dissatisfaction with exercise avoidance. Participants were 110 students and staff from an urban, private US university. Body dissatisfaction, exercise avoidance, and hypothesized mediators were measured at baseline; objective exercise was measured with accelerometers for one month. Exercise avoidance mediated the relation between body dissatisfaction and exercise frequency (*B* = -.02 (SE =.01) [95% CI: -.04 to -.01]). Additionally, the relation between body dissatisfaction and exercise avoidance was fully mediated by embarrassment (*B* = .24 (SE .10) [95% CI: .08 to .47])and fatigue (*B* = .10 (SE .06) [95% CI: .01 to .28]) but not by self-efficacy (*B* = -.00 (SE .02) [95% CI: -.06 to .01]). Thus, exercise interventions may not effectively target individuals who are dissatisfied with their body because they may be avoiding exercise due to perceived embarrassment and fatigue.

CHAPTER 1. INTRODUCTION

Both women and men are susceptible to feeling dissatisfied with their bodies; 61% of women and 41% of men were found to rate themselves as 'too heavy', and 21% of women and 11% of men reported that they feel they are unattractive (Frederick, Peplau & Lever, 2006). Perceptions of being overweight are common, even among those who are not considered to be medically overweight (Frederick et al., 2006). Perceptions of being overweight and body dissatisfaction in general are linked with poor mental and physical well-being, even after controlling for actual markers of mental and physical health (Bucchianeri & Neumark-Sztainer, 2014; Černelič-Bizjak & Jenko-Pražnikar, 2014; Vartanian & Novak, 2011; Wilson, Latner & Hayashi, 2013). We briefly review that literature here and suggest that targeting body dissatisfaction may be a key first step in improving individuals' mental and physical health. In particular, we evaluate the possible roles of body dissatisfaction in preventing involvement in regular exercise, which is an important behavior for mental and physical health (Penedo & Dahn, 2005).

Links Between Body Dissatisfaction and Health

First, body dissatisfaction is associated with risky health behaviors and poor mental and physical well-being. With regards to mental health, body dissatisfaction has been found to mediate the relationship between BMI and psychological health, such that higher BMI leads to poorer mental-health outcomes at least in part due to body dissatisfaction (Bucchianeri & Neumark-Sztainer, 2014). Specifically, body dissatisfaction mediates the relationship between BMI and self-esteem and depressed mood (Mond, van den Berg, Boutelle, Hannan, & Neumark-Sztainer, 2011). With regards to physical health, body dissatisfaction has been shown to mediate

the relationship between BMI and physical health-related quality of life, such that higher BMI was associated with poorer physical health at least partially due to body dissatisfaction (Wilson, Latner & Hayashi, 2013). This may be due to the influence of body dissatisfaction on health-related behaviors as well as directly on biological health processes: regarding behaviors, body dissatisfaction is related to dieting which increases the risk of disordered eating (Stice & Shaw, 2002), and individuals who subscribe to anti-fat attitudes and experience weight-related stigma avoid exercise (Vartanian & Novak, 2011). For women and men, dissatisfaction with the body is linked to an increase of inflammatory biomarkers (i.e., C-reactive protein)
even after controlling for weight and other known predictors, such as sleep quantity, alcohol consumption, gender, and age (Černelič-Bizjak & Jenko-Pražnikar, 2014). Thus, body dissatisfaction appears to be a potential independent contributor to heart disease.

Second, positive body image, or body *satisfaction,* is associated with mental and physical health benefits. Regardless of actual body shape, both women and men who have a positive body image were less likely to adopt unhealthy diets and more likely to make an effort to protect their bodies from sun damage (Gillen, 2015). Further, those with a positive body image are more likely to have higher self-esteem and were less likely to be depressed (Gillien, 2015). This association between body satisfaction and mental health may be due to individual differences in optimism and due to more proactive coping strategies (e.g., exercise) among those who report positive levels of body satisfaction (Avalos, Tylka, & Wood-Barcalow, 2005).

Tested Interventions to Increase Exercise and Body Satisfaction

Interventions to improve/enhance body satisfaction have primarily focused on increasing participants' physical activity; these efforts have had some success, across different types of exercise and groups of individuals (Campbell & Hausenblas, 2009; Hausenblas & Fallon 2006).

One meta-analysis of 57 studies examining the impact of exercise interventions on body satisfaction found that individuals in intervention groups had a small but significant improvement in body satisfaction between baseline and follow-up relative to control groups (Campbell & Hausenblas, 2009), and this effect did not differ by participants' overweight status or change in fitness level or BMI during the intervention. These results indicate that both medically healthy and medically overweight individuals can improve their body satisfaction by exercising and that these changes may not require improvements in actual fitness or BMI level.

Though exercise interventions have been shown to improve body satisfaction, these effects have been relatively small (Campbell & Hausenblas, 2009). Further, these interventions likely only worked for those individuals who remained in the studies, and attrition is a large problem for exercise interventions (Linke, Gallo, & Norman, 2011). Therefore, the effectiveness of exercise interventions (on behavior, as well as mental and physical health outcomes) may be increased by first addressing reasons for participant attrition and the intention-behavior gap (e.g., participants' perceived behavioral control/self-efficacy and barriers to exercise; Ajzen, 1991; 2013; Sniehotta, Scholz & Schwarzer, 2005).

Body Dissatisfaction Prevents Engagement in Exercise

We propose that exercise interventions may not effectively target individuals who are dissatisfied with their bodies, because individuals low in body satisfaction may be more likely to avoid signing up for an intervention advertising exercise, or to drop out or not adhere to the intervention. That is, we propose that body dissatisfaction may contribute to active *avoidance* of exercise, which is known to decrease engagement in moderate or vigorous exercise (Vartanian & Shaprow, 2008), thereby limiting the effectiveness of exercise interventions for those at-risk individuals (those high in body dissatisfaction).

Body dissatisfaction may contribute to exercise avoidance due to several possible factors: first, Schmalz (2010) found that individuals who perceive that weight stigmatization is common are more likely to believe that they are not competent enough to engage in physical activity and that perceived exercise competence was explained by body satisfaction but not by actual weight status (i.e., BMI). Therefore, body dissatisfaction may lead to exercise avoidance due to low perceived competence or self-efficacy.

Second, individuals who are dissatisfied with their bodies may perceive greater barriers to exercise, and perceiving barriers to exercise can prevent an individual from adopting and maintaining engagement in regular exercise (Booth, Bauman, Owen & Gorge, 1997; Grubbs & Carter, 2002)—regardless of whether the perceived barriers are real (Simonavice & Wiggins, 2008). Grubbs and Carter (2002) found that individuals who do not engage in regular exercise were more likely to perceive exercising as embarrassing than individuals who are regular exercisers. Importantly, non-exercising individuals are not only more likely to perceive barriers to exercise, such as feeling embarrassed or fatigued when exercising, but are also less likely to perceive benefits to exercise (Grubbs & Carter, 2002). Thus, individuals who are dissatisfied with their bodies may not only avoid exercise due to experiencing (or perceiving) more of these barriers, but they may also be less likely to find the appeal in joining an exercise intervention.

The Current Study

The present study has two purposes. The first is to empirically evaluate a link between body dissatisfaction and exercise frequency via (i.e. mediated by) exercise avoidance. The second is to evaluate whether body dissatisfaction predicts psychological well-being via exercise avoidance. These relationships have not been explicitly tested or proposed in the literature, to our knowledge, but the links between body dissatisfaction, health behaviors (including exercise), and

mental and physical health outcomes suggest that these relationships exist. Assuming body dissatisfaction will be significantly related to exercise avoidance, the third objective is to evaluate specific, potentially-changeable factors that could account for the relationship between body dissatisfaction and exercise avoidance. Specifically, we test the hypothesis that the relationships between body dissatisfaction and exercise avoidance will be mediated by individuals' exercise self-efficacy and perceived exercise barriers—embarrassment and fatigue from exercise, controlling for participants' reported BMI so that we isolate the effect of *body dissatisfaction* on exercise frequency and avoidance from the effect of being *overweight* on exercise frequency and avoidance.

If results suggest that exercise self-efficacy, perceived embarrassment, and perceived fatigue mediate the relationship between body dissatisfaction and exercise avoidance, they could potentially be targeted in those with body dissatisfaction prior to commencing any exercise program in order to boost individuals' engagement in (and potential benefits from) the exercise intervention. By targeting body satisfaction and therefore exercise *avoidance* first, it is possible that exercise interventions could increase participation of and effectiveness for individuals at high risk for poor mental and physical health.

CHAPTER 2. METHODS

Participants

The sample consisted of 123 adults (students and N = 36 staff) recruited through the psychology subject pool and departmental e-mails from an urban, private university in the US. Participants ranged from 18 to 73 years of age, with a mean age of 24.7 (11.24) years. The majority of the sample was female (72%). Most participants identified as Caucasian (76%); other identified ethnicities were South Asian (9.1%), Black (6.6%), East Asian (3.3%), and Middle Eastern (0.8%). The final sample excluded participants who failed random response checks and/or who reported being NCAA athletes (N = 110).

Procedure

The data obtained for the present study was part of a larger, month-long observational study, and the hypotheses evaluated in the current analyses have not been evaluated or published elsewhere. Prospective participants were recruited if they were willing to try to be active at least two times per week for 20 consecutive minutes for the duration of the study. At the first time point in the study, participants answered questions regarding their body satisfaction and demographic information. Next, participants attended an in-person session where they were given their Fitbit. Researchers helped the participants create a 'Fitbit action plan' that was intended to help participants remember to wear their Fitbits for the entire study. Additionally, participants downloaded the Fitbit app that allowed them to sync their Fitbit activity to the app. Participants were asked to begin wearing their Fitbit the next day.

Within 48 hours of the in-person session participants received a link to complete the second online questionnaire. The questionnaire included questions to assess self-efficacy and

perceived embarrassment and fatigue while exercising. Participants returned to the lab four-weeks after the initial in-person session to return their assigned Fitbit, to get weighed, and to answer self-report questionnaires assessing exercise avoidance and psychological wellbeing.

Measures

Body dissatisfaction

Body dissatisfaction was measured with two scales from the published literature. First, the *Body Appreciation Scale* (Avalos, Tylka & Wood-Barcalow, 2005) is a 13-item measure that assesses four aspects of body acceptance: having positive opinions about one's body, body acceptance regardless of perceived imperfections, respecting one's body by engaging in health behaviors, and maintaining positive body satisfaction by not idealizing thin body types typically displayed in the media. The measure has a 5-point-likert- type scale and response options range from 'Not at all' to 'Extremely', with higher scores being indicative of higher body appreciation. The variable was scored as instructed and then re-scored so that higher scores indicate greater body dissatisfaction for analyses of the current hypotheses (which are stated in terms of body dissatisfaction). Scores on the Body Appreciation Scale has been shown to have high internal consistency ($\alpha = .94$) and have convergent validity (See Avalos, Tylka & Wood-Barcalow, 2005; e.g., body surveillance -.55 and body shame $r = -.77$). The reliability coefficient for scores on the Body Appreciation Scale, measured at baseline in the present sample, was 0.92, and test re-test reliability with follow-up body appreciation scores was found ($r = .83$, paired $t(112) = -.66$, $p = .51$). Second, the *Body Shape Satisfaction Scale* (Pingitore, Spring, Garfield, 1997*) is a* 10-item measure that assesses body satisfaction with specific parts of the body (e.g., waist, stomach, thighs). Items are rated on a 5-point-likert-type scale ranging from 'Very dissatisfied' to 'Very satisfied', the items were reverse coded so that higher scores indicated high

levels of body dissatisfaction. Scores on the Body Shape Satisfaction Scale has been shown to have high internal consistency (α = .88) (Pingitore, Spring & Garfield, 1997*)* and convergent validity (See Petrie, Tripp & Harvey, 2002; bodily shame r = -.63 and appearance evaluation r = -.75). The reliability coefficient for the Body Shape Satisfaction Scale in the present study was 0.88. Finally, baseline and follow up scores from the Body Shape Satisfaction Scale demonstrated test re-test reliability in the present sample (r = .82, paired $t(114)$ = .79, p = .43).

Recently, distinctions have been made between body dissatisfaction/satisfaction and body appreciation (e.g., Tylka & Wood-Barlow, 2015; Tiggerman & McCourt, 2013). Researchers have proposed that negative body-image (e.g., body dissatisfaction) and positive body-image (e.g., body appreciation) do not represent equivalent dimensions (e.g., Tylka & Woof-Barlow, 2015). Therefore, exploratory factor analysis (maximum likelihood extraction – direct oblimin) along with parallel analysis (which verifies how many factors should be attained above chance level; Hayton, Allen, & Scarpello, 2004) is used in the current study to determine whether body dissatisfaction and body appreciation should be used as combined or as separate predictors for the main hypotheses.

Exercise frequency

The Fitbit (Fitbit.com, "Zip" model) counts movement as steps using accelerometry technology. Past studies have found high convergent validity between counted steps by Fitbits and manually counted steps (Evenson, Goto & Furberg, 2015). Additionally, Fitbits have been shown to have high inter-device reliability for counting steps. Even sedentary individuals should show light activity on a day-to-day basis (e.g., walking between classes). Lack of activity is therefore an indication that the participant was not wearing the Fitbit. Participants were excluded from the final dataset if they had no recorded activity on 25% or more of the intervention days;

further, days where participants wore the device for less than 10 hours were excluded from analyses. In the present study, exercise frequency was the proportion of days that individuals engaged in at least one 20-minute exercise session (i.e., 20 or more consecutive minutes of moderate or vigorous exercise activity).

Exercise avoidance

Exercise avoidance was measured using two items developed by Vartanian and Shaprow (2008): 'I avoid engaging in physical activity when others might be around', and 'I feel uncomfortable going to a gym'. These two items are part of a 3-item scale used by Vartanian and Novak (2011) to represent exercise avoidance. One of the original items was not used in the present study because it assessed exercise avoidance due to embarrassment. Response options were displayed as a 7-point-likert-type scale with higher scores reflecting higher levels of exercise avoidance. Observed reliability was $\alpha = .86$ and test re-test reliability was assessed with follow-up scores ($r = .78$, paired $t(115) = -1.54$, $p = .13$).

Subjective psychological well-being

The flourishing scale was used to assess participants' subjective psychological well-being (Diener et al., 2009). The flourishing scale consists of 8 items (e.g., 'I lead a purposeful and meaningful life') that are rated on a 7-point-likert-type scale ranging from 'Strongly disagree' to 'Strongly agree'. Higher scores correspond to higher levels of general psychological well-being. The flourishing scale has been shown to have temporal stability and high internal validity ($\alpha = .87$). Additionally, the flourishing scale has convergent validity with other measures of psychological well-being (e.g., satisfaction with life $r = .62$ and optimism $r = -.59$, where low scores reflect optimism; Diener et al., 2010). The reliability coefficient for the flourishing scale,

measured at follow-up, was 0.95, and test re-test reliability was evaluated with baseline scores r = .50, paired $t(116) = .41$, $p = .68$).

Perceived barriers to exercise

The Benefits and Barriers to Exercise Scale was used to assess perceived barriers to exercise (Sechrist, Walker, & Pender, 1987). Two barriers are proposed to mediate the relation between body dissatisfaction and exercise avoidance in the present study. Embarrassment was measured using the item 'I am too embarrassed to exercise'. Fatigue was measured using the items 'I am fatigued by exercise' and 'exercise is hard work' ($\alpha = .76$). Both of the items were rated on a 5-point-likert-type scale ranging from 'Strongly disagree' to 'Strongly agree'. For both variables, higher scores indicate greater experience of barriers to exercise. The evaluated barriers in the current study were chosen due to the barriers related to body dissatisfaction in the existing literature (Booth, Bauman, Owen & Gorge, 1997; Grubbs & Carter, 2002; Schmalz, 2010); the other barriers in the scale are not conceptually related to body dissatisfaction and so were not included as tested mediators of the relationship between body dissatisfaction and exercise avoidance (e.g., 'Inconvenient facility schedules' and 'Costs too much to exercise').

Self-efficacy

Self-efficacy was measured using the item 'I am confident that I can exercise for at least 20 minutes, three times per week for the next month'. This item was derived from the Theory of Planned Behavior Questionnaire and is thought to measure the capacity component of perceived behavioral control, which is behavior-specific self-efficacy (Ajzen, 2013). The item is measured on a 7-point-likert-type scale ranging from 'False' to 'True'. Scores on the self-efficacy item measured at baseline and follow-up did significantly differ ($r = .24$, paired $t(115) = 4.66$, $p < .001$) suggesting that self-efficacy may not be a stable construct.

Demographics

Self-report questions were used to identify participants' age, gender identification, race and ethnicity identifications, year of schooling, height, and weight.

Random response check

Two items were included in the survey to check for random responding. The first item required participants to answer "mostly untrue" and the second item required participants to select the value "4" to help identify individuals who randomly responded to items. Random responses have been shown to drastically alter effect sizes (Credé, 2010). We took a conservative approach to eliminating data by excluding only those individuals who missed both checks.

CHAPTER 4. RESULTS

Mean imputation was used to correct the missing self-report data that was present in the dataset. Missing data was not imputed for one-item scales (i.e., self efficacy, missing N = 1) or for scales in which a participant answered zero of multiple items (i.e., six participants did not complete any Time 2 self-report questionnaires, due to dropping out of the study). Therefore, in total, six participants had missing data, with six total cells missing. Data was examined for multivariate outliers using Mahalonobis Distance values. Skewness and kurtosis was examined using z-scores, variables with a score greater than 3.3 were transformed using a log10 transformation (i.e., exercise avoidance, embarrassment, self-efficacy, psychological well-being, and exercise frequency). To demonstrate the robustness of the results, all hypotheses were analyzed with and without the inclusion of imputed data, the multivariate outlier, and the transformed variables (see Steegen, Tuerlinckx, Gelman, & Vanpaemel, 2016). There were no differences between the main analyses and the aforementioned alternative analyses. Thus, all results are reported with mean imputation, the inclusion of the multivariate outlier, and using the non-transformed variables.

Table 1 contains descriptive statistics and correlations. It should be noted that Proportion of Exercise Days and BMI report the observed minimum and maximum values. One participant had an estimated BMI value of 0.75, which was determined to be a mistake in his/her self-reported height; accordingly this value was replaced with the mean. Combined body dissatisfaction descriptive statistics were derived from raw scores

The exploratory factor analysis of the Body Appreciation Scale and the Body Shape Satisfaction Scale, along with the solution from the parallel analysis, resulted in a single-factor

solution. The item "height" from the Body Shape Satisfaction Scale was removed after initial analyses as it loaded poorly onto the factor (.25) and had a low extracted communality (0.06). After removal of the item the single factor accounted for 47.58% of the variance in scores and all of the remaining items from both the Body Shape Satisfaction Scale and the Body Appreciation Scale loaded onto the single factor (See Table 3). Thus, individual z-scores for the Body Shape Satisfaction Scale and the Body Appreciation Scale were calculated and combined to form an overall measure of body dissatisfaction that was used as the predictor variable in all subsequent analyses (referred to as body dissatisfaction).

There is no theoretical reason *or* reason identified in previous research to suggest that gender or the category of student versus staff would influence the relationships between the tested variables. However, to statistically test whether these categories should be included as moderators of the main analyses a series of regression analyses and independent samples t-test were conducted. To test whether gender should be included as a moderator of the mediated relationship the interaction between gender and body image (mean centered) was compared against gender and body image as individual predictors of exercise avoidance. Similarly, the interaction between gender and exercise avoidance (mean centered) was compared against gender and exercise avoidance as individual predictors of exercise frequency and psychological well-being. Participants' status as a student or staff member was also tested as a possible moderator using the aforementioned method. For all linear regression analyses examining gender as a possible moderator, the interaction term was non-significant. Additionally, for all independent samples t-tests gender did not significantly predict any of the variables. Thus, gender will not be included as a moderator in any tests of hypotheses. With regards to the category of student versus staff, the interaction term with body dissatisfaction was

not a significant predictor of exercise avoidance. Additionally, the interaction term with exercise avoidance was not a significant predictor of psychological well-being. However, the interaction was a significant predictor of exercise frequency. Likewise, there was a significant relationship between the category of student versus staff and exercise avoidance and exercise in the independent samples t-tests. Thus, analyses to test the research hypothesis were conducted with and without the inclusion of staff to determine whether the inclusion of staff members changed the results. No differences were found between the direction and significance of the indirect effect in the analyses, thus only the results with the inclusion of both student and staff members are reported.

Each hypothesis test was conducted using Hayes' PROCESS procedures for bootstrapped mediation analyses using 1000 bootstrapped samples and 95% confidence intervals (Hayes, 2013). In each analysis using participants' estimated BMI as a covariate controlled for the effect of BMI on the results.

Hypothesis 1

As hypothesized, the relationship between body dissatisfaction and exercise frequency was mediated by exercise avoidance, even after controlling for BMI [Indirect effect: B = -.02 (SE =.01) (95% CI: -.04 to -.01]). That is, a one-unit increase in body dissatisfaction results in a -.02 unit decrease in exercise frequency through the mediating variable of exercise avoidance. Additionally, the relationship between body dissatisfaction and exercise frequency depended on exercise avoidance since the direct effect of body dissatisfaction on exercise frequency was non-significant (see path c' Figure 1 and Table 4). That is, individuals who are more dissatisfied with their body exercise less because they are more likely to be avoiding exercise. Importantly, this relationship does not depend on BMI.

Hypothesis 2

Counter to the hypothesis, the relationship between body dissatisfaction and psychological well-being was not mediated by exercise avoidance after controlling for BMI [*B* = .05 (SE =.19) (95% CI: -.31 to .41]). The path between body dissatisfaction and exercise avoidance (path a) was significant, as in the test of Hypothesis 1 (See Figure 1; see path coefficients in Table 5). However, the path between exercise avoidance and psychological well-being was not significant. The direct effect and total effect were significant, even after controlling for BMI. That is, higher levels of body dissatisfaction predicted lower levels of psychological well-being above and beyond the effect of the mediator (exercise avoidance) and BMI. Hypothesis 2 was partially supported in that
body dissatisfaction was predictive of psychological well-being, but this relationship was *not* mediated by exercise avoidance.

Hypothesis 3

As hypothesized, the relationship between body dissatisfaction and exercise avoidance was mediated by embarrassment and fatigue as barriers to exercise, even after controlling for BMI (*B* = .24 (SE .10) [95% CI: .08 to .47]) and (*B* = .10 (SE .06) [95% CI: .01 to .28]), respectively—but not by self-efficacy (*B* = -.00 (SE .02) [95% CI: -.06 to .01]). Thus, a one-unit increase change in body dissatisfaction leads to a .24 or .10 increase in exercise avoidance due to increased perceived embarrassment and fatigue, respectively. The direct effect of body dissatisfaction on exercise avoidance was non-significant, suggesting that the relationship between body dissatisfaction and exercise avoidance was accounted for by perceived embarrassment and fatigue as barriers to exercise (see tested model in Figure 2; see path coefficients in Table 6). Thus, Hypothesis 3 was partially confirmed, in that the relationship

between body dissatisfaction and exercise avoidance was explained by embarrassment and fatigue as barriers to exercise, but not by self-efficacy.

CHAPTER 4. DISCUSSION

Body dissatisfaction has been linked to poor mental and physical health outcomes including depressed mood and increased risk of heart disease (e.g., Bucchianeri & Neumark-Sztainer, 2014; Černelič-Bizjak & Jenko-Pražnikar, 2014). Exercise interventions have been used as a common tool to improve body image in participants (Campbell & Hausenblas, 2009; Hausenblas & Fallon 2006). Although these interventions have had some success, it is possible that they do not effectively target individuals experiencing body dissatisfaction. That is, individuals who are dissatisfied with their bodies may avoid exercise (and interventions to promote exercise) because they feel that they are unable to exercise or that exercise would make them feel fatigued or embarrassed (Booth, Bauman, Owen & Gorge, 1997; Grubbs & Carter, 2002; Schmalz, 2010).

The present study is the first to examine the link between body dissatisfaction and exercise avoidance, as well as specific, potentially-changeable factors, such as perceived embarrassment and fatigue from exercise, that may account for the aforementioned relationship. The present study found evidence of the mediating role of exercise avoidance in the relationship between body dissatisfaction and exercise frequency and identified two factors that account for this relationship (i.e., perceived embarrassment and fatigue). The results therefore indicate that, by first targeting embarrassment and fatigue as perceived barriers to exercise, interventions may influence individuals who are dissatisfied with their bodies to be more likely to join and adhere to an exercise intervention. Furthermore, since perceived embarrassment and fatigue from exercise mediated the relationship between body dissatisfaction and exercise avoidance it is possible that interventions that target these two factors alone may have very large effects. It is important to note that mediation can exist without a significant bivariate relationship between the

predictor variable and the outcome variable (e.g., Shrout & Bolger, 2002; Hayes & Rockwood, 2016). In this instance, a non-significant direct effect signifies either that the predictor and outcome variable are non-linearly related *or* that the relationship depends on a third variable (mediator) (Hayes & Rockwood, 2006). In light of this, the insignificant direct effect between body dissatisfaction and exercise frequency (hypothesis 1) and the between body dissatisfaction and exercise avoidance (hypothesis 2) should not detract from the mediation (indirect) effect found in both cases.

Although a low level of body satisfaction is predictive of lower levels of psychological well-being, we did not find that this relationship is due to individuals' exercise avoidance. Thus, Hypothesis 2 was rejected. It may be that the relationship between body dissatisfaction and psychological well-being is due to a general negative mood or that poor well-being causes poor estimates of body image. If a more domain-specific measure of well-being, or exercise-related affect, were measured in place of the very general flourishing scale, it is possible that body dissatisfaction would predict this exercise-related affect/experience via exercise avoidance.

A second unexpected finding was that exercise self-efficacy did not mediate the relationship between body dissatisfaction and exercise avoidance. That is, perceived ability to exercise did not explain why individuals who have low body satisfaction avoid exercise. This null finding is surprising, as a meta-analysis of the components of the Theory of Planned Behavior found that self-efficacy is a unique and useful predictor of both intention and behavior (Armitage & Conner, 2001). Additionally, Schmalz (2010) found that body esteem was predictive of perceived competence to engage in physical activity. It is possible that the null finding can be

explained by the use of a limited 1-item measure used to assess self-efficacy. However, others have successfully used single-item measures of self-efficacy to assess health outcomes (e.g., Hoeppner, Kelly, Urbanoski, & Slaymaker, 2001). It is also possible that the ceiling effect observed for the self-efficacy item (i.e., 71.8% of participants reported the highest level of self-efficacy) compromised the mediation analysis of the effect of body dissatisfaction on exercise avoidance through perceived ability. That is, it is possible that the lack of variation in scores for self-efficacy impacted the results of the mediation analysis. To this end, it may be helpful for future studies to set a higher threshold for self-efficacy that better reflect the current physical activity guidelines for adults (e.g., Office of Disease Prevention and Health Promotion, 2017).

There are several limitations to the present study that must be addressed. First, the scale used to measure exercise avoidance focused solely on social exercise avoidance (e.g., I avoid engaging in physical activity when others might be around). Therefore, it is possible that there are other facets of exercise avoidance that relate differentially to body dissatisfaction (e.g., private exercise avoidance or exercise avoidance due to physical reactions). It would be beneficial to expand measurement of exercise avoidance to include additional facets in order to further explore the relationship between body dissatisfaction and exercise avoidance.

A second limitation to the present study is the range restriction with regards to exercise frequency and body dissatisfaction. That is, the procedure stated that participants must be *willing* to engage in exercise for a minimum of 20 minutes at least two times per week. Although some participants reported being currently sedentary (at baseline), it is possible that individuals who have the worst body image (and would not be willing to do minimal activity for a study) did not volunteer for the present study. Beneficial future research would find alternative methods for recruiting sedentary individuals and individuals who are the most dissatisfied with their bodies.

In conclusion, this research is a first step in examining how body dissatisfaction impacts physical health through exercise frequency and exercise avoidance. We found that the relationship between body dissatisfaction and exercise was fully explained by exercise avoidance. Additionally, the relationship between body dissatisfaction and exercise avoidance was fully explained by embarrassment and fatigue as perceived barriers to exercise. Therefore, it is likely that exercise interventions aimed at increasing body satisfaction are not able to effectively target individuals who are the most dissatisfied with their bodies. These interventions may be more successful at targeting the desired population if they target perceived embarrassment and fatigue first.

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and Human Decision Processes, 50(2)*, 179-211. DOI: 10.1016/0749-5978(91)900020-T

Ajzen, I. (2013). Theory of Planned Behavior Questionnaire. Measurement Instrument Database for the Social Science. Retrieved from www.midss.org

Armitage, C. J. & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*, 471-499. Retrieved from http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)2044-8309

Avalos, L., Tylka, T. L., & Wood-Barcalow, N. (2005). The Body Appreciation Scale: Development and psychometric evaluation. *Body Image*, *2*(3), 285–297. DOI: 10.1016/j.bodyim.2005.06.002

Booth, M. L., Bauman, A., Owen, N., & Gore, C. J (1997). Physical activity preferences, preferred sources of assistance, and perceived barriers to increased activity among physically inactive Australians. *Preventive Medicine, 26,* 131-137. DOI: 10.1006/pmed.1996.9982

Bucchianeri, M. M., & Neumark-Sztainer, D. (2014). Body dissatisfaction: An overlooked public health concern. *Journal of Public Mental Health, 13(2),* 64-68. DOI: dx.doi.org/10.1108/JPMH-11-2013-0071

Campbell, A., & Hausenblas, H. A. (2009). Effects of Exercise Interventions on Body Image A Meta-analysis. *Journal of Health Psychology*, *14*(6), 780–793. DOI: 10.1177/1359105309338977

Černelič-Bizjak, M., & Jenko-Pražnikar, Z. (2014). Impact of negative cognitions about body image on inflammatory status in relation to health. *Psychology & Health*, *29*(3), 264–278. DOI: 10.1080/08870446.2013.844807

Credé, M. (2010). Random responding as a threat to the validity of effect size estimates in correlational research. *Educational and Psychological Measurement, 70(4)*, 596-612. DOI: 10.1177/0013164410366686

Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D-W., Oishi, S., & Biswas-Diener, R. (2009). New well-being measures: Flourishing and positive and negative feelings. *Social Indicators Research, 39*, 247-266. DOI: 10.1007/978-90-481-2354-4_12

Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D-W., Oishi, S., & Biswas-Diener, R. (2010). New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Social Indicators Research, 97(2)*, 143-156. DOI: 10.1007/s11205-009-9493-y

Evenson, K. R., Goto, M. M., & Furberg, R. D. (2015). Systematic review of the validity and reliability of consumer-wearable activity trackers. *The International Journal of Behavioral Nutrition and Physical Activity*, *12*: 159. DOI: 10.1186/s12966-015-0314-1

Frederick, D. A., Peplau, L. A., & Lever, J. (2006). The swimsuit issue: Correlates of body image in a sample of 52,677 heterosexual adults. *Body Image*, *3*(4), 413–419. DOI: 10.1016/j.bodyim.2006.08.002

Gillen, M. M. (2015). Associations between positive body image and indicators of men's and women's mental and physical health. *Body Image*, *13*, 67–74. DOI: 10.1016/j.bodyim.2015.01.002

Grubs, L., & Carter, J. (2002). The relationship of perceived benefits and barriers to reported exercise behaviors in college undergraduates. *Family Community Health, 25(2)*, 76-84. Retrieved from http://journals.lww.com/familyandcommunityhealth/Pages/default.aspx

Hausenblas, H. A., & Fallon, E. A. (2006). Exercise and body image: A meta-analysis. *Psychology & Health*, *21*(1), 33–47. DOI: 10.1080/14768320500105270

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis.* New York: The Guildford Press.

Hayes, A. F., & Rockwood, N. J. (2016). Regression-based statistical mediation and moderation analysis in clinical research: Observations, recommendations, and implementation. *Behavior and Research Therapy.* DOI: 10.1016/j.brat.2016.11.001

Hayton, J. C., Allen, D. G., & Scarpello, V. (2004). Factor retention decisions in exploratory factor analysis: A tutorial on parallel analysis. *Organizational Research Methods, 7*, 191-205. DOI: 10.1177/1094428104263675

Hoeppner, B. B., Kelly, J. F., Urbanoski, K. A., & Slaymaker, V. (2011) Comparative utility of a single-item versus multiple-item measure of self-efficacy in predicting relapse among young adults. *Journal of Substance Abuse Treatment, 41*, 205-312. DOI: 10.1016/j.jsat.2011.04.005

Linke, S. E., Gallo, L. C., & Norman, G. J. (2011). Attrition and adherence rates of sustained vs. intermittent exercise interventions. *Annual Behavioral Medicine, 42,* 197-209. DOI: 10.1007/s12160-011-9279-8

Mond, J., van den Berg, P., Boutelle, K., Hannan, P., & Neumark-Sztainer, D. (2011). Obesity, body dissatisfaction, and emotional well-being in early and late adolescence: findings from the project EAT study. *Journal of Asolescent Health*, *48,* 373-378. DOI: 10.1016/j.adohealth.2010.07.022

Office of Disease Prevention and Health Promotion (2008). 2008 *Physical Activity Guidelines for Americans Summary.* Retrieved from: https://health.gov/paguidelines/guidelines/summary.aspx

Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, *18*, 189-193. Retrieved from http://journals.lww.com/co-psychiatry/Pages/default.aspx

Petrie, T. A., Tripp, M. M., & Harvey, P. (2002). Factorial and construct validity of the body parts satisfaction scale revised: An examination of minority and nonminority women. *Psychology of Women Quarterly, 26*, 213-221. DOI: 10.1111/1471-6402.00060

Pingitore, R., Spring, B., & Garfield, D. (1997). Gender differences in body satisfaction. *Obesity Research, 5(5)*, 402-409. Retrieved from http://www.nature.com/aj/formerly_published.html

Schmalz, D. L. (2010). "I Feel Fat": Weight-Related Stigma, Body Esteem, and BMI as Predictors of Perceived Competence in Physical Activity. *Obesity Facts*, *3*(1), 15–21. DOI: 10.1159/000273210

Sechrist, K. R., Walker, S. N., & Pender, N. J. (1987). Development and psychometric evaluation of the exercise benefits/barriers scale. *Research in Nursing and Health, 10,* 357-365. Retrieved from http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1098-240X

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods, 7,* 422-225. DOI: 10.1037//1082-989X.7.4.422

Simonavice, E. M., & Wiggins, M. S. (2008). Exercise barriers, self-efficacy, and stages of change. *Perceptual and Motor Skills, 107*(3), 946-950. DOI: 10.2466/PMS.107.3.946-950

Sniehotta, F. F., Scholz, E., & Schwarzer, R. (2005). Bridging the intention-behavior gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology and Health, 20(2),* 143-160. DOI: 10.1080/08870440512331317670

Steegan, S., Tuerlinckx, F., Gelman, A., & Vanpaemel, W. (2016). Increasing transparency through a multiverse analysis. *Psychological Science, 11,* 702-712. DOI: 10.1177/1745691616658637

Stice, E., & Shaw, H. E. (2002). Role of body dissatisfaction in the onset and maintenance of eating pathology a synthesis of research findings. *Journal of Psychosomatic Research, 53*, 985-993. Retrieved from http://www.journals.elsevier.com/journal-of-psychosomatic-research

Tiggemann, M., & McCourt, A. (2013). Body appreciation in adult women: Relationships with age and body satisfaction. *Body Image, 10,* 624-627. DOI: 10.1016/j.bodyim.2013.07.003

Tylka, T. L., & Wood-Barlow, N. L. (2015). What is and what is not positive body image? Conceptual foundations and construct definition. *Body Image, 14,* 118-129. DOI: 10.1016/j.bodyim.2015.04.001

Vartanian, L. R., & Novak, S. A. (2011). Internalized Societal Attitudes Moderate the Impact of Weight Stigma on Avoidance of Exercise. *Obesity*, *19*(4), 757–762. DOI: 10.1038/oby.2010.234

Vartanian, L. R., & Shaprow, J. G. (2008). Effects of weight stigma on exercise motivation and behavior a preliminary investigation among college-aged females. *Journal of Health Psychology*, *13*(1), 131–138. DOI: 10.1177/1359105307084318

Wilson, R. E., Latner, J. D., & Hayashi, K. (2013). More than just body weight: The role of body image in psychological and physical functioning. *Body Image*, *10*(4), 644–647. DOI: 10.1016/j.bodyim.2013.04.007

Table 1. Descriptive Statistics and Correlations

Scale Minimum	Scale Maximum	Combined Body Dissatisfaction	Exercise Frequency	Exercise Avoidance	Fatigue	Embarrassment	Self-Efficacy	Psychological Well-Being
1	5							
0	1	-.04						
1	7	.28	-.28					
1	5	.24	-.20	.48				
1	5	.32	-.09	.65	.45			
1	7	.04	.17	.06	.17	.12		
8	56	-.49	.02	-.07	-.12	-.05	-.09	
17.01	41.12	.28	-.23	.07	-.03	.20	-.12	.03

Table 1 Continued

	Mean	Standard Deviation
Combined Body Dissatisfaction	2.43	0.67
Exercise Frequency	0.35	0.23
Exercise Avoidance	1.95	1.48
Fatigue	2.41	1.14
Embarrassment	1.48	0.93
Self-Efficacy	5.78	2.21
Psychological Well-Being	47.80	7.70
BMI	23.99	6.31

Table 2. Exploratory Factor Analysis of the Body Shape Satisfaction Scale and the Body Appreciation Scale

	Factor Loadings
Item	Body Dissatisfaction
I feel good about my body	.91
On the whole, I am satisfied with my body	.88
I take a positive attitude toward my body	.84
My feelings toward my body are positive, for the most part	.83
Despite its imperfections I still like my body	.82
Despite its flaws, I accept my body for what it is	.81
Body Build	.75
I respect my body	.70
Weight	.70
Body Shape	.68
Waist	.67
I feel good that my body has at least some good qualities	.62
Stomach	.62
Hips	.61
Shoulders	.61
I am attentive to my body's needs	.58
I engage in healthy behaviors to take care of my body	.58
Thighs	.56
My self-worth is independent of my body shape or weight	.45

Table 2 Continued

I do not allow unrealistic images of women/men presented in the media to affect my attitudes towards my body	.42
Face	.40
I do not focus a lot of energy on being concerned with my body shape or weight	.38

Table 3. Mediation analysis results for Hypothesis 1

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.45	.18	2.46	.02	.09	.81
Path b	-.05	.02	-3.16	<.00	-.09	-.02
Path c	.01	.03	.49	.63	-.04	.07
Path c’	.04	.03	1.28	.20	-.02	.09

Note: path c refers to the total effect and path c’ refers to the direct effect

Table 4:Mediation analysis results for Hypothesis 2

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.48	.17	2.80	.01	.14	.82
Path b	.11	.40	.27	.79	-.69	.91
Path c	-4.07	.67	-6.09	<.00	-5.39	-2.74
Path c’	-4.12	.70	-5.90	<.00	-5.51	-2.73

Note: Path c refers to the total effect and path c’ refers to the direct effect

Table 5. Mediation analysis results for Hypothesis 3

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.10	.26	.40	.69	-.41	.62
Path b	-.03	.05	-.64	.52	-.14	.07
Path c	.48	.17	2.79	.01	.14	.82
Path c’	.14	.14	1.01	.31	-.14	.42
Path d	.27	.10	2.66	.01	.07	.47
Path e	.91	.14	6.06	<.00	.61	1.20
Path f	.34	.13	2.62	.01	.08	.61
Path g	.28	.11	2.45	.02	.06	.51

Note: Path c refers to the total effect and path c’ refers to the direct effect

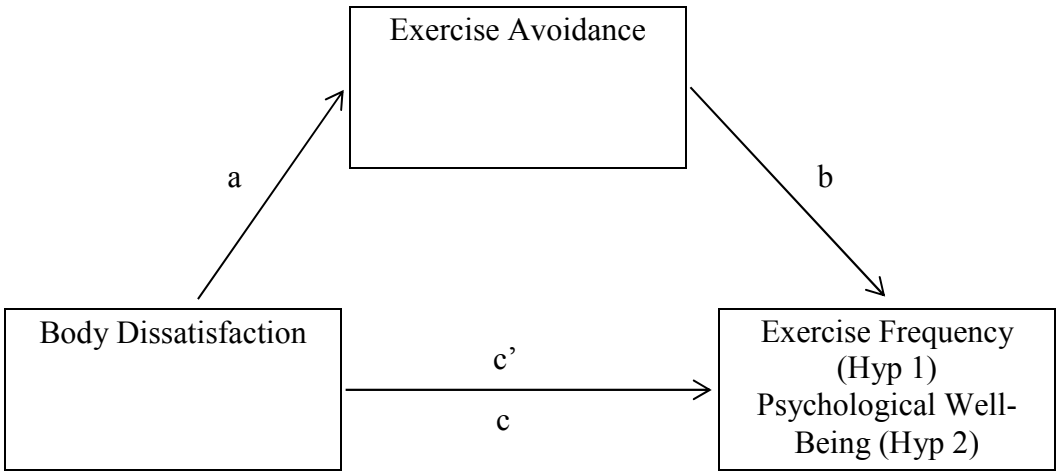


Figure 1. Mediation Model to Test Hypotheses 1 and 2

Note: path c refers to the total effect and path c' refers to the direct effect

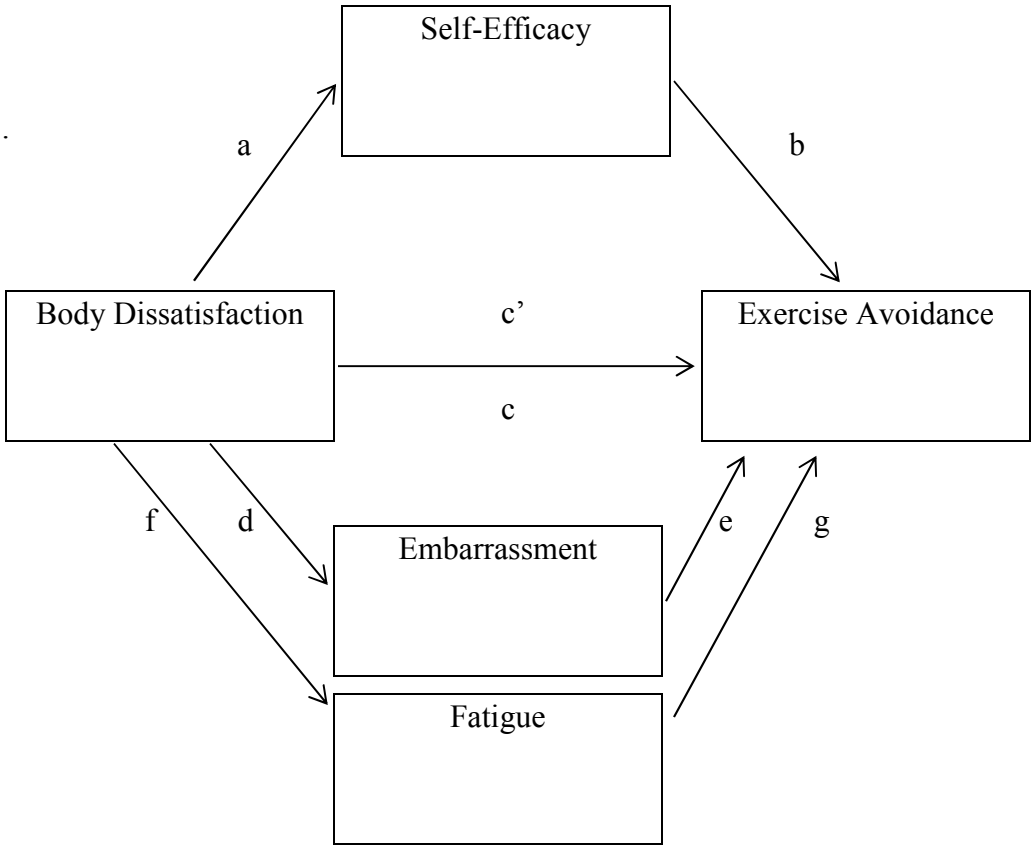


Figure 2. Mediation Model to Test Hypothesis 3

Note: Path c refers to the total effect and path c' refers to the direct effect

APPENDIX A

SELF-REPORT MEASURES

Body appreciation scale

1) I respect my body
2) I feel good about my body
3) On the whole, I am satisfied with my body
4) Despite its flaws, I accept my body for what it is
5) I feel that my body has at least some good qualities
6) I take a positive attitude toward my body
7) I am attentive to my body's needs
8) My self-worth is independent of my body shape or weight
9) I do not focus a lot of energy on being concerned with my body shape or weight
10) My feelings toward my body are positive, for the most part
11) I engage in health behaviors to take care of my body
12) I do not allow unrealistic images of women/men presented in the media to affect my attitudes towards my body
13) Despite its imperfections, I still like my body

Body shape satisfaction scale

1) Height
2) Weight
3) Shoulders
4) Body Build
5) Waist
6) Stomach
7) Thighs
8) Face
9) Body Shape
10) Hips

Exercise avoidance

1) I feel uncomfortable going to a gym
2) I avoid engaging in physical activity when others might be around

Subjective psychological well-being

1) I lead a purposeful and meaningful life
2) My social relationships are supportive and rewarding
3) I am engaged and interested in my daily activities
4) I actively contribute to the happiness and well-being of others
5) I am competent and capable in the activities that are important to me
6) I am a good person and live a good life
7) I am optimistic about my future
8) People respect me

Self-efficacy

1) I am confident that I can exercise for at least 20 minutes, three times per week for the next month

Perceived barriers to exercise

Embarrassment

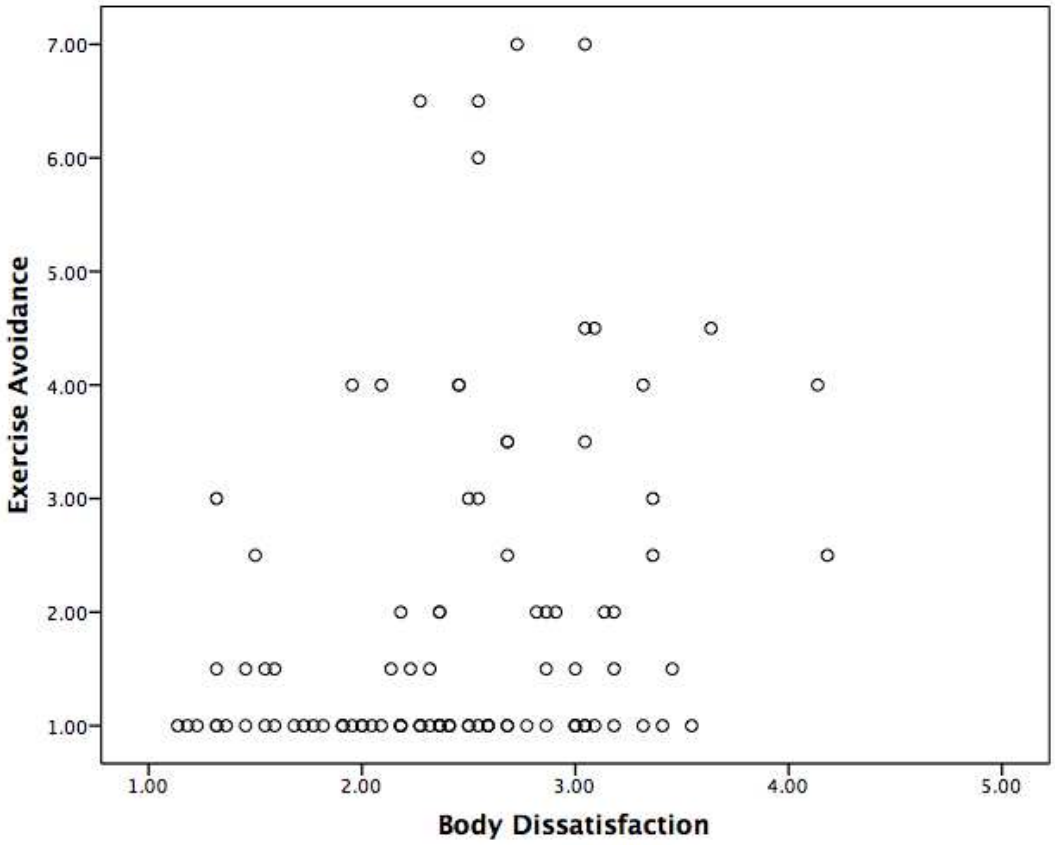
1) I am too embarrassed to exercise

Fatigue

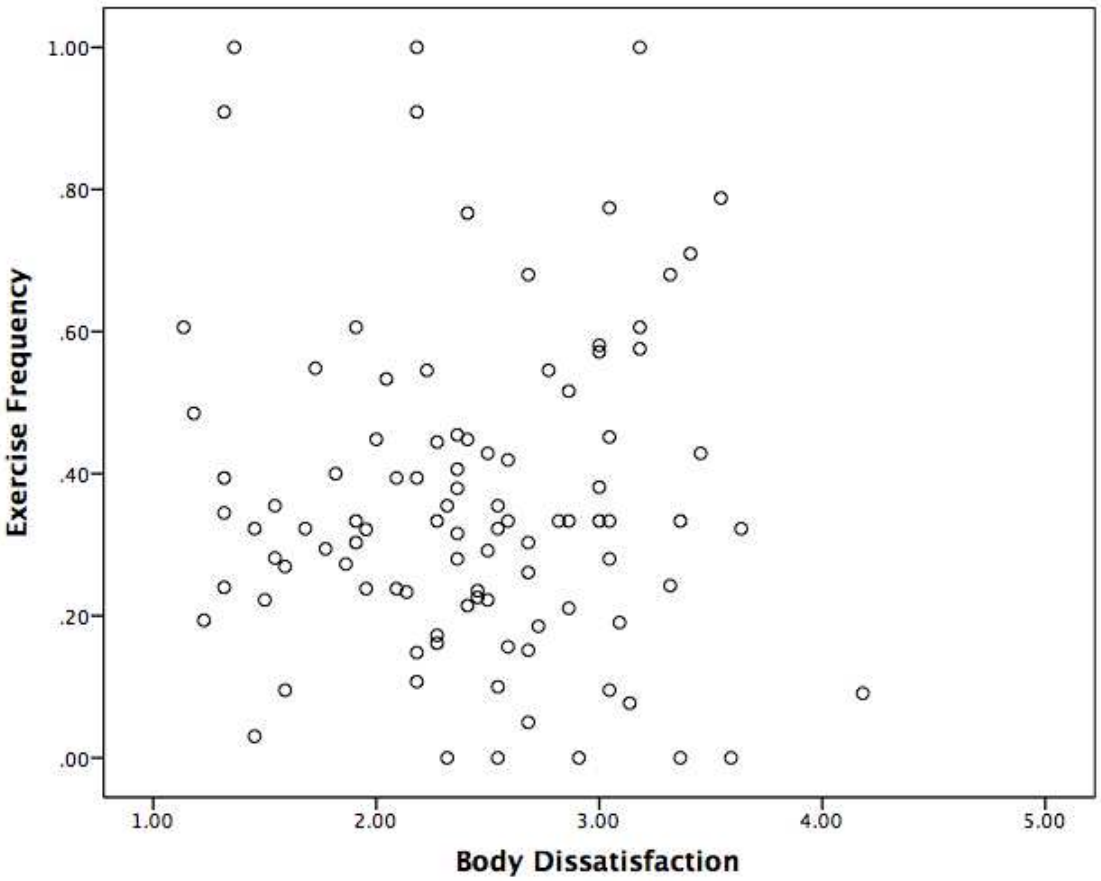
1) I am fatigued by exercise
2) Exercise is hard work

APPENDIX B

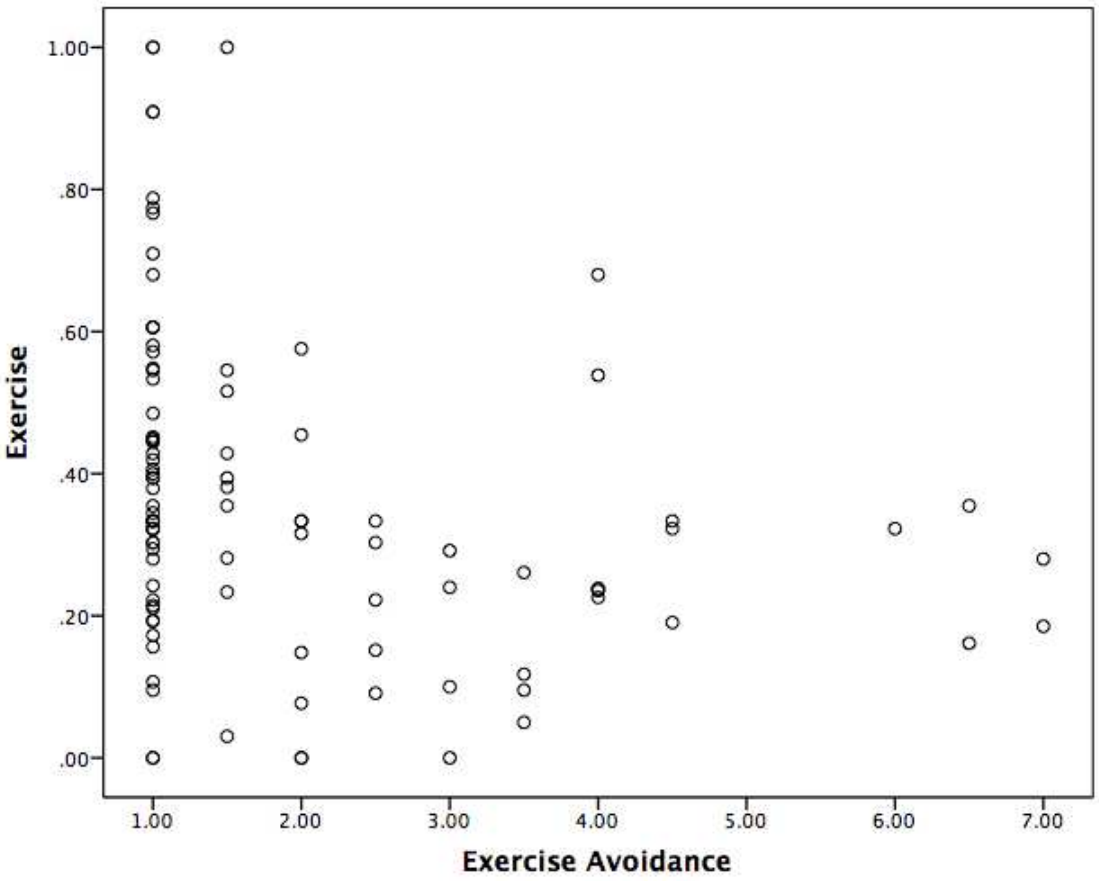
SCATTERPLOTS



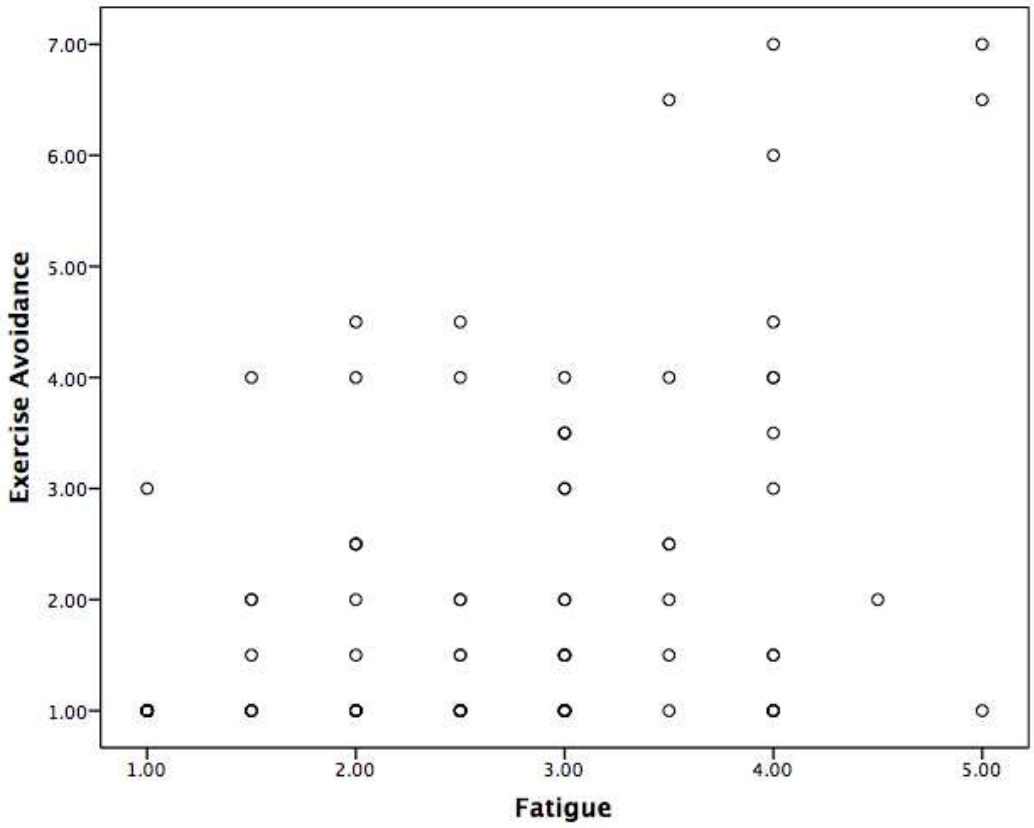
Scatterplot B1. Exercise Avoidance and Combined Body Dissatisfaction



Scatterplot B2. Exercise and Combined Body Dissatisfaction

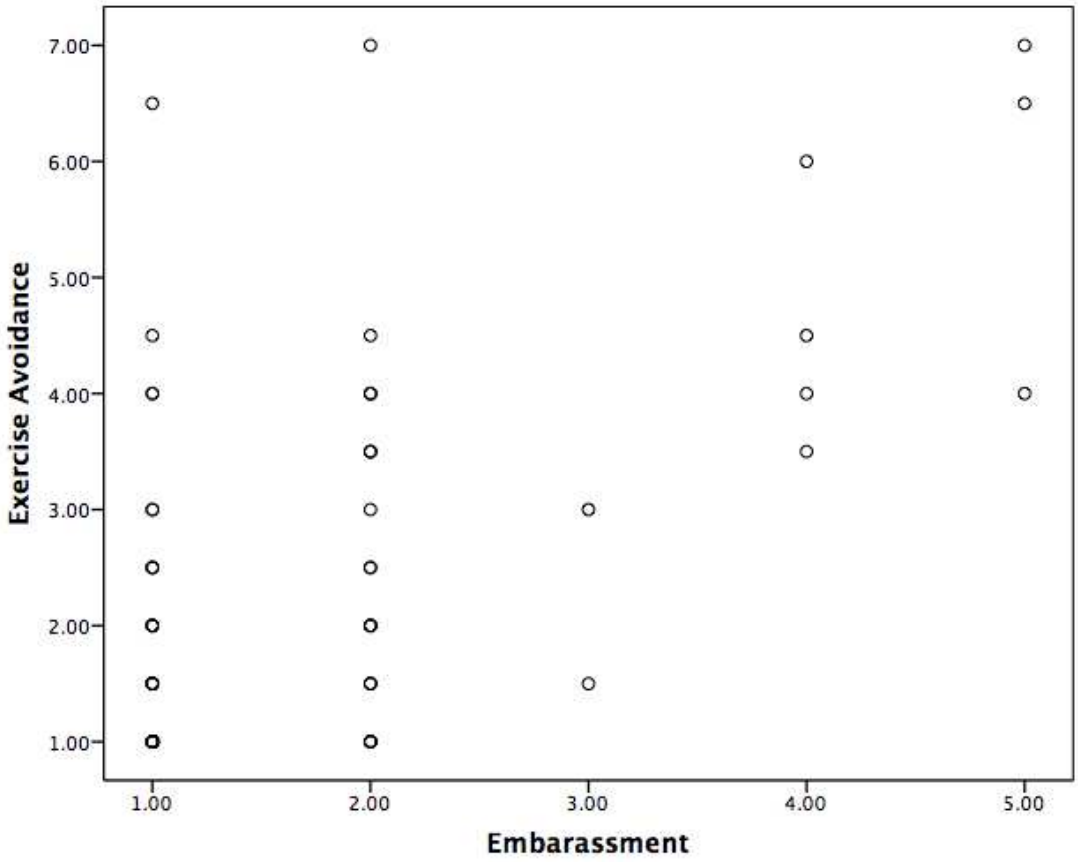


Scatterplot B3. Exercise and Exercise Avoidance

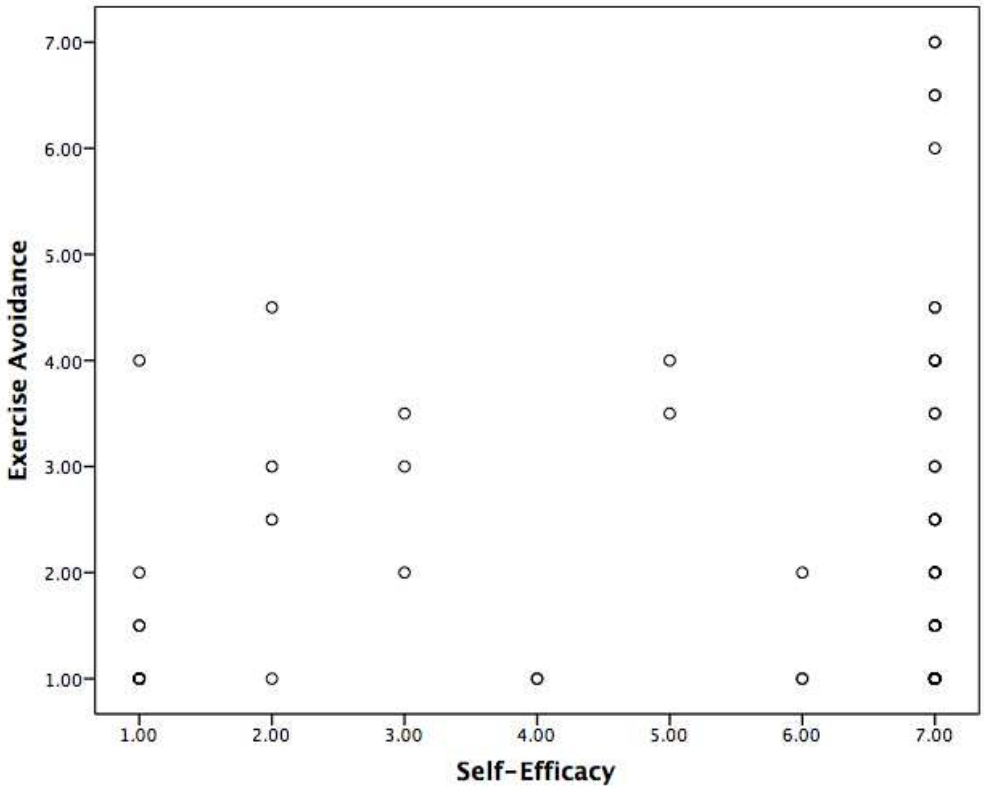


Scatterplot B4. Exercise Avoidance and Fatigue

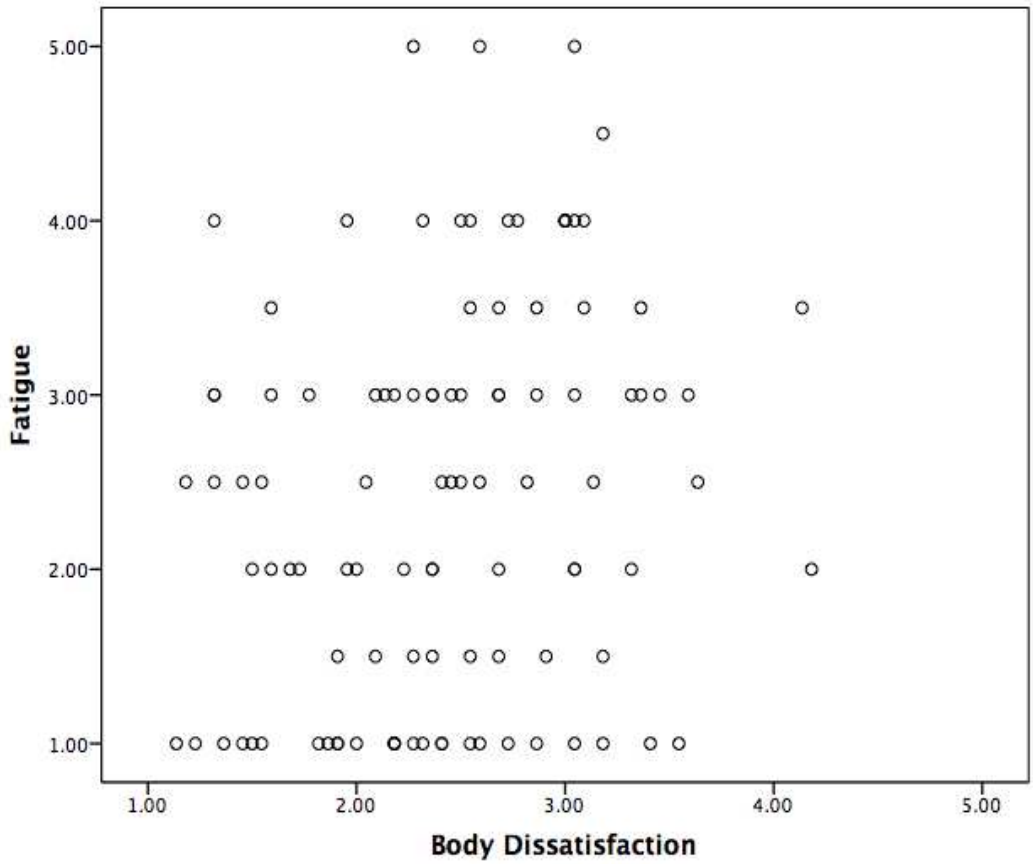
Scatterplot B5: Exercise Avoidance and Embarrassment



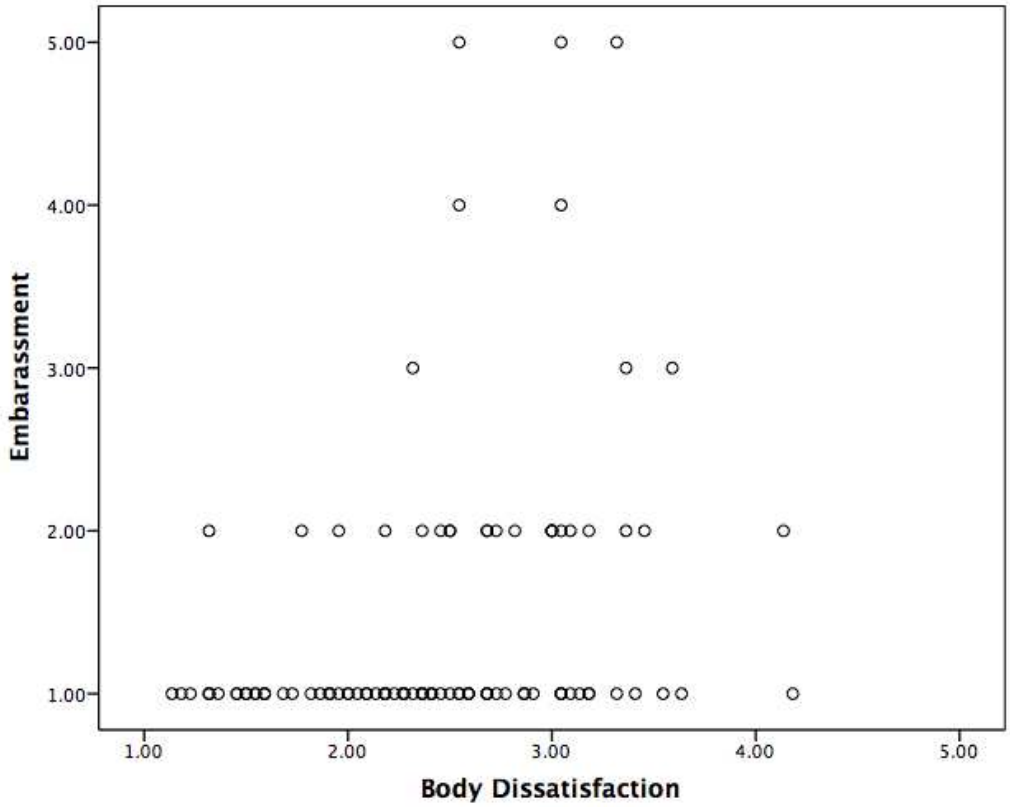
Scatterplot B5: Exercise Avoidance and Embarrassment



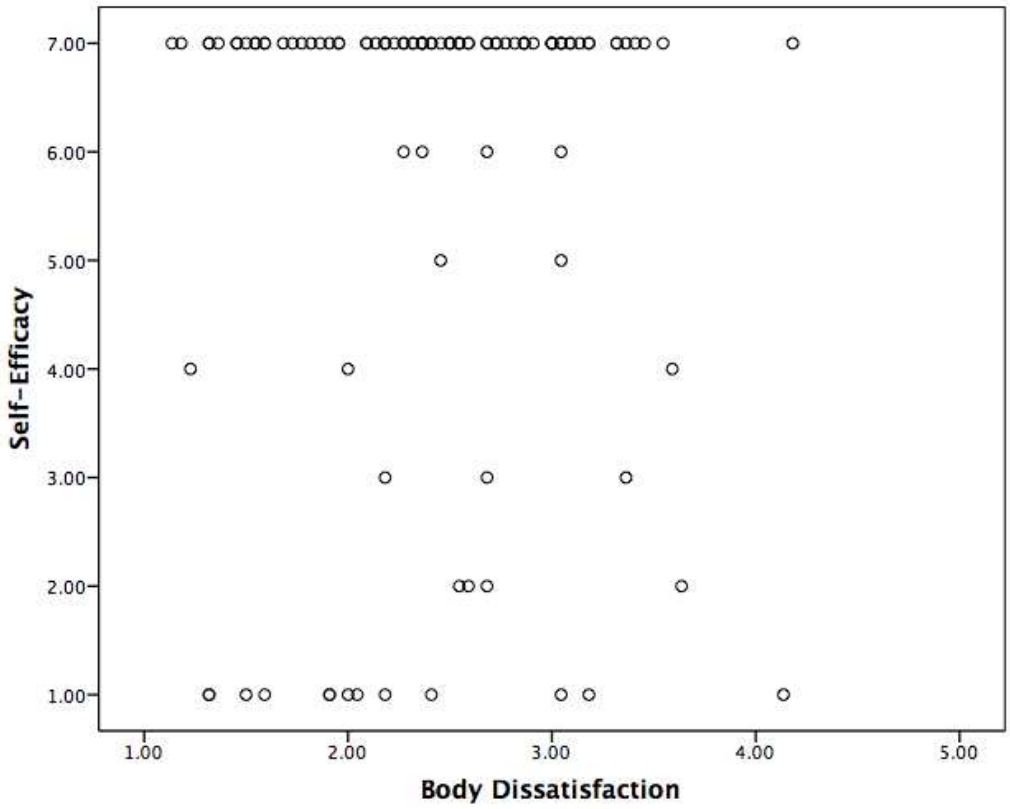
Scatterplot B6: Exercise Avoidance and Self-Efficacy



Scatterplot B7: Combined Body Dissatisfaction and Fatigue



Scatterplot B8: Combined Body Dissatisfaction and Embarrassment



Scatterplot B9: Combined Body Dissatisfaction and Self-Efficacy

APPENDIX C

RESULTS WITH EXCLUSION OF OUTLIERS

Table C1. Mediation analysis results for Hypothesis 1 (With Removal of Multivariate Outlier)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.45	.18	2.46	.01	.42	3.79
Path b	-.05	.02	-3.16	<.00	-.08	-.02
Path c	.01	.03	.49	.63	-.04	.07
Path c’	.04	.03	1.28	.20	-.02	.09

Note: path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for hypothesis 1 (*B* = -.02 (SE .01) [95% CI: -.04 to -.01])

Table C2. Mediation analysis results for Hypothesis 2 (With Removal of Multivariate Outlier)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.48	.17	2.80	.01	.14	.81
Path b	.11	.40	.27	.79	-.69	.91
Path c	-4.07	.67	-6.09	<.00	-5.39	-2.74
Path c’	-4.12	.70	-5.90	<.00	-5.51	-2.73

Note: Path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for hypothesis 2 (*B* = .05 (SE .19) [95% CI: -.31 to .41])

Table C3. Mediation analysis results for Hypothesis 3 (With Removal of Multivariate Outlier)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.10	.26	.40	.69	-.41	.62
Path b	-.03	.05	-.64	.52	-.14	.07
Path c	.47	.17	2.79	.01	.14	.81
Path c’	.14	.14	1.01	.31	-.14	.41
Path d	.27	.10	2.66	.01	.07	.46
Path e	.91	.15	6.06	<.00	.61	1.20
Path f	.34	.13	2.62	.01	.08	.61
Path g	.28	.11	2.45	.02	.05	.51

Note: Path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for fatigue (*B* = .10 (SE .06) [95% CI: .01 to .28])

Indirect effect for embarrassment (*B* = .24(SE .10) [95% CI: .08 to .47])

Indirect effect for self-efficacy (*B* = -.00(SE .02) [95% CI: -.06 to .01])

APPENDIX D

RESULTS WITHOUT MEAN IMPUTATION

Table D1. Mediation analysis results for Hypothesis 1 (Without Inclusion of Imputed Means)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.40	.15	2.74	.01	.11	.69
Path b	-.05	.02	-2.67	.01	-.08	-.01
Path c	.01	.02	.53	.59	-.04	.06
Path c’	.03	.03	1.27	.21	-.02	.08

Note: path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for hypothesis 1 (*B* = -.02 (SE .01) [95% CI: -.04 to -.01])

Table D2. Mediation analysis results for Hypothesis 2 (Without Inclusion of Imputed Means)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.44	.14	3.15	<.00	.16	.72
Path b	-.05	.47	-.11	.92	-.98	.88
Path c	-3.86	.63	-6.16	<.00	-5.10	-2.61
Path c’	-3.84	.66	-5.79	<.00	-5.15	-2.52

Note: Path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for hypothesis 2 (*B* = -.02 (SE .23) [95% CI: -.45 to .44])

Table D3. Mediation analysis results for Hypothesis 3 (Without Inclusion of Imputed Means)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.17	.23	.74	.46	-.29	.63
Path b	-.04	.04	-.87	.39	-.12	.05
Path c	.46	.13	3.39	<.00	.19	.72
Path c’	.14	.10	1.41	.16	-.06	.34
Path d	.26	.09	2.92	<.00	.08	.43
Path e	.90	.12	7.43	<.00	.66	1.14
Path f	.31	.12	2.68	.01	.08	.54
Path g	.29	.09	3.22	<.00	.11	.48

Note: Path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for fatigue (*B* = -.01(SE .02) [95% CI: -.08 to .01])

Indirect effect for embarrassment (*B* = .23(SE .09) [95% CI: .07 to .42])

Indirect effect for self-efficacy (*B* = .09 (SE .05) [95% CI: .02 to .23])

APPENDIX E

RESULTS WITH LOG10 TRANSFORMATION

Table E1. Mediation analysis results for Hypothesis 1 (Using Log10 of Exercise Avoidance and Frequency)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.08	.03	2.55	.01	.02	.15
Path b	-.42	.11	-3.91	<.00	-.63	-.21
Path c	.02	.03	.67	.51	-.05	.09
Path c’	.06	.03	1.73	.09	-.01	.12

Note: path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for hypothesis 1 (*B* = -.03 (SE .01) [95% CI: -.07 to -.01])

Table E2: Mediation analysis results for Hypothesis 2 (Using Log10 of Exercise Avoidance and Psychological Well-Being)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.09	.03	3.01	<.00	.03	.15
Path b	.01	.02	.34	.73	-.04	.06
Path c	-.04	.01	-5.77	<.00	-.05	-.02
Path c’	-.04	.01	-5.59	<.00	-.06	-.03

Note: Path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for hypothesis 2 (*B* = <.00 (SE <.00) [95% CI: <-.00 to .01])

Table E3. Mediation analysis results for Hypothesis 3 (Using Log10 of Exercise Avoidance, Embarrassment, and Self-Efficacy)

	B	SE	*t*	*p*	Lower Limit of 95% Confidence Interval	Upper Limit of 95% Confidence Interval
Path a	.02	.03	.50	.62	-.05	.09
Path b	-.03	.07	-.37	.71	-.17	.12
Path c	.09	.03	3.00	<.00	.03	.15
Path c’	.03	.03	1.27	.21	-.02	.08
Path d	.06	.02	2.93	<.00	.02	.10
Path e	.67	.14	4.96	<.00	.40	.94
Path f	.34	.13	2.62	.01	.08	.61
Path g	.04	.02	2.06	.04	<.00	.09

Note: Path c refers to the total effect and path c’ refers to the direct effect

Indirect effect for fatigue (*B* = .02(SE .01) [95% CI: <.00 to .05])

Indirect effect for embarrassment (*B* = .04(SE .02) [95% CI: .01 to .08])

Indirect effect for self-efficacy (*B* = <-.00(SE .02) [95% CI: -.01 to <.00])