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## Examining Body-Focused Self-Improvement and Self-Evaluation Social Comparisons on Exercise in Young Adult Women Using Ecological Momentary Assessment

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**EXAMINING BODY-FOCUSED SELF-IMPROVEMENT AND SELF-EVALUATION  
SOCIAL COMPARISONS ON EXERCISE IN YOUNG ADULT WOMEN USING  
ECOLOGICAL MOMENTARY ASSESSMENT**

by

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## ABSTRACT

### EXAMINING BODY-FOCUSED SELF-IMPROVEMENT AND SELF-EVALUATION SOCIAL COMPARISONS ON EXERCISE IN YOUNG ADULT WOMEN USING ECOLOGICAL MOMENTARY ASSESSMENT

Rachel I. MacIntyre  
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Exercise is highly recommended by health professionals due to its numerous health benefits, yet little is known about the social factors that influence people's motivation to exercise each day. Studies on social comparisons reveal that college women frequently evaluate their weight and shape compared to those around them through upward body-focused comparisons (i.e., comparing themselves to someone they perceive to be thinner or in better physical shape). Research suggests these comparisons can be driven by two different motivations, self-evaluation and self-improvement. However, the occurrence of these two different types of motivations in everyday life and how they may be associated with different levels of body dissatisfaction and exercise behaviors have yet to be examined in an ecologically valid study. The purpose of this study was to examine whether the way in which women seek and internalize daily upward body-focused social comparisons, in a self-evaluation or a self-improvement manner, is associated with different levels of body dissatisfaction, exercise intentions, and behaviors. Undergraduate college women ( $N = 74$ ,  $M_{age} = 20.4$  years) completed ecological momentary assessment measures on the frequency and nature of their social comparisons, their thoughts of exercising, and body dissatisfaction five times per day for seven consecutive days. Intentions to exercise the next day were gathered each night and their exercise behavior was collected continuously with a Fitbit accelerometer. Multilevel analyses revealed that comparisons high in self-evaluation and self-improvement were significantly associated with greater momentary thoughts of exercising

( $p < .05$ ), but no associations were found between the motivations and momentary body dissatisfaction or daily exercise intentions or behaviors ( $p > .05$ ). However, person-level differences in baseline measures of body dissatisfaction, appearance comparison tendency, and exercise behaviors used as moderators revealed differences between these motivations as well as their associations with body dissatisfaction and exercise behaviors. This was the first study to examine motivations to engage in naturally occurring upward body-focused comparisons. Theoretical and clinical implications associated with self-improvement motivation findings and future directions for research are discussed.

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This thesis is dedicated to my parents, Liz and Jeff, and sister, Sara, for their unwavering love and support.

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## CHAPTER I

### INTRODUCTION

The Physical Activity Guidelines for Americans recommend that adults get a minimum of two and half hours of moderate-intensity aerobic activity or an hour and fifteen minutes of vigorous-intensity aerobic activity a week for good health (U.S. Department of Health and Human Services, 2008). The health benefits associated with physical activity include reduced risk of type 2 diabetes, obesity, cardiovascular disease, and breast cancer (Bauman, 2004). Unfortunately, most adults do not meet these requirements and the decline begins in late adolescence and early adulthood resulting in a mere 43.6% of college students who engage in enough physical activity to attain health benefits (American College Health Association, 2009; Casperson, Pereira, & Curran, 2000). Furthermore, these low physical activity levels are predictive of physical activity in later adulthood making young adulthood a pivotal time for physical activity interventions (Casperson et al., 2000). Additionally, college women are most in need of interventions as only 39.9% meet the physical activity requirements compared to the 50.4% of their male counterparts (American College Health Association, 2009). However, before we can create effective interventions to increase physical activity in college students, particularly college women, we need to first better understand the factors that influence these behaviors in this population. The present study will contribute to this gap in the literature by examining daily social influences on college women's exercise behaviors.

#### **Theory of Planned Behavior**

Past research has commonly used the theory of planned behavior as a way to understand why people engage in physical activity. The theory postulates that when and why people engage in behaviors is dependent upon the strength of their intentions (Ajzen, 1991). While intentions

influence behaviors, a person's perceived control, attitude, and subjective norms towards the activity influence their intentions (Ajzen, 1991) and, subsequently, affect whether a person engages in a particular behavior. The theory posits that people are more likely to engage in a behavior when they have a positive attitude towards the activity (attitudes), perceive the activity as an expectation of others (subjective norms), and believe they have control over the activity (perceived control; Ajzen, 1991; Conroy, Elavsky, Doerksen, & Maher, 2013). This theory has been used to better understand why some people engage in exercise while others do not, and within those who do exercise, why people engage in exercise some days and not others (Conroy, Elavsky et al., 2013; Hagger, Chatzisarantis, & Biddle, 2002; Rhodes & Nigg, 2011).

While there is strong evidence that greater perceived control and positive attitudes towards exercise are associated with stronger intentions to exercise, the influence of subjective norms (i.e. other people's expectations for behavior) has received less support (see Figure 1; Conroy, Elavsky et al., 2013; Hagger et al., 2002). Studies have found subjective norms to have small or no significant effect on exercise intentions (Conroy, Elavsky et al., 2013; Hagger et al., 2002). However, it is plausible that there are either inconsistencies with the way in which subjective norms are defined and operationalized or the constructs themselves do not account for potential social influences on exercise intentions (Miniard & Cohen, 1981). While general subjective norms are the perceived social pressures to perform a behavior, these are often further divided into injunctive and descriptive subjective norms. Injunctive subjective norms can be defined as beliefs about what ought to be done, while descriptive subjective norms are beliefs about what is actually done by others (Conroy, Elavsky et al., 2013; Hagger et al., 2002). In terms of exercise behavior, subjective norms would suggest people have greater intentions to

exercise if they believe it is something they should or ought to do (injunctive) and something that many others are doing (descriptive).

A study that investigated the influence of daily subjective norms on exercise intentions and behaviors in college men and women was conducted by Conroy, Elavsky and colleagues (2013). In their daily diary study, they measured descriptive subjective norms with the item “I saw a lot of people exercising today” and injunctive subjective norms with “Other people expect me to exercise tomorrow.” They found that endorsing the injunctive norms item was significantly correlated with greater exercise intentions, but the descriptive subjective norms item did not produce a significant effect. It is possible that the social influence on exercise intentions is not simply whether a person observes a lot of people exercising measured via the descriptive subjective norms item used by Conroy, Elavsky and colleagues (2013), but rather whether they actually compare themselves to a lot of people who they perceive exercise more than them. If this is true, then this act of comparing oneself to others they perceive perform the behavior may be a useful extension to the theory of planned behavior.

While the main focus of the present study is to examine this additional social influence on exercise intentions and behaviors, a secondary aim of the study will investigate whether the operational definitions of subjective norms used by Conroy, Elavsky and colleagues (2013) influenced their findings. This will be further discussed in Aim 4.

### **A Social Comparison Extension to the Theory of Planned Behavior**

Social comparison theory states that people have a drive to assess their progress and standing in life by comparing themselves to others (Festinger, 1954). Comparing oneself to others can occur both intentionally and unintentionally and is considered a common social phenomenon (Suls, Martin, & Wheeler, 2002). It has been found to be particularly common

amongst college women (Borsari & Carey, 2001). During college, social interactions become more significant as the majority of support and influence is gathered from peers rather than parents (Borsari & Carey, 2001) and for women, concerns about weight and shape become increasingly salient (Cash & Green, 1986). A common way in which peer influence on weight and shape ideals is transferred through social interactions is by mode of social comparisons (Corning, Krumm, & Smitham, 2006). Previous studies reveal that college women frequently engage in appearance-related social comparisons, making comparisons between their appearance and the appearance of others around them (Fitzsimmons-Craft, 2011; Leahey, Crowther, & Mickelson, 2007). Additionally, these comparisons have been found to more often involve comparing oneself to someone they perceive to be better looking than them (known as an *upward comparison*), than making comparisons to someone they perceive to be less attractive (known as a *downward comparison*; Festinger, 1954; Fitzsimmons-Craft, 2011; Myers & Crowther, 2009). Upward appearance-related social comparisons are of particular importance because they expose women to thin ideals and influence their thoughts and feelings about their own bodies (Fitzsimmons-Craft, 2011).

Understanding the body-related feelings and cognitions associated with these comparisons is important in the study of daily exercise behaviors in a population of college women. Given that college women are often motivated to exercise to alter their body shape or weight (Kilpatrick, Hebert, & Bartholomew, 2005), patterns of body-related thoughts and feelings associated with these comparisons may impact their intentions to exercise and exercise behaviors. Therefore, it is important to examine the frequency and nature of upward body-focused comparisons, appearance-related comparisons that focus on attributes that are affected by exercise (body weight and shape), in natural settings and their associations with body

dissatisfaction and exercise intentions and behaviors. This will help us better understand the social influences on daily exercise behavior in college women and evaluate whether upward body-focused comparisons are a useful extension to the theory of planned behavior.

### **Social Comparison Motivations**

In his original theory, Festinger (1954) postulated that people engage in social comparisons for the sole purpose of evaluating themselves to others around them. However, recent theorists have suggested that there may be another motivation behind these social comparisons, self-improvement (Hegelson & Mickelson, 1995). These theorists propose that people engage in comparisons motivated by self-improvement if they perceive their comparison target to be a knowledgeable resource from whom they can gain information and learn how to improve themselves to be more like them (Buunk & Gibbons, 2007; Leahey et al., 2007). For instance, body image research suggests that women who engage in upward body-focused self-improvement comparisons perceive women who are thinner or in better physical shape to be knowledgeable resources and seek these comparisons for inspiration and information on how to be thinner or in better physical shape (Buunk & Gibbons, 2007). If we combine information from the theory of planned behavior and social comparison theory, theory would suggest that women who are motivated to engage in upward body-focused social comparisons for self-improvement will have stronger intentions to achieve their ideal weight or shape and will engage in greater self-improvement behaviors, such as exercise, following these comparisons. Conversely, women who are motivated to engage in body-focused upward social comparisons for self-evaluation will engage in comparisons for the sole purpose of evaluating their body and will likely feel dissatisfied with their body following these comparisons without having the intentions to change their weight or shape (Fitzsimmons-Craft, 2011).

At this time, when and how these two different motivations to engage in upward body-focused social comparisons occur is unknown. Some women may have a greater tendency to engage in self-improvement body-focused comparisons and others self-evaluation body-focused comparisons (that is, a between-person process). This may be associated with overall differences in body dissatisfaction and exercise between these two groups. However, it is more likely that all women engage in self-improvement body-focused comparisons some times and self-evaluation body-focused comparisons other times (that is, a within-person process; Knobloch-Westerwick, 2015). This vacillation between self-evaluation and self-improvement social comparisons could differentially influence college women's intentions to exercise and, therefore, could help to explain why they exercise some days and not others.

Most of the research on the influence of social comparisons on body dissatisfaction in college women has found that exposures to ideal body imagery are associated with an increase in body dissatisfaction (Fitzsimmons-Craft et al., 2015; Krones, Stice, Batres, & Orjada, 2005). Both an experimental study (Krones et al., 2005) and an observational daily diary study (Fitzsimmons-Craft et al., 2015) with college women found this increase in body dissatisfaction within the short period following thin ideal exposures. Still there are experimental studies that found an association between magazine and television thin ideal exposures and positive body ratings in young adult women (Mills, Polivy, Herman, & Tiggemann, 2002; Myers & Biocca, 1992).

In an experimental study, Knobloch-Westerwick (2015) investigated whether women's motivation to engage in these body-focused comparisons could explain this difference in previous findings. In this study, thin-ideal magazine images were presented to college women 16 times in a daily 30-minute laboratory session for five consecutive days. Self-improvement and

self-evaluation comparisons to these exposures were measured after each exposure. Knobloch-Westerwick (2015) found that different comparison motivations had opposite effects on body satisfaction; self-improvement social comparisons increased body satisfaction while self-evaluation social comparisons decreased body satisfaction. This study provides evidence that women can engage in both self-evaluation and self-improvement comparisons and that the different motivations have different effects on body satisfaction. However, a limitation of these findings is that they provide no evidence of this pattern in real-life settings with naturally occurring social comparisons, and it is unclear how these different comparison motivations might influence behaviors, such as exercise.

### **Social Comparison and Exercise in Daily Life**

While the influence of self-evaluation and self-improvement social comparisons on exercise behavior in real life have yet to be researched, there is evidence that upward social comparisons can increase thoughts of exercising and engagement in exercise behaviors in the daily lives of young adult women (Leahey et al., 2007; Leahey, Crowther, & Ciesla, 2011; Rancourt, Leahey, LaRosa, & Crowther, 2015). Rancourt et al. (2015) found that upward weight-focused social comparisons increased thoughts of exercising and reports of exercise engagement in overweight young adult women. Leahey et al. (2011) found this relationship to be stronger in young adult women who reported high trait-level body dissatisfaction and eating pathology symptoms. Neither of these studies examined social comparison motivations, intentions to exercise, or exercise behavior with an objective measure (e.g., an accelerometer). While it is apparent that body-focused social comparisons are associated with thoughts of exercising in young adult women, it is unclear how these comparisons are associated with actual exercise

behaviors and how different motivations to engage in comparisons may influence these relationships.

A better understanding of the association between upward body-focused social comparison motivations and exercise intentions and behaviors could contribute to the theory of planned behavior and be used to develop more effective interventions to increase exercise behaviors. A greater understanding of factors that influence daily intentions to exercise and actual engagement in exercise behaviors would be especially beneficial to college women who are most in need of increasing their levels of physical activity (Bray & Born, 2004).

### **Potential Moderators**

Previous research indicates trait-level body dissatisfaction (Leahey et al., 2011), tendency to engage in social comparisons (Fitzsimmons-Craft et al., 2015), and baseline exercise behaviors (Gardner, de Bruijn, & Lally, 2011), may be important moderators in the relationship between social comparisons, body dissatisfaction, and exercise thoughts and behaviors. Although there is somewhat limited research on body-focused social comparison in young women, existing research has examined trait-level relationships in laboratory and natural settings.

**Body dissatisfaction.** Because there is evidence that upward body-focused social comparisons influence one's thoughts and feelings about one's body, it is important to examine whether one's trait-level body dissatisfaction influences the amount of change caused by the comparisons. The findings of Leahey et al. (2011) suggest that college women with greater trait-level body dissatisfaction engage in greater appearance-related social comparisons and greater exercise thoughts and behaviors following their comparisons than individuals with low trait-level body dissatisfaction. This suggests that individuals with a high trait-level body dissatisfaction may be more likely to engage in upward body-focused social comparisons and experience

stronger relationships with outcomes, but whether they engage in both self-evaluation and self-improvement comparisons and experience differences in body dissatisfaction and exercise-related thoughts and behaviors with these two types is unknown and important to examine.

**General social comparisons.** It is also important to examine whether the relationship exists across individuals with a greater tendency to engage in social comparisons. An individual who compares herself to others often may become desensitized to the comparisons and experience less change in her thoughts and behaviors following the comparisons or she may experience greater thoughts and behaviors that motivate her comparisons. The findings of an ecological momentary assessment (EMA) study on social comparisons, body surveillance, and body dissatisfaction suggest that college women with high trait-like engagement in body comparisons experience higher levels of body dissatisfaction during the same short-term period they engaged in in a body-focused comparison (Fitzsimmons-Craft et al., 2015). Even though there is no research on this potential moderator in the relationships between body-focused comparison motivations and exercise, the findings of Fitzsimmons-Craft et al. (2015) suggest it may moderate the relationships and may reveal individuals that experience greater negative outcomes when engaging in higher levels of self-evaluation comparisons.

**General exercise behavior.** Similar to a general tendency to engage in social comparisons, individuals who exercise each day also may not experience a similar pattern of thoughts and behaviors following body-focused comparisons. The exercise behavior of individuals who exercise each day may be driven by a different motivation (e.g., sports training) that is not influenced by engaging in body-focused social comparisons. Physical activity research suggests that people with strong physical activity intentions no longer need to assess the positive outcomes associated with exercise or reflect on their attitudes or intentions to exercise (Gardner,

et al., 2011). Because there is a medium to strong relation between habit strength and physical activity (Gardner et al., 2011), there is perhaps a weaker association between upward body-focused comparisons and exercise intentions and behaviors in individuals who habitually exercise each day. It is possible that this pattern also applies to individuals with strong sedentary habits (Conroy, Maher, Elavsky, Hyde, & Doerksen, 2013). Like those with strong habits to exercise, individuals who habitually refrain from physical activity likely experience less daily change in their exercise intentions and behaviors regardless of the number of body-focused comparisons they conduct.

### **The Present Study**

The present study used ecological momentary assessment (EMA) to examine the impact of naturally occurring body-focused social comparisons on body dissatisfaction and exercise thoughts, intentions, and behaviors in young adult women. Most importantly, it examined whether the two distinct motivations to engage in body-focused social comparisons (i.e., self-evaluation and self-improvement) observed by Knobloch-Westerwick (2015) exist in real-life settings and whether these motivations differentially influence body dissatisfaction and exercise-related cognitions and behaviors. EMA was used because the constructs being measured (i.e., social comparison motivation, behavior intentions, and cognitions) are dynamic across time as well as between individuals. In order to capture the natural occurrence of social comparison events and limit recall bias in our results, data were collected five times a day across seven consecutive days.

In each of the EMA surveys, participants reported the body-focused social comparisons they made since the last time they filled out a survey. If they endorsed any social comparisons, they were asked follow-up questions about the nature of the comparisons (upward or downward),

the type of comparison (self-improvement or self-evaluation), as well as a series of questions assessing their thoughts about their body and exercise since their last comparison. In addition, participants were asked if and when they exercised that day and whether they intend to exercise the next day in the end-of-day survey. Furthermore, exercise behavior was objectively measured continuously throughout the seven days via wrist-worn Fitbit accelerometers.

**Aim 1.** The first aim of the present study was to investigate the between-person (Hypothesis 1a) and within-person (Hypothesis 1b) influence of upward body-focused social comparisons on exercise thoughts, intentions, and behaviors. The between-person analyses proposed for Hypothesis 1a tested whether people who engage in more upward body-focused social comparisons differ in body dissatisfaction and exercise-related thoughts and behaviors than people who engage in less upward body-focused social comparisons. The within-person analyses proposed for Hypothesis 1b tested whether engaging in more upward body-focused social comparisons on some days was associated with greater body dissatisfaction and exercise-related thoughts and behaviors on those days than on days when women engage in fewer upward body-focused social comparisons.

***Hypothesis 1a (Person-level).*** Based on the findings of previous EMA studies, it was hypothesized that participants who report more upward body-focused comparisons across the seven days will also report greater body dissatisfaction, more thoughts of exercising, greater intentions to exercise (measured via self-report EMA), and also exercise more (measured via Fitbit accelerometers).

***Hypothesis 1b (Day-level).*** On days when participants are higher in upward body-focused comparisons, they will report greater body dissatisfaction, more thoughts of exercising, greater intentions to exercise the next day, and exercised more.

**Aim 2.** The second aim of the present study was to evaluate the findings of Knobloch-Westerwick (2015) in natural settings. Knobloch-Westerwick (2015) demonstrated that in a laboratory setting using an experimental manipulation, women can engage in two different forms of social comparisons, self-evaluation and self-improvement, and that engaging in them can have different effects on women's body dissatisfaction. However, the study did not assess whether women actually engage in these two types of comparisons in their daily lives and whether similar effects occur in the real world. The following analyses measured whether the association between self-improvement comparisons and lower body dissatisfaction and that between self-evaluation comparisons and greater body dissatisfaction observed by Knobloch-Westerwick (2015) exists within naturally occurring comparisons and explore how they relate to exercise thoughts, intentions, and behaviors.

***Hypothesis 2a (Moment-level).*** At times when participants report having engaged in higher levels of self-improvement upward body-focused comparisons, they will also have lower body dissatisfaction and greater thoughts of exercising.

***Hypothesis 2b (Day-level).*** On days when participants engage in higher levels of self-improvement upward body-focused comparisons, they will exercise more and have greater intentions to exercise the next day.

***Hypothesis 2c (Moment-level).*** At times when participants report having engaged in higher levels of self-evaluation upward body-focused comparisons, they will also have greater body dissatisfaction and less thoughts of exercising.

***Hypothesis 2d (Day-level).*** On days when participants engage in higher levels of self-evaluation upward body-focused comparisons, they will not experience a significant increase in their exercise behavior or their intentions to exercise the next day.

**Aim 3.** The third aim of the present study was to explore the moderating influence of baseline measures of trait-level body dissatisfaction, tendency to engage in social comparisons, and exercise behaviors on the associations examined in Hypotheses 2a-d.

**Hypothesis 3a.** It was hypothesized that trait-level body dissatisfaction would weaken the associations described in Hypotheses 2a-d. Individuals with very high or very low trait-level body dissatisfaction would likely not experience a significant change in their body dissatisfaction or exercise, thoughts, intentions, or behaviors following upward body-focused social comparisons because other feelings and cognitions likely maintained their positive or negative body images.

**Hypothesis 3b.** Given the evidence that individuals who frequently engage in body-focused comparisons experience greater body dissatisfaction following their comparisons (Fitzsimmons-Craft et al., 2015), it was hypothesized that one's natural tendency to engage in these comparisons would strengthen the association between comparisons with higher levels of self-evaluation and body dissatisfaction and would weaken the associations between comparisons with higher levels of self-improvement and body dissatisfaction, exercise thoughts, exercise intentions, and exercise behaviors.

**Hypothesis 3c.** Like trait-level body dissatisfaction, it was hypothesized that baseline exercise behavior would weaken the associations described in Hypotheses 2a-d. Individuals who do not exercise would likely not be motivated to exercise following any upward body-focused social comparison. In contrast, individuals who exercise every day have established a routine and are driven to exercise due to motivations that are not changed whether they engage in upward body-focused comparisons with high levels of self-improvement or not. Therefore, it was predicted that only moderate exercisers will experience the associations described in Aim 2.

**Aim 4.** The final aim of this study examined whether the operational definition of

subjective norms used by Conroy, Elavsky and colleagues (2013) influenced their findings. According to subjective norms research, individuals have distal (e.g., crowds) and proximal levels (e.g., close friends) of peer perceptions, perceptions of the attitudes held by others around them (Paek, 2009). Individuals also differentiate between subjective norms of proximal peers and those of distal peers and may be influenced by either depending on the behavior (Borsari & Carey, 2003). Yun and Silk (2011) found proximal peer descriptive norms and proximal peer injunctive norms (i.e., perceptions of close friends) were related to intentions to exercise in college students. Distal peer descriptive norms and distal peer injunctive norms (i.e., perceptions of other college students) were not related to their intentions to exercise. These findings demonstrate that the distance between participants and the norms being assessed is important to consider when examining the influence of subjective norms on exercise behavior. They also suggest that proximal peer norms have a larger influence on college student exercise intentions than distal peer norms. This could explain why Conroy, Elavsky and colleagues (2013) did not find a significant influence of descriptive subjective norms on daily exercise intentions in college students; they assessed distal peer descriptive norms with the item “I saw a lot of people exercising today”. Their findings indicate that distal descriptive subjective norms do not influence college students’ daily intentions to exercise, but they do not tell us about the effect of proximal peer descriptive norms on their daily exercise intentions. Even though Conroy, Elavsky and colleagues (2013) found injunctive subjective norms to significantly influence college student exercise intentions, they did not distinguish between proximal and distal peer injunctive norms. The item they used to assess injunctive norms, “Other people expect me to exercise tomorrow”, captures the expectation of others on the behavior, but does not provide insight into *who* these other people are with the expectation. Examining both distal and proximal descriptive and injunctive norms may be useful

for developing a better understanding of the influence of subjective norms on daily exercise behavior.

**Research Question (Day-level).** To explore the influence of proximal and distal descriptive and injunctive subjective norms on exercise intentions.

## CHAPTER II

### METHOD

#### Participants

Female undergraduate students between the ages of 18 and 25 were recruited through Old Dominion University's SONA system. A power analysis for multilevel modeling was conducted prior to recruitment to determine the sample size needed. Based on the G\*Power 3.1.9 regression analysis (Faul, Erdfelder, Lang, & Buchner, 2007), 159 participants would be required to observe a small to medium effect ( $f^2=.05$ ) for one predictor and 222 participants would be required for three predictors. However, because this regression power analysis did not account for the correlation amongst residuals in multilevel nested designs, a formula developed by West and colleagues (2011) was used to determine the number of participants needed for a nested design (i.e., EMA) for power of .80. Based on previous research it was expected that participants would report about 6 upward body-focused comparisons in this study's 7 days of assessments (Rancourt et al., 2015). Previous physical activity EMA research suggested we would see an intraclass correlation coefficient (ICC; the total variance due to individual differences) of .33 (Conroy, Elavsky et al., 2013). Given the expected number of EMA reports for each participant, and assuming an ICC of .33, a sample size of 70 participants would yield power of .80. Seventy-seven participants were recruited and 74 were included in the analyses, providing sufficient data to use for testing study aims.

#### Baseline Measures

**Body Mass Index.** Participants' height and weight were measured during their initial laboratory visit. Their body mass index (BMI) was calculated by dividing their weight in kilograms by their squared height in meters.

**Tendency to engage in social comparisons.** The Physical Appearance Comparison Scale-Revised (PACS-R; Schaefer & Thompson, 2014) was used to assess participants' baseline tendency to compare their physical appearance to the appearance of others (see Appendix A). The PACS-R is an 11-item measure that assesses this tendency in eight social contexts and with five different aspects of one's physical appearance. The scale asks participants to indicate how often they make each type of comparison on a 5-point Likert scale (0 = *never* and 4 = *always*). Participants' responses on these 11 items were summed to determine their baseline tendency to engage in social comparisons. Schaefer and Thompson (2014) found high internal consistency ( $\alpha = .97$ ) within a sample of female undergraduate students. Additionally, they found the measure to have high convergent and divergent validity. The measure was significantly positively correlated with measures of eating pathology ( $r = .68$ ) and internalization of appearance ideals ( $r = .63$ ) as well as significantly negatively correlated with measures of body satisfaction ( $r = -.55$ ) and self-esteem ( $r = -.39$ ; Schaefer & Thompson, 2014). In the present study, the PACS-R demonstrated high internal consistency ( $\alpha = .95$ ). In addition to the PACS-R total score, a PACS-R squared total score was created by squaring the values of the PACS-R total score in order to examine potential curvilinear relationships in Hypothesis 3b.

**Trait-level body dissatisfaction.** The Body Shape Questionnaire (BSQ-16; Evans & Dolan, 1993) was used to assess participants' trait level body dissatisfaction. The BSQ-16 is a 16-item questionnaire that measures concerns about body shape (see Appendix B). Participants were asked to rate the frequency with which they experience body dissatisfaction on a 7-point Likert scale (0 = *never* to 6 = *always*). Higher scores indicate greater body weight and shape concerns. Participants' summed BSQ-16 score were calculated and used to assess their trait-level body dissatisfaction. The scale has demonstrated good internal consistency ( $\alpha = .93-.97$ ; Evans &

Dolan, 1993) and adequate convergent validity with other measures of body dissatisfaction ( $r = .58-.81$ ; Rosen et al., 1995). In the present study, the BSQ-16 demonstrated high internal consistency ( $\alpha = .93$ ).

In addition to the BSQ-16 total score, BSQ-16 categorical and total squared scores were created to examine Hypothesis 2b that predicts linear and curvilinear associations. The categorical BSQ-16 scores were created based on the recommendations by one of the scale authors (Evans, 2003). Scores of less than 38 were coded as 0 indicating “no concern with shape”, scores between 38 and 51 were coded as 1 for “mild concern with shape”, scores between 52 and 66 were coded as 2 indicating “moderate concern with shape”, and scores over 66 were coded as 4 for “marked concern with shape”. The total squared scores were calculated by squaring the BSQ-16 total values.

**Exercise behavior.** Exercise behavior was assessed using the self-administered short-form of the International Physical Activity Questionnaire (IPAQ; Booth, 2000). The IPAQ self-report short-form is a 7-item measure that gathers information on time spent in vigorous physical activity, moderate physical activity, walking, and sitting in a usual week (see Appendix C). Given that there is no standard method used to weight participants’ time in vigorous physical activity to account for their additional efforts, participants’ baseline exercise behavior was calculated by summing the amount of time they typically spend in vigorous physical activity and moderate physical activity a week. Craig et al. (2003) found the IPAQ self-report short-form to be a reliable and valid measure of exercise behavior in a diverse adult sample and a test-retest Spearman correlation coefficient of .79 over a 10-day interval was found. They analyzed the criterion validity of the measure by comparing results to those of accelerometer-measured physical activity. They obtained a median Spearman rho of .30, which is similar to other self-report

validation studies and indicates a fair to moderate agreement between the measures of physical activity with the IPAQ self-report short-form. Behrens and Dinger (2006) tested the validity of the measure in a college sample. They found similar correlation coefficients between IPAQ and accelerometer- measured physical activity, ranging from .19 to .47, suggesting this is a moderately valid measure of exercise in a college sample.

To examine participants' exercise behavior in a typical week, reported minutes spent in moderate physical activity and vigorous physical activity were added together to create an IPAQ total score. Similar to the additional composite scores used to examine trait-level body dissatisfaction, IPAQ categorical and squared total scores were also created to examine the linear and curvilinear associations proposed in Hypothesis 3c. Because there is currently no standardized method to categorize IPAQ scores, the IPAQ categorical score was created by dividing participants into three groups, infrequent exercisers, somewhat frequent exercisers, and frequent exercises, based on the distribution of participant responses. The 27 participants who reported 180 minutes or less of physical activity a week were considered infrequent exercisers, the 28 participants who reported 181-450 minutes of physical activity a week were considered somewhat frequent exercisers, and the 22 participants who reported greater than 450 minutes of physical activity a week were considered frequent exercisers. IPAQ total squared scores were calculated by squaring the IPAQ total scores.

### **Ecological Momentary Assessment Measures**

The following section describes the EMA questions that were used to address the research questions in the proposed study. In order to mask the purpose of the study and prevent biased responses or measurement reactivity, questions about mood, stress, social interactions, internet

usage, and academic performance were added to create wide-ranging and balanced surveys. The complete EMA survey questions can be found in Appendix D.

**Social comparisons.** The EMA survey assessed the occurrence, nature, and effects of body-focused social comparisons (see Appendix D). Participants were asked if they had made a body comparison since the last questionnaire they answered. If they did, they were asked to consider their most recent comparison and indicate: (1) whether the comparison was upward or downward (“Compared to the other person, I looked: much worse, worse, same, better, or much better”); and (2) whether the comparison was self-evaluative or self-improvement focused. Two statements were used to assess self-evaluation (“I thought that person was thinner or more physically fit than me,” “I negatively judged my own body compared to that person?”) and self-improvement (“I would like my body to be as thin or physically fit as that other person’s.” and “I thought about ways I could change my body to look like theirs.”). Responses were gathered on 7-point Likert scales (0 = *not at all* and 6 = *very much*) and averaged responses to the two questions for each motivation were used as self-evaluation and self-improvement composite scores. “Worse” and “Much Worse” were coded as upward comparisons, “Same” were coded as lateral comparisons, and “Better” and “Much Better” were coded as downward comparisons.

The survey structure and several questions regarding social comparison occurrence and nature were created and used by Leahey and Crowther (2008). They found significant differences in women’s affect, appearance esteem, and diet thoughts based on the direction of social comparisons in which participants engaged, upward or downward, indicating the question format is a valid measure of social comparison direction in women. The questions regarding comparison type, self-evaluation or self-improvement, were created for the proposed study with evidence

from past research that the two types are distinct constructs, but these questions have yet to be used in studies with high ecological validity up until this point (Knobloch-Westerwick, 2015).

**Body dissatisfaction.** Participants' body dissatisfaction at the time they filled out each survey was assessed with the 6-item Body Image States Scale (BISS; Cash, Fleming, Alindogan, Steadman, & Whitehead, 2002). The BISS measures satisfaction with (1) one's overall physical appearance, (2) one's body size and shape, (3) one's weight, (4) one's physical attractiveness, (5) current feeling's regarding one's looks compared to how one typically feels, and (6) comparison of one's appearance compared to the average person's appearance. Items are rated on a 7-point scale ranging from 0 (*extremely dissatisfied/ extremely unattractive/ a great deal worse*) to 6 (*extremely satisfied/ extremely attractive/ a great deal better*). Participants' momentary level of body dissatisfaction was calculated by summing their responses; lower sum scores suggest greater body dissatisfaction. Cash and colleagues (2000) found the scale to be acceptably internally consistent ( $\alpha = .77$ ) across a range of neutral, positive, and negative contexts and moderately stable ( $r = .69$ ) over a two to three-week period in a female college sample. Alphas were somewhat lower in a neutral context than in either positive or negative contexts. Cash et al. (2000) also found the scale to be a valid measure of body dissatisfaction by conducting a 2 x 2 ANOVA to assess whether BISS results are significantly affected by emotional reactions to appearance related stimuli like the body image construct. An experimental group was exposed to questions regarding their body weight prior to filling out the BISS, while a control was not given these questions. Participants were further split into two groups based on their level of dysfunctional investment in their appearance (measured by the Appearance Schemas Inventory), consisting of a high level of dysfunctional investment group and a low level of dysfunctional investment group. Simple effects of the ANOVA indicated that the high dysfunctional

investment group had less favorable BISS scores in the experimental condition versus the control condition ( $M_s = 5.73$  versus  $5.33$ ) and the opposite was the case for the low dysfunctional investment group ( $M_s = 6.03$  versus  $6.58$ ). Further analyses revealed confounding variables, such as weight, could not explain the results. Thus, the findings illustrate that the BISS adequately measures the body image construct, which previous research has determined is significantly affected by emotional reactions to appearance-related stimuli. The Cronbach's alpha for the current study ( $\alpha = .95$ ) indicates the scale also contained high internal consistency.

**Thoughts of exercising.** Participants were asked a question created by the author to assess their thoughts of exercising. This question (“Have you thought about being more physically active since the last notification?”) was answered using a 7-point Likert scale (0 = *not at all* and 6 = *very much*). Similar questions have been used with young women to measure thoughts of exercising in EMA studies previously (Rancourt, Leahey, LaRosa, and Crowther, 2015).

**Daily exercise behavior.** Measures of daily exercise behavior were gathered from the Fitbit accelerometers participants wore throughout the EMA data collection period. Both total daily steps and total daily minutes in moderate or vigorous physical activity were used as measures of exercise behavior. The purpose of including two measures of daily exercise behaviors was to assess the association between upward body-focused social comparisons and a global measure of physical activity (step count) as well as a measure that focuses on exercise behavior and excludes intermittent walks to and from places (minutes in moderate or vigorous physical activity). Greater number of steps and greater number of minutes in moderate or intense physical activity will indicate more exercise behaviors.

**Subjective norms.** At the end of each day descriptive and injunctive subjective norms were assessed to examine the distal-proximal influence on daily exercise intentions. Descriptive subjective norms were assessed with two items, “I think a lot of my friends or family members exercised today” (proximal) and “I think a lot of other college students in general exercised today” (distal). Injunctive subjective norms were assessed with the items “My friends or family members expect me to exercise tomorrow” (proximal) and “Other people expect me to exercise tomorrow” (distal). Responses to these four items were gathered on a 7-point Likert scale (0 = *strongly disagree* and 6 = *strongly agree*).

**Intentions to exercise.** Also at the end of each day intentions to exercise the next day were assessed using one item (“Do you think you will exercise tomorrow?”) Responses were collected on a 5-point Likert scale (0 = *definitely will not* and 4 = *definitely will*). A similar question has been used to assess college students’ intentions to exercise the next day in previous daily diary research (Conroy, Elavsky et al., 2013).

## **Equipment**

**Accelerometers.** The Fitbit Flex was used to measure participants’ daily exercise behaviors. It is a small device that participants wore on their wrists throughout the EMA data collection period. The Fitbit Flex has been found to be a valid and reliable measure of step count and minute-by-minute energy expenditure (Diaz et al., 2015).

**EMA survey software.** A commercial software called LifeData was used to develop EMA surveys. The software allows users to configure survey access and alarm schedules. It requires participants to download the company’s mobile application, RealLife Exp, on their iOS or Android device to access the surveys. Once participants downloaded the RealLife Exp

application and began taking surveys, their data were uploaded to LifeData's cloud-based platform and, subsequently, downloaded for statistical analyses.

### **Procedure**

Refer to Figure 2 for an outline of the study's procedure. IRB approval for the study was obtained from Old Dominion University. As part of a larger study, participants were recruited through a cloud-based research system (SONA) and scheduled for a lab visit. During the lab visit, participants provided informed consent, received training on study procedures, and provided weight and height measurements. They were also provided a Fitbit Flex to wear and instructed to download the mobile application RealLife Exp where they accessed the EMA surveys created through LifeData. Participants were provided with a code during the session to allow them to download surveys for the study (i.e. only people taking part in the sessions were able to access the study surveys). All participants were provided the option to borrow an Android smartphone that had all non-survey functions (e.g., phone, text messaging, etc.) disabled if they did not have an Apple or Android phone or did not want to use theirs for the study. Only one participant used an Android smartphone for the EMA portion of the study. The remaining participants used their own Apple or Android smartphones.

For the first four days, participants completed EMA surveys without social comparison questions as part of a larger study. These data were not used. For the following seven days, participants completed surveys about their body-focused social comparisons, body dissatisfaction, thoughts of exercising as well as other daily thoughts and behaviors five times a day. Data from these seven days were used for the current study. Questions regarding their exercise behavior that day and intentions to exercise the next day were included in the last survey of each day.

Participants received notifications for the survey from RealLife Exp at random times throughout the day. Notifications for the four surveys were scheduled to deliver between 9am and 9pm and not occur within two hours of each other. In addition to the four surveys delivered via notifications, participants were also instructed to complete an additional survey through RealLife Exp before they went to bed each night. To increase compliance of this participant-initiated survey, participants were instructed to set an alarm on their smartphones around their usual bedtime to remind them to take the survey. Exercise behavior was gathered via Fitbits continuously throughout the data collection.

To thank participants for their time, two research participation credits were awarded to participants who both attended the initial laboratory session and returned their Fitbit Flexes to the laboratory after data collection. Additionally, participants were compensated 15 dollars for answering EMA surveys and an additional 5 dollars (a total of 20 dollars) for answering at least 85% of the surveys.

## CHAPTER III

### RESULTS

#### Data Management

The current study produced data at multiple “levels,” including moment-level (level-1), day-level (level-2), and person-level (level-3). The momentary dataset was comprised of measures of BISS total scores, thoughts of exercising, self-improvement comparisons, and self-evaluation comparisons. The day-level dataset contained measures of exercise intentions, step count, exercise minutes, proximal descriptive subjective norms, distal descriptive subjective norms, proximal injunctive subjective norms, and distal injunctive subjective norms. It also included day aggregated mean BISS total scores, thoughts of exercising, self-improvement comparisons, self-evaluation comparisons, which were aggregated from momentary responses. The person-level dataset contained total scores and squared total scores of each baseline measure: trait-level body dissatisfaction, tendency to engage in appearance social comparisons, and exercise behaviors. Additional categorical scores of baseline measures of trait-level body dissatisfaction and exercise behaviors were also included to the person-level dataset to test Aim 3 hypotheses. Furthermore, person aggregated mean scores of thoughts of exercising, BISS total scores, exercise intentions, step count, and exercise minutes were included to test Aim 1 hypotheses.

In order to create the moment-level and day-level EMA datasets, survey data were downloaded from LifeData. Questionnaire data gathered during each lab visit were entered into a person-level spreadsheet and Fitbit data were added to the day-level EMA dataset. Prior to conducting main analyses, the three datasets were analyzed for missing patterns. Two participants were removed from primary analyses for completing less than 20% of the EMA

surveys. A third participant was removed from primary analyses because of missingness in her baseline exercise behavior (IPAQ) scores; this was done because there was only one participant with missing data, and the statistical program used, HLM 7.0, is sensitive to missingness at the third-level (in this case, person-level). This left a total of 74 participants included in analyses.

In the EMA data, questions regarding self-improvement and self-evaluation motivations and thoughts of exercising were only given to participants when they indicated they engaged in an upward body-focused social comparison. Therefore, missingness for these variables was expected and not imputed. Descriptive statistics for each of the baseline and EMA measures are presented in Table 1.

After addressing the missing not at random (MNAR) data, a Missing Values Analysis (MVA) was conducted and revealed missingness of the following variables: baseline body dissatisfaction, baseline exercise behavior, baseline tendency to engage in appearance comparisons, intentions to exercise the next day, proximal descriptive subjective norms, distal descriptive subjective norms, proximal injunctive subjective norms, and distal injunctive subjective norms. The total missingness for the data was less than 5%. However, because the day-level dataset involved a combination of survey data and Fitbit data, there was additional missingness in this dataset due to participants either not having Fitbit data for a given day or missing an end-of-day survey on some days. Expectation Maximization (EM) was used to address missing data for continuous baseline and day-level variables. EM imputation was chosen because it uses an iterative process to determine appropriate values and preserves the associations between variables.

Following EM imputation, regression assumptions were checked at each level in HLM 7.0 and SPSS 24. Outliers were assessed for each variable with boxplots. In the level-1 (moment-

level) dataset, self-improvement contained two outliers. In the level-2 (day-level) dataset, daily steps contained two outliers, exercise minutes contained two outliers, daily comparison count contained three outliers, and the day-level self-improvement aggregate contained one outlier. In the level-3 (person-level) dataset, the IPAQ total score contained three outliers and the upward comparison count contained two outliers. All outliers found were winzorized. The level-1, level-2, and level-3 residual files were gathered from HLM and examined graphically in SPSS. Based on these graphs, the data appeared to meet the normality, homoscedasticity, and independence assumptions. Structurally, the outcome variables appeared to meet the linear form assumption. All variables were either group mean or grand mean centered to prevent multicollinearity; no HLM multicollinearity error messages appeared for any of the final models suggesting the independent variables assumption was also met.

### **EMA Survey Compliance**

Completion rates, or the total number of assessments completed divided by the total number of expected assessments, were calculated for each participant for momentary surveys and end of day surveys. Participants completed an average of 22.9 (81.8%) of all momentary surveys during the study and 5.1 (72.9%) of all end of day surveys during the study. An additional method that is considered more conservative was used for calculating momentary survey compliance. This second method involved comparing the number of surveys participants completed within an hour of being notified to take the survey to the total of expected assessments. This method excludes surveys that participants completed more than an hour after they were notified of the survey, thereby reducing the likelihood of recall bias that can occur in retrospective data collection. Using this second approach, 80% of all momentary surveys were completed within an hour of the notification. Total and timely momentary survey compliance are

presented in Table 2. Total end of day survey compliance is displayed in Table 3. The end of day survey compliance rates and timely momentary survey compliance rates described above translates to 1,372 momentary surveys and 391 end of day surveys collected for the sample during the seven days of EMA data collection.

### **Descriptive Statistics**

Descriptive statistics on the demographic data for the 74 women whose data were included in analyses are presented in Table 4. The mean age of study participants was 20.4 years old ( $SD = 1.63$ , range 18-25). The majority of participants were Black ( $n = 44$ , 59.5%) or White ( $n = 31$ , 41.9%) with several other participants self-identified as Hispanic ( $n = 4$ , 5.4%), Asian ( $n = 2$ , 2.7%), American Indian or Alaska Native ( $n = 1$ , 1.4%), Native Hawaiian or Other Pacific Islander ( $n = 1$ , 1.4%), or an Other race ( $n = 1$ , 1.4%); percentages across the race categories do not add to 100% because participants were allowed to select multiple races. Participants were relatively dispersed amongst the first three years of school, freshman ( $n = 25$ , 33.8%), sophomores ( $n = 19$ , 25.7%), juniors ( $n = 23$ , 31.1%), and a minority were seniors ( $n = 7$ , 9.5%). Fifty-eight percent of participants lived on campus and 41.9% lived off campus. The majority of participants lived with other people ( $n = 74$ , 95.9%), while only 3 participants (4.1%) lived alone. Body Mass Index [BMI] was calculated for all participants based on their measured height and weight. The mean BMI of study participants was 27.8 ( $SD = 7.61$ ). According to the standards of Bray and Gray (1988), a BMI less than 18.5 is considered underweight, 18.5-24.9 is normal weight, 25.0-29.9 is overweight, 30.0-39.9 is obese, and over 40.0 is morbidly obese. In the present sample, no participants were underweight, 34 (45.9%) were normal weight, 21 (28.4%) were overweight, 13 (17.6%) were obese, and 6 (8.1%) were morbidly obese.

### **Data Analysis Strategy**

Due to the multilevel nature of the data, HLM 7.0 was used for all hypotheses except for Hypothesis 1a, which was conducted with person-level variables only in SPSS 24. For Hypothesis 1b and Aims 2, 3, and 4, three-level models for momentary analyses and two-level models for day-level analyses were created in HLM 7.0. Each analysis was conducted with random slopes at each level and sigma and tau variances were assessed to determine final models. When tau and sigma variances were significant, random slopes remained in the final models, but were removed if their *p* value was greater than .05. Lastly, robust standard error results were used if the values differed from those provided with fixed standard errors.

### **Preliminary Results**

Random effects ANOVAs were conducted for each outcome variable in order to determine the extent to which each measure varied within-person and between-person. Intraclass correlation coefficients (ICC) calculations for the momentary BISS total score model revealed that 25% of variability in participant body dissatisfaction was within-person at the momentary level, 10% was within-person at the daily level, and 65% was between-person. ICC calculations for the momentary thoughts of exercising model demonstrated 29% of variability in participant responses was within-person at the momentary level, 7% within-person at the daily level, and 64% between-person. For the two-level models, ICC calculations indicated 44% of variability in daily exercise intentions was within-person at the daily level and 56% was between-person. A 25% variability in daily step counts was within-person at the daily level, whereas 75% of variability was between-person. Lastly, a 22% variability in exercise minutes was within person at the daily level and 78% was between-person.

### **Hypothesis Testing**

The research aims and specific hypotheses are presented below followed by their analytic strategy and predicted results.

***Aim 1. The first aim was to investigate the between-person (Hypothesis 1a) and within-person (Hypothesis 1b) influence of upward body-focused social comparisons on exercise thoughts, intentions, and behaviors.***

***Hypothesis 1a (Person-level).*** *Based on the findings of previous EMA studies, it is hypothesized that participants who are higher in upward body-focused comparisons across the seven days will also report greater body dissatisfaction, more thoughts of exercising, greater intentions to exercise the next day (measured via self-report EMA), and will also exercise more (measured via Fitbit accelerometers).*

The aggregate function in SPSS was used to create person-level mean scores for upward body-focused comparison count (i.e., the total number of upward body-focused comparisons participants reported), momentary BISS and thoughts of exercising ratings and day-level measures of exercise intentions and behaviors. Person-level BISS, thoughts of exercising, exercise intentions, step count, and exercise minutes were each used as dependent variables in separate regression analyses with total upward body-focused comparison count as the independent variable. Results revealed that participants who were higher in upward body-focused comparisons across the seven days also reported significantly greater body dissatisfaction,  $B = -0.30$ ,  $F(1,72) = 7.19$ ,  $p = .009$ ,  $R^2 = 0.19$ . However, no significant associations were found between upward body-focused comparisons and thoughts of exercising ( $B = 0.16$ ,  $F(1,36) = 0.94$ ,  $p = .340$ ,  $R^2 = 0.03$ ), exercise intentions ( $B = 0.01$ ,  $F(1,72) = 0.00$ ,  $p = .960$ ,  $R^2 = 0.00$ ), step count ( $B = 0.06$ ,  $F(1,72) = 0.22$ ,  $p = .640$ ,  $R^2 = 0.00$ ) or exercise minutes ( $B = 0.03$ ,  $F(1,72) = 0.06$ ,  $p = .805$ ,  $R^2 = 0.00$ ) across the seven days (see Table 5).

***Hypothesis 1b (Day-level).*** *On days when participants are higher in upward body-focused comparisons, they will report greater body dissatisfaction, more thoughts of exercising, greater intentions to exercise the next day, and will exercise more.*

Similar to the analytic strategy used in Hypothesis 1a, aggregated day-level upward body-focused comparison count, BISS scores, and thoughts of exercising were created for these analyses. However, unlike the analyses for Hypothesis 1a, the analyses for Hypothesis 1b used HLM 7.0 to analyze the associations between participants' day-level upward body-focused comparison count and each outcome variable: day-level aggregated BISS scores, day-level aggregated thoughts of exercising, daily exercise intentions, step count, and exercise minutes. As shown in Table 6, results for Hypothesis 1b revealed a significant association between day-level upward body-focused comparison count and day-level aggregated BISS scores ( $B = -0.22$ ,  $t(396) = -2.91$ ,  $p < .001$ ,  $R^2 = 0.20$ ) and thoughts of exercising ( $B = 0.44$ ,  $t(396) = 4.26$ ,  $p < .001$ ,  $R^2 = 0.30$ ). This suggests that participants reported greater body dissatisfaction and thoughts of exercising on days when they engaged in more upward body-focused comparisons. However, no significant associations between day-level upward body-focused comparisons and daily exercise intentions,  $B = 0.05$ ,  $t(396) = 0.51$ ,  $p = .610$ , daily step count ( $B = -348.77$ ,  $t(396) = -1.13$ ,  $p = .261$ ), or daily exercise minutes ( $B = -0.23$ ,  $t(396) = -0.12$ ,  $p = .906$ ) were found (see Table 6).

***Summary of Aim 1 Results.*** These results demonstrate a difference in the person-level and day-level associations between upward body-focused comparisons and body dissatisfaction and thoughts of exercising. Participants who engaged in more upward body-focused comparisons during the seven days experienced greater body dissatisfaction, but no significant effect was observed in person-level thoughts of exercising. On days when participants engaged in more upward body-focused comparisons, they experienced more body dissatisfaction and thoughts of

exercising. Neither person-level nor day-level upward body-focused comparisons were significantly associated with exercise intentions, step count, or exercise minutes.

***Aim 2. The second aim of the present study was to evaluate the findings of Knobloch-Westerwick (2015) in natural settings. Knobloch-Westerwick (2015) demonstrated that women can engage in two different forms of social comparisons, self-evaluation and self-improvement, and that engaging in them can have different effects on women's body dissatisfaction.***

Only participants who endorsed upward body-focused comparisons were included in the analyses for Aim 2. Descriptive statistics on self-improvement and self-evaluation motivations indicated a shorter range for self-improvement ratings ( $Range = 4.81$ ) than self-evaluation ratings ( $Range = 6.00$ ), but similar mean scores (self-improvement,  $M = 4.36$ ,  $SD = 1.02$ ; self-evaluation,  $M = 4.51$ ,  $SD = 1.04$ ; see Table 1 for more descriptive statistics). Additionally, a multilevel correlation analysis indicated the motivations were significantly correlated with one another,  $B = 0.59$ ,  $t(32) = 0.59$ ,  $p < .001$ .

***Hypothesis 2a (Moment-level).*** *At times when participants report having engaged in higher levels of self-improvement upward body-focused comparisons, they will also have lower body dissatisfaction and greater thoughts of exercising.*

Momentary BISS scores and thoughts of exercising were used as outcome variables in three-level models with self-improvement ratings as the predictor. Results of the momentary BISS score model indicated no significant association between self-improvement ratings and momentary body dissatisfaction,  $B = 0.05$ ,  $t(32) = 0.43$ ,  $p = .668$ . Conversely, results of the momentary thoughts of exercising model demonstrated a significant positive association between momentary self-improvement ratings and thoughts of exercising,  $B = 0.83$ ,  $t(73) = 3.08$ ,  $p =$

.003,  $R^2 = 0.65$  (see Table 7). The B value suggests that on average participants' thoughts of exercising increased by 0.83 for every one-unit increase in self-improvement rating. The  $R^2$  calculation indicates that 65% of variability in momentary thoughts of exercising were explained by self-improvement ratings.

***Hypothesis 2b (Day-level).*** *On days when participants engage in higher levels of self-improvement upward body-focused comparisons, they will exercise more and have greater intentions to exercise the next day.*

For hypothesis 2b, daily exercise intentions, step count, and exercise minutes were used as outcome variables in two-level models with daily mean self-improvement ratings as the predictor. As shown in Table 7, a marginally significant negative association was found between self-improvement ratings and daily step count ( $B = -1602.49$ ,  $t(41) = -1.83$ ,  $p = .075$ ,  $R^2 = 0.78$ ) and no significant associations were found between self-improvement ratings and daily exercise intentions ( $B = 0.03$ ,  $t(41) = 0.14$ ,  $p = .886$ ) or exercise minutes ( $B = -0.51$ ,  $t(78) = -0.07$ ,  $p = .472$ ).

***Hypothesis 2c (Moment-level).*** *At times when participants report having engaged in higher levels of self-evaluation upward body-focused comparisons, they will also have greater body dissatisfaction and less thoughts of exercising.*

The same analytic strategy was used to test this hypothesis as was used for Hypothesis 2a with the exception that self-evaluation was used instead of self-improvement as the independent variable in the three-level models. As shown in Table 7, similar to the results of Hypothesis 2a, no significant association was found between momentary self-evaluation ratings and body dissatisfaction,  $B = 0.02$ ,  $t(32) = 0.13$ ,  $p = .901$ . But a significant positive association was found between momentary self-evaluation ratings and thoughts of exercising,  $B = 0.58$ ,  $t(32) = 2.36$ ,  $p =$

.025,  $R^2 = 0.63$ . These results indicate that on average participants' thoughts of exercising increased by 0.58 for every one-unit increase in self-evaluation rating and 63% of variability in momentary thoughts of exercising were explained by self-evaluation ratings.

***Hypothesis 2d (Day-level).*** *On days when participants engage in higher levels of self-evaluation upward body-focused comparisons, they will not experience a significant increase in their exercise behavior or their intentions to exercise the next day.*

Daily mean self-evaluation rating was used as a predictor in two-level models with daily exercise intentions, step count, and exercise minutes as outcomes. As predicted by Hypothesis 2d, no significant associations were found between self-evaluation ratings and daily exercise intentions ( $B = 0.03$ ,  $t(41) = 0.14$ ,  $p = .289$ ), step count ( $B = -519.39$ ,  $t(42) = -0.40$ ,  $p = .692$ ), or exercise minutes ( $B = -0.51$ ,  $t(32) = -0.07$ ,  $p = .955$ ); see Table 7.

***Summary of Aim 2 Results.*** The main findings for Aim 2 were the significant momentary associations between both motivations and thoughts of exercising. This suggests that participants' thoughts of exercising were higher when they reported higher ratings of self-improvement and self-evaluation motivations when engaging in a recent upward body-focused comparison. A non-significant trend was found between self-improvement ratings and step count, but in the opposite direction than was expected. Although not significant, this finding suggests that participants engaged in fewer daily steps on days they engaged in comparisons higher in self-improvement. No significant association between self-evaluation ratings and daily step count were found. Additionally, neither self-improvement nor self-evaluation ratings were significantly associated with participants' intentions to exercise the next day or minutes exercising.

***Aim 3.*** *The third aim of the present study is to explore the influence of baseline measures of trait-level body dissatisfaction, tendency to engage in social comparisons, and*

*exercise behaviors on the associations examined in Hypotheses 2a-d.*

Before analyses for Aim 3 were conducted, total scores and squared total scores were created for each baseline measure. An additional categorical score was created for both baseline body dissatisfaction and exercise behaviors. These composite scores were entered into the models described in Aim 2 as interactions to test the moderating effects of each baseline measure. Total scores were used to examine possible linear associations, whereas squared values were used to assess the presence of curvilinear associations. Additionally, categorical values for baseline body dissatisfaction and exercise behaviors were used to assess the strength of the associations predicted by Hypotheses 3a and 3c. The results of these analyses are displayed in Tables 8, 9, and 10. All models reported in these tables included both predictor and moderator main effects as well as interactions, but only the interaction terms are reported in the table. When more than one baseline score (total, squared total, or categorical) were significant, both the total score and the squared total score were entered into the model to determine which best described the association, a linear or curvilinear trend. The categorical score did not add information about the trend of the association, therefore, significant categorical scores were not added to the models in this step.

After this step, additional follow-up analyses were conducted to examine the significance and direction of the association when baseline scores were centered at one standard deviation above the mean and one standard deviation below the mean (see Table 11). Table 11 displays the changes in the associations between the independent and dependent variables when the moderators were added.

***Hypothesis 3a.** It is hypothesized that trait-level body dissatisfaction will weaken the associations described in Hypotheses 2a-d. Individuals with very high or very low trait-level body dissatisfaction will likely not experience a significant change in their body dissatisfaction or*

*exercise, thoughts, intentions, or behaviors following upward body-focused social comparisons because other feelings and cognitions are maintaining their positive or negative body images.*

Total, squared, and categorical BSQ-16 scores were entered into the models described in Aim 2 as interactions. The results for hypothesis 3a for the total, squared, and categorical BSQ-16 interaction term are displayed in Table 8. The association between self-improvement ratings and thoughts of exercising was significantly moderated by baseline body dissatisfaction using the BSQ-16 total score, squared total score, and categorical score ( $p < .05$ ). When both the total score and squared score were entered into the same model, the total score interaction was significant ( $B = 0.47, t(30) = 2.22, p = .027, R^2 = -0.02$ ) and the squared score was marginally significant ( $B = -0.00, t(30) = -1.86, p = .093$ ). These findings suggest that this moderating association is linear; as shown in Figure 3, there is a stronger positive relationship between thoughts of exercising (y-axis) and self-improvement (x-axis) at higher levels of baseline body dissatisfaction (High BSQ Total line). The Low BSQ Total line indicates greater baseline body dissatisfaction. Follow-up analyses using total scores centered around one standard deviation above the mean and one standard deviation below the mean confirmed that the association between self-improvement ratings and thoughts of exercising is significantly stronger for participants with higher levels of baseline body dissatisfaction ( $B = 1.65, t(31) = 2.74, p = .010$ ). At lower levels of baseline body dissatisfaction, the association became marginally significant ( $B = -0.81, t(31) = -1.98, p = .094$ ). The association between self-improvement ratings and thoughts of exercising was the only association described in Aim 2 that was significantly moderated by baseline body dissatisfaction (see Table 8 for non-significant findings).

***Hypothesis 3b.*** *Given that individuals who frequently engage in body-focused comparisons experience greater body dissatisfaction following their comparisons (Fitzsimmons-*

*Craft et al., 2015), it is hypothesized that one's natural tendency to engage in these comparisons will strengthen the association between comparisons with higher levels of self-evaluation and body dissatisfaction and will weaken the associations between comparisons with higher levels of self-improvement and body dissatisfaction, exercise thoughts, exercise intentions, and exercise behaviors.*

To test Hypothesis 3b, PACS-R total scores and squared total scores were calculated and each added to the associations described in Aim 2 as moderators. The association between self-improvement comparisons and momentary body dissatisfaction was significantly moderated by both PACS-R total scores and PACS-R total squared scores ( $p < .05$ ; see Table 9). When PACS-R total scores and PACS-R squared total scores were entered in the same model, both the total score interaction and total squared interaction were significant (PACS-R total,  $B = -0.09$ ,  $t(30) = -5.84$ ,  $p < .001$ ,  $R^2 = -0.06$ ; PACS-R total squared,  $B = 0.00$ ,  $t(30) = 2.25$ ,  $p = .03$ ,  $R^2 = -0.06$ ). This suggests that both a linear and curvilinear trend significantly fit this model (see Figure 4 as a representation of the BISS total score and self-improvement association moderated by PACS-R total and PACS-R squared total scores). As shown in Table 11, follow-up analyses with the scores centered around one standard deviation above the mean and one standard deviation below the mean revealed differences between the two PACS-R composite scores. All significant analyses with momentary body dissatisfaction were interpreted in the opposite direction as lower BISS total scores indicate greater body dissatisfaction. When using the PACS-R squared total scores, a significant positive association between self-improvement ratings and body dissatisfaction was found for participants with a higher baseline tendency to engage in appearance comparisons ( $B = -1.04$ ,  $t(31) = -2.95$ ,  $p = .006$ ) and a marginally significant association was found for participants with a lower baseline tendency to engage in comparisons ( $B = 0.35$ ,  $t(31) = 1.95$ ,  $p = .060$ ). The

direction of the associations stayed the same with the PACS-R total scores. Using the PACS-R total scores, a significant negative association between self-improvement comparisons and body dissatisfaction was found for participants with lower appearance comparison tendencies ( $B = 0.34, t(31) = 3.15, p = .004$ ) and a significant positive association was found for participants with higher appearance comparison tendencies ( $B = -0.88, t(31) = -5.18, p < .001$ ).

The self-evaluation comparison and body dissatisfaction association was also moderated by baseline tendency to engage in appearance comparisons. But in this model, only the PACS-R total scores were significant ( $B = -0.07, t(72) = -1.99, p = .023, R^2 = -0.04$ ). This suggests that a linear trend best fits the association between self-evaluation comparisons and body dissatisfaction moderated by baseline tendency to engage in comparisons (see Figure 5). As shown in Table 11, follow-up analyses using the PACS-R total scores centered around one standard deviation above the mean and one standard deviation below the mean demonstrated similar findings as were found for the self-improvement association. A stronger positive association was found for participants with a higher appearance comparison tendency ( $B = -0.61, t(31) = -2.64, p = .013$ ), and the association became non-significant at lower levels of appearance comparison tendency ( $B = 0.27, t(31) = 1.26, p = .217$ ).

In addition to its moderating effect on the associations between both motivations and body dissatisfaction, baseline tendency to engage in comparisons also moderated the self-evaluation and thoughts of exercising association (PACS-R total,  $B = -0.81, t(31) = -1.98, p = .051, R^2 = -1.94$ ); PACS-R total squared,  $B = -0.81, t(31) = -1.98, p < .001, R^2 = -1.88$ ). Although both the PACS-R total and the PACS-R squared total interactions were significant on their own, only the PACS-R squared total was significant when they were both entered into the model ( $B = -0.81, t(31) = -1.98, p = <.001$ ). This suggests that a curvilinear trend best describes the association (see

Figure 6). As shown in Table 11, follow-up analyses with the values centered at one standard deviation above the mean and one standard deviation below the mean revealed a significant negative association between self-evaluation ratings and thoughts of exercising in participants with a lower appearance comparison tendency ( $B = 1.39, t(31) = -4.01, p < .001$ ) and a significant negative association between the two measures in participants with a higher appearance comparison tendency ( $B = -1.03, t(31) = -2.02, p = .047$ ).

Baseline tendency to engage in appearance comparisons significantly moderated all momentary analyses in Aim 2, except for the self-improvement and thoughts of exercising association (see Table 9). It also did not moderate any of the day-level analyses in Aim 2 (see Table 9).

***Hypothesis 3c.** Like trait-level body dissatisfaction, it is hypothesized that baseline exercise behavior will weaken the associations described in Hypotheses 2a-d. Individuals who do not exercise will likely not be motivated to exercise following any upward body-focused social comparison. In contrast, individuals who exercise every day have established a routine and are driven to exercise due to motivations that are not changed whether they engage in upward body-focused comparisons with high levels of self-improvement or not.*

Similar to the analytic strategy used for Hypotheses 3a, IPAQ total scores, total squared scores, and total categorical scores were calculated and used as moderators in each of the models described in Aim 2. As shown in Table 10, this IPAQ categorical score as well as the IPAQ total and IPAQ squared total scores all significantly moderated the association between self-improvement comparisons and thoughts of exercising (IPAQ category,  $B = -0.58, t(31) = -3.36, p = .010, R^2 = 0.11$ ; IPAQ total,  $B = -0.00, t(31) = -2.73, p = .002, R^2 = 0.05$ ; IPAQ total squared,  $B = -0.00, t(31) = -2.80, p = .009, R^2 = 0.14$ ). However, when both the IPAQ total and IPAQ

squared scores were entered into the same model, neither interaction was significant (IPAQ total,  $B = -0.01$ ,  $t(30) = -1.01$ ,  $p = .323$ ; IPAQ total squared,  $B = 0.00$ ,  $t(30) = 0.81$ ,  $p = .426$ ). Based on the  $R^2$  calculations from their separate models, it appears that the IPAQ squared total scores explains greater variability in momentary thoughts of exercising. Therefore, a curvilinear trend is likely best suited for this model. As shown in Table 11, follow-up analyses with the IPAQ squared total scores centered around one standard deviation above the mean and one standard deviation below the mean revealed a significant positive association between self-improvement ratings and thoughts of exercising for participants with less baseline exercise behaviors ( $B = 1.12$ ,  $t(31) = 2.59$ ,  $p = .015$ ) and a significant negative association between measures for participants with more baseline exercise behavior ( $B = -0.81$ ,  $t(31) = -2.87$ ,  $p = .007$ ; see Figure 7).

In addition to moderating the self-improvement and thoughts of exercising association, IPAQ squared total scores moderated the self-improvement and exercise minutes association ( $B = -0.00$ ,  $t(36) = -2.21$ ,  $p = .033$ ,  $R^2 = -0.23$ ). As shown in Table 11, follow-up analyses IPAQ squared total scores centered around one standard deviation above the mean and one standard deviation below the mean revealed a significant negative association between self-improvement ratings and exercise minutes in participants with more baseline exercise behaviors ( $B = -22.46$ ,  $t(36) = -2.19$ ,  $p = .035$ ). The association became non-significant for participants with low baseline exercise behaviors ( $B = 7.11$ ,  $t(36) = 0.63$ ,  $p = .532$ ; see Table 10 and Figure 8).

Additional analyses with the three IPAQ composite scores as moderators, demonstrated two marginally significant models. The association between self-improvement comparisons and intentions to exercise the next day was moderated by IPAQ squared total scores at a marginal level of significance ( $B = -0.00$ ,  $t(40) = -0.21$ ,  $p = .097$ ). The association between self-evaluation comparisons and body dissatisfaction was also moderated by IPAQ squared total scores at a

marginal level of significance ( $B = -0.00$ ,  $t(31) = -1.75$ ,  $p = .090$ ). Due to the fact that follow-up analyses of these models did not produce significant results, it is possible that these marginally significant moderator associations are spurious effects.

***Summary of Aim 3 Results.*** The results of Aim 3 demonstrated that baseline measures of body dissatisfaction, tendency to engage in social comparisons, and exercise behaviors moderated several associations described in Aim 2. Significant positive associations between the two motivations and body dissatisfaction were found for participants with higher baseline appearance comparison tendency. The association between self-improvement comparisons and thoughts of exercising was significantly moderated by baseline exercise behaviors and body dissatisfaction. A stronger positive association was found between these measures in participants with less baseline exercise behaviors and greater body dissatisfaction. The association between self-evaluation comparisons and thoughts of exercising was not moderated by baseline exercise behaviors or body dissatisfaction, but rather baseline social comparison tendency. A negative association between self-evaluation comparisons and thoughts of exercising was found in participants with higher appearance comparison tendency. Baseline exercise behaviors was the only one of the three baseline measures that moderated day-level associations, including the associations between self-improvement comparisons and exercise intentions, self-improvement comparisons and exercise minutes, and self-evaluation comparisons and body dissatisfaction. Besides the self-improvement and exercise minutes association, all other moderator effects in day-level models were marginally significant.

***Aim 4. The final aim of this study will examine whether the operational definitions of subjective norms in Conroy, Elavsky and colleagues (2013) influenced their findings.***

***Research Question (Day-level).*** To explore the influence of proximal and distal subjective

*and injunctive norms on exercise intentions.*

Two-level models were used to examine the associations between distal descriptive subjective norms, proximal descriptive subjective norms, distal injunctive subjective norms, and proximal injunctive subjective norms and intentions to exercise. The four subjective norms were entered in four separate models as independent variables and intentions to exercise was used as the dependent variable in each. Results of these four models revealed significant associations between exercise intentions and distal descriptive subjective norms ( $B = 0.07$ ,  $t(396) = 2.34$ ,  $p = .020$ ,  $R^2 = 0.09$ ), proximal injunctive subjective norms ( $B = 0.34$ ,  $t(73) = 7.612$ ,  $p < .001$ ,  $R^2 = 0.29$ ), and distal injunctive subjective norms ( $B = 0.29$ ,  $t(73) = 5.28$ ,  $p < .001$ ,  $R^2 = 0.10$ ). The association between the fourth type of norm, proximal descriptive subjective norms and exercise intentions was not significant,  $B = 0.15$ ,  $t(73) = 1.49$ ,  $p = .141$ . To compare the three significant subjective norms, all three were entered into the same model with exercise intentions as the outcome. Results of this model indicated significant positive associations between the two injunctive norms (proximal injunctive subjective norm,  $B = 0.18$ ,  $t(73) = 2.81$ ,  $p = .006$ ; distal injunctive subjective norm,  $B = 0.17$ ,  $t(73) = 2.62$ ,  $p = .011$ ) and exercise intentions. The association between distal descriptive subjective norms and exercise intentions became non-significant in this model,  $B = 0.00$ ,  $t(73) = 0.01$ ,  $p = .993$ . These findings suggest injunctive descriptive norms are more closely related to exercise intentions than descriptive norms. The  $R^2$  calculations for the injunctive and descriptive norms suggest the proximal injunctive norm accounted for greater variability in participants' exercise intentions.

## CHAPTER IV

### DISCUSSION

The purpose of this study was to examine the association between naturally occurring upward body-focused social comparisons and body dissatisfaction and exercise thoughts, intentions, and objective measures of exercise behaviors in young adult women. Additionally, the present study aimed to examine the ecological validity of the findings observed by Knobloch-Westerwick (2015) and provide evidence that different motivations to engage in upward-body focused comparisons (self-evaluation and self-improvement) differentially influence the associations between these comparisons and body-dissatisfaction and exercise thoughts, intentions, and behaviors.

#### **Person-level and Day-level Associations with Upward Body-Focused Comparisons**

Results of Aim 1 revealed that participants who engaged in more upward body-focused comparisons reported greater body dissatisfaction. On days when participants engaged in more upward body-focused comparisons, they also had significantly greater body dissatisfaction and thoughts of exercising. These findings are consistent with previous EMA research on upward body-focused comparisons (Leahey et al., 2011; Rancourt et al., 2015) and suggest college women who frequently engage in these comparisons are more likely to experience greater body dissatisfaction. Furthermore, engaging in these comparisons is associated with daily changes in body dissatisfaction and thoughts of exercising.

Rancourt et al. (2015) found an association between higher scores of exercise thoughts and self-reported behaviors following upward weight-focused comparisons in their overweight young adult women sample. The present sample, which had an average BMI in the overweight range, also found an association between reports of engaging in these comparisons and higher

levels of exercise thoughts. However, the objective measures of physical activity used in the present study were not significantly associated with these comparisons. It is possible that exercise behaviors were excluded from the present study's objective measures, such as swimming and cycling that are not detected by the wrist-worn Fitbit accelerometers, and may have influenced the non-significant findings. Although accelerometers may not detect all forms of exercise, they remain to be the optimal measure of physical activity because they eliminate recall biases that commonly affect self-report data. Taking into consideration both the benefits and drawbacks of these assessment techniques, a combination of accelerometer data and self-report data may be the best way to assess changes in exercise behavior in future research. Using accelerometer data to assess walking, jogging, and running, and self-report data for other forms of exercise (e.g., swimming, cycling, tennis) would capture all possible types of exercise. Alternatively, accelerometers that are not wrist-worn (e.g., are worn on hip or leg) may be able to better capture exercise behaviors that are not reliant on arm movements, such as cycling.

### **Self-Improvement vs. Self-Evaluation Motivations**

Although the findings of Aim 1 were largely consistent with previous research, the findings of Aim 2 add to our understanding of upward body-focused comparisons. This is the first study to assess different motivations to engage in these comparisons (self-improvement and self-evaluation) in real-life settings and demonstrate person-level differences between these motivations and body- and exercise-related thoughts and behaviors.

The experimental study mentioned earlier by Knobloch-Westerick (2015) demonstrated that women *can* engage in upward body-focused comparisons motivated by self-improvement as well as self-evaluation. The present study revealed that women *do* engage in upward body-focused comparisons with these motivations and that these motivations can be measured with

EMA assessments. Although this supports the research of Knobloch-Westerwick (2015), the present study did not find the same associations between these motivations and body dissatisfaction. Knobloch-Westerwick (2015) found comparisons with thin ideal exposures motivated by self-improvement increased body satisfaction while those motivated by self-evaluation decreased body satisfaction in the longitudinal experimental study. The present study did not find any significant associations between either motivation and momentary body dissatisfaction. However, moderator analyses revealed that participants with a greater tendency to engage in appearance comparisons experienced a significant positive association between their body dissatisfaction and comparison ratings high in self-improvement and self-evaluation. Even though this suggests that women who frequently make body comparisons experience greater body dissatisfaction, it does not help disentangle the relationship between self-improvement and self-evaluation motivations. This may mean that this group of women may experience negative consequences after making comparisons regardless of the motivation behind their comparisons (self-improvement or self-evaluation).

Another inconsistency between the findings of Knobloch-Westerwick (2015) and the present study were the relationships between the motivations and momentary thoughts of exercising. Although thoughts of exercising were not included in Knobloch-Westerwick's (2015) experimental study, an association was found between self-evaluation ratings and weight-loss behaviors, which included skipping meals, avoiding certain foods, and eating smaller portions. The present study examined a different indicator of weight loss and fitness intentions, thoughts of exercising, and found the comparisons high in self-evaluation as well as those high in self-improvement to be significantly associated with increases in thoughts of exercising. The relationship between self-evaluation and thoughts of exercising was positive for participants who

have a greater tendency to engage in appearance comparisons and negative for those who have a lower tendency. The association between self-improvement and thoughts of exercising was significantly moderated by baseline body dissatisfaction and exercise behaviors indicating participants with greater body dissatisfaction and less exercise behaviors experienced a positive association between self-improvement and thoughts of exercising. Additionally, participants with more baseline exercise behaviors experienced a negative association between self-improvement and thoughts of exercising. The latter finding may suggest that women who regularly exercise think that the bodies of their comparison targets are attainable based on their current exercise regimens and, therefore, do not engage in more thoughts about exercising than what is typical for them. In contrast, women who have greater negative feelings about their bodies and are not regular exercisers may think more about exercising as a way to be more like their comparison targets.

Leahey et al. (2011) also found women with higher baseline body dissatisfaction to experience greater thoughts about exercising following upward body-focused comparisons. While Leahey and colleagues (2011) suggest that these comparisons have additional negative consequences for women with greater body dissatisfaction, these findings on self-improvement comparisons show that these women are not just evaluating their bodies, but also thinking about ways they can improve themselves to be more like the women they compare themselves to, such as engage in exercise. Further research on translating these self-improvement motivations to self-improvement behaviors could reduce the deleterious effects associated with upward body-focused comparisons in these women.

The present study did not find any significant associations between upward body-focused comparisons, either motivated by self-evaluation or self-improvement, and intentions to exercise

the next day. This may be because other factors that were not measured in this study, such as the weather, time availability, attitudes towards exercising, and exercise self-efficacy (Conroy, Elavsky et al., 2013), influenced participant' plans to exercise. Future studies should incorporate these factors when examining upward-body focused comparisons on exercise behaviors.

Although no significant findings were seen for exercise intentions, a significant negative association between self-improvement comparisons and exercise minutes was found in participants with more baseline exercise behaviors. This pattern was not predicted, instead it was hypothesized that participants would exercise more on days they engaged in comparisons high in self-improvement. However, a similar theory used to explain the negative association between self-improvement comparisons and thoughts of exercising in participants with more baseline exercise could explain this pattern. Participants who regularly exercise may have greater thoughts that the bodies of their comparison targets are attainable given their current exercise regimen. Instead of self-improvement motivations driving them to exercise more, these comparisons may improve their feelings about their bodies and, thereby, reduce their drive to exercise. It is also possible that other factors, such as lower intentions to exercise due to contextual constraints (e.g., weather, time availability) may have reduced their exercise behaviors on days they engaged in comparisons high in self-improvement.

Several day-level marginally significant associations were also found, including negative associations between self-improvement comparisons and exercise intentions and step count in participants with more baseline exercise behaviors. These results are consistent with the present study's findings of less exercise minutes on days participants high in baseline exercise behavior engaged in these comparisons that were discussed earlier. It is possible that there was not enough power to reveal significant findings with these variables or they are a result of spurious effects.

However, it is also possible that the intensity of participants' steps measured by exercise minutes are more closely associated with self-improvement comparisons than step count, which would encompass walking for the purpose of transportation rather than exercise, as well as daily intentions to exercise.

Overall, the findings of Aims 2 and 3 demonstrate similar patterns between self-improvement and self-evaluation comparison motivations. Both motivations were positively associated with thoughts of exercising and both associations between the motivations and momentary body dissatisfaction were moderated by baseline tendency to engage in appearance comparisons. Yet additional person-level factors revealed different associations between the motivations and body- and exercise- related thoughts and behaviors. The association between self-improvement comparisons and thoughts of exercising were significantly moderated by baseline body dissatisfaction and exercise behaviors. Whereas the association between self-evaluation comparisons and thoughts of exercising was only moderated by baseline tendency to engage in appearance comparisons. Furthermore, the associations between self-improvement comparisons and exercise intentions and behaviors (step count and exercise minutes) moderated by baseline exercise behaviors were the only day-level associations that produced significant and marginally significant results.

### **Subjective Norms**

Although intentions to exercise were not significantly associated with upward body-focused comparisons of either motivation (self-improvement or self-evaluation), they were significantly associated with subjective norms. While several studies have found that subjective norms have little effect on exercise intentions (Conroy, Elavsky et al., 2013; Hagger et al., 2002), the present study found 10-29% variability in daily exercise intentions to be explained by

injunctive subjective norms (the belief that friends, family, and others expect them to exercise) and 9% explained by distal descriptive subjective norms (the belief that many other college students are exercising). In Conroy, Elavsky et al. (2013), the injunctive subjective norms were significantly correlated with exercise intentions, but not descriptive subjective norms. The present findings expanded on Conroy, Elavsky et al. (2013) findings by examining the distal and proximal effects of injunctive and descriptive norms and their associations with exercise intentions. Additional support for the findings that injunctive norms are associated with exercise intentions was found. Although Conroy, Elavsky, and colleagues (2013) did not find a significant association between descriptive subjective norms and exercise intentions, the present study found a significant association between distal descriptive norms and exercise intentions. This suggests that on days college women have stronger beliefs that a lot of other college students exercised that day, they also have greater intentions to exercise the next day. But the greatest explanation for daily exercise intention variability was proximal injunctive norms suggesting that stronger beliefs that their friends and family members expect them to exercise is significantly associated with college women's greater intentions to exercise the next day.

### **Theoretical Implications**

The theory of planned behavior postulates that when and why people engage in behaviors is dependent upon the strength of their intentions. The present study examined factors, such as upward body-focused comparison motivations, that may influence daily exercise intentions in college women. According to the findings, no associations were found between upward body-focused comparisons or their motivations (self-improvement and self-evaluation) and daily measures of intentions to exercise. Therefore, no conclusions can be drawn about social comparisons being an additional social component in the theory of planned behavior. Given that

these comparisons were significantly associated with body dissatisfaction and thoughts of exercising, it is possible that these comparisons influence momentary body- and exercise- related thoughts, but that other factors (such as exercise self-efficacy, weather, and time availability; Conroy, Elavsky et al., 2013) may keep college women from actually intending to engage in these behaviors.

Although the findings do not expand on the theory of planned behavior in the context of exercise, they do add to social comparison theory. The present study demonstrated that upward body-focused comparisons are motivated by self-evaluation as well as by self-improvement. This is supported by participants being able to answer both self-evaluation and self-improvement items. The correlation between self-evaluation and self-improvement ratings was high ( $r = .59$ ), but not perfect suggesting that participants' responses on the self-evaluation items differed from their responses on the self-improvement items. Furthermore, the strongest evidence are the person-level differences that were found in the associations between the two motivations and body- and exercise- related thoughts and behaviors. Even though more research is needed to better understand the differences between self-evaluation and self-improvement motivations to engage in upward body-focused comparisons, the present study gives us reason to believe that these are two distinct motivations that have different between-person associations with body and exercise cognitions and behaviors.

### **Clinical Implications**

The findings in the present study also have several notable clinical implications. First, the study informs researchers of another factor (motivations when engaging in comparisons) that influences momentary thoughts of exercising and body dissatisfaction in college women. Second, this information on these motivations may help to inform interventions on college

campuses targeted to women. Although the study was intended to inform physical activity interventions in this population where physical activity levels are at alarmingly low rates, the findings may be more beneficial for body image interventions. The findings that self-improvement ratings were negatively associated with thoughts of exercising and exercise minutes in women with more baseline exercise behaviors, suggests that women who regularly exercise may think that the bodies of their comparison targets are attainable based on their current exercise regimens and, therefore, do not have more thoughts about exercising than what is typical for them. In other words, these self-improvement comparisons may have protective effects against body dissatisfaction for some women. If this is the case, education on self-improvement comparisons may help body image interventions to extend these effects to other women.

In addition to clinical implications of self-improvement comparisons, results of the present study suggest information on subjective norms should be incorporated in physical activity interventions on college campuses. In particular, intervention efforts should consider using the expectations of participants' friends and family for them to exercise as a way to increase participants' daily intentions to exercise. This may involve incorporating friends and family in the scheduling of exercise activities and instructing them to remind participants of their schedule in order to make them more accountable for their decisions.

### **Strengths and Limitations**

The present study had a number of strengths and limitations. The most notable strength was the research design used. The design used EMA to capture body-focused comparisons as they were actually occurring in real-life. Participants answered five surveys a day at random times for seven consecutive days in order to ensure body-focused comparisons were captured.

Moreover, the study used two objective measures of physical activity, which no previous EMA study on body-focused comparisons has done before. Two objective measures were used to capture participants overall physical activity (step count) as well as only their activity in moderate and vigorous intensity (exercise minutes). Even though there are limitations with using exclusively objective measures of physical activity as explained earlier, these objective measures eliminated the chance of biases that typically affect self-report data and also enabled the differentiation between exercise frequency and intensity.

Despite the strengths of the research design, there are also several limitations. The five surveys participants answered each day reduced the chance of missing comparisons, but did not eliminate it. It is possible that participants engaged in upward body-focused comparisons unconsciously and, therefore, were unable to report them in the surveys. Additionally, the EMA items that assessed motivations were displayed after participants were instructed to think about their most recent comparisons. Although this instruction was given to increase the accuracy of their reports, it also prevented the gathering of information about earlier comparisons. An event-related EMA design in which participants were instructed to self-initiate a survey each time she engaged in a social comparison, would have increased the likelihood of capturing all comparisons as they occurred, but also would have likely biased the results. Instructing participants to answer surveys each time they engaged in comparisons may have reduced the amount of data collected because it would require participants to initiate all surveys themselves and would not provide us information on their thoughts regarding their bodies and exercise during times they were not engaging in comparisons. Additionally, this method would likely make engaging in these comparisons more salient to participants. Instead of passively answering questions about comparisons at random times throughout their days, an event-specific study

design may have caused participants to actively seek and engage in comparisons. In turn, their responses on other measures would be associated with their intentional comparisons rather than their naturally occurring comparisons, which were needed to examine study aims.

In addition to limitations in capturing body-focused comparisons, there was also a limitation in the items used to assess self-improvement and self-evaluation motivations. The items were adapted from those used by Knobloch-Westerwick (2015), but were never used before. Given the novelty of assessing comparison motivations with EMA, this limitation was unavoidable.

Two additional limitations were the correlational study design and the college women study sample. No causal relationships between upward body-focused comparisons, including both motivations, and associated body and exercise thoughts and behaviors can be concluded based on the results. In other words, the findings can only tell us that thoughts of exercising and body dissatisfaction are associated with reports of comparisons. Conclusions about the series of events, such as upward comparisons causing an increase in thoughts of exercising, cannot be concluded. In addition to an inability to draw conclusions about causal relationships, the findings also cannot be generalized to other populations besides college women. College women were selected for this study because research informs us that college women frequently engage in upward body-focused comparisons (Fitzsimmons-Craft, 2011) and that their physical activity rates are much lower than their male counterparts (American College Health Association, 2009). Although understanding the association between these comparisons and exercise thoughts and behaviors is particularly relevant for this population, the study sample comprising only of college women limits our ability to generalize these findings to other women or male college students.

### **Future Directions**

Given this was the first study to examine motivations to engage in naturally occurring upward-body focused comparisons, there is still much left to be examined about these motivations in future research. For instance, the association between self-evaluation and self-improvement motivations to engage in these comparisons needs further examination. In the present study, ratings of self-improvement and self-evaluation were positively correlated, but they did not perfectly align. A better understanding of the association between the two motivations would help us determine the best way to quantify these comparisons. The present study examined the two motivations separately, but perhaps there are certain combinations of self-evaluation and self-improvement ratings that are more strongly associated with lower body dissatisfaction and greater exercise thoughts, intentions, and behaviors than others. For instance, the “higher” motivation for the comparison may be more indicative of associated patterns of body and exercise thoughts and behaviors rather than the individual scores themselves and may want to be examined in future research.

Additionally, person-level differences in baseline body dissatisfaction, appearance comparison tendency, and exercise behaviors revealed differences between the two comparison motivations and associated body and exercise cognitions and behaviors. Further research on these person-level differences as well as other possible person-level differences may help disentangle the relationship between these motivations and help inform body image interventions. In particular, more information on self-improvement comparisons in frequent exercisers would clarify the negative association between these comparisons and thoughts of exercising observed in this group in the present study. It is possible that these comparisons momentarily protect these individuals’ body image and reduce their motivations to exercise. In turn, information on the cognitive strategies these individuals use when making comparisons

could be translated to interventions aimed to help other women reduce high levels of body dissatisfaction associated with these comparisons that was observed in the present study and others (Leahey et al., 2011).

Not only does future research need to increase our understanding of these motivations, but it also has to examine whether these motivations can be shaped and manipulated in interventions. This could be examined by taking a cognitive-behavioral approach in an intervention study. The cognitive-behavioral approach would involve 1) educating participants on these comparisons and how to recognize their thoughts, feelings, and behaviors in response to these thin-ideal exposures and 2) using thought switching strategies to confront self-evaluative thoughts, such as “I am heavier than her”, and replace them with self-improvement thoughts, such as “I am capable of making positive changes to look more like her”. This research design would require an experimental group that is trained on this cognitive-behavioral approach and a control group that receives no training in order to assess changes in body dissatisfaction associated with this approach. Moreover, random sampling for both conditions would reduce the likelihood of confounding variables, such as baseline exercise behaviors, influencing the results.

In addition to future research on self-improvement and self-evaluation motivations to engage in these comparisons, a better understanding of the association between thoughts of exercising and intentions to exercise is needed. The findings of the present study suggest that upward body-focused comparisons are positively associated with thoughts of exercising, but no significant association between these comparisons and interventions was found. Future research should consider information about when college women last exercised in order to understand if recent exercise behavior influence lower reports of exercise thoughts and intentions as well as other reasons for low exercise intentions ratings, such as individual differences in perceived time

availability, exercise self-efficacy, and attitudes towards exercising (Conroy, Elavsky et al., 2013).

In addition to other factors that may influence daily intentions to exercise, there are likely other momentary processes that influence individuals' engagement in self-improvement comparisons and thoughts of exercising. Previous research on the association between mood states and body-related cognitions suggest that women with negative moods (e.g., sadness, anger) overestimate the size of their bodies (Cooper & Taylor, 1992) and are more likely to internalize the thin-ideal when exposed to thin-ideal media images (Cattarin, Thompson, Thomas & Williams, 2000). This suggests that mood may be an important predictor in comparison motivations and associated processes (e.g., thoughts of exercising, exercise intentions) and needs to be examined in future research.

## **CHAPTER V**

### **CONCLUSIONS**

The present study was the first to examine motivations to engage in upward body-focused comparisons in real-life settings. Similar patterns were found for self-improvement and self-evaluation comparison motivations and their associations with body and exercise thoughts and behaviors in young women's daily lives. Both motivations were positively associated with thoughts of exercising and both associations between the motivations and momentary body dissatisfaction were moderated by baseline tendency to engage in appearance comparisons. However, an examination of additional person-level differences suggests that the associations between self-improvement motivations and body and exercise thoughts and behaviors may differ from the associations between the same constructs and self-evaluation comparisons for certain individuals. In particular, a significant negative association between self-improvement comparisons and thoughts of exercising was found in participants with high baseline exercise behaviors that was not observed for the self-evaluation and thoughts of exercising relationship. This suggests certain groups of women, such as frequent exercisers, engage in comparisons in different ways. Further research is needed to examine these person-level differences and how self-improvement motivations to engage in upward body-focused comparisons may offer protection against momentary body dissatisfaction associated with these upward body-focused comparisons.

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Table 1

*Descriptive Statistics of Study Measures*

Measure	<i>N</i>	<i>M (SD)</i>	Range [Min, Max]	Skewness ( <i>SE</i> )	Kurtosis ( <i>SE</i> )
<i>Person-level</i>					
BSQ Total	74	40.77 (16.09)	78 [17, 95]	0.99 (0.28)	0.92 (0.55)
BSQ Categorical	74	0.80 (0.95)	3 [0, 3]	0.91 (0.28)	-0.25 (0.55)
BSQ Sq. Total	74	1917.60 (1598.57)	8736 [289, 9025]	1.99 (0.28)	5.10 (0.55)
PACSR Total	74	18.13 (10.93)	44 [0, 44]	0.38 (0.28)	-.31 (0.55)
PACSR Sq. Total	74	446.46 (463.48)	1936 [0, 1936]	1.54 (0.28)	2.07 (0.55)
IPAQ Total	74	437.30 (492.23)	2000 [0, 2000]	1.76 (0.28)	2.90 (0.55)
IPAQ Categorical	74	0.96 (0.80)	2 [0, 2]	0.07 (0.28)	-1.43 (0.55)
IPAQ Sq. Total	74	245178.38 (333535.18)	1000000 [0,1000000]	1.46 (.28)	0.70 (0.55)
<i>Day-level</i>					
Step Count	607	6866.71 (4055.83)	22417 [0, 22417]	0.53 (0.10)	0.20 (0.20)
Exercise Minutes	607	22.03 (25.55)	130 [0, 130]	1.47 (0.10)	2.30 (0.20)

Table 1 Continued

Measure	<i>N</i>	<i>M</i> ( <i>SD</i> )	Range [Min, Max]	Skewness ( <i>SE</i> )	Kurtosis ( <i>SE</i> )
Exercise Intentions	607	1.58 (1.06)	4 [0, 4]	0.79 (0.10)	0.58 (0.20)
Prox. Des. Norm	607	1.42 (1.43)	6 [0, 6]	1.37 (0.10)	1.76 (0.20)
Dis. Des. Norm	607	2.88 (1.67)	6 [0, 6]	0.01 (0.10)	-0.42 (0.20)
Prox. Inj. Norm	607	1.49 (1.48)	6 [0, 6]	1.21 (0.10)	1.14 (0.20)
Dis. Inj. Norm	607	1.41 (1.45)	6 [0, 6]	1.33 (0.10)	2.30 (0.20)
<i>Moment-level</i>					
Exercise Thoughts	1388	2.49 (2.06)	6.00 [0, 6]	0.17 (0.07)	-1.29 (0.13)
Self-Improvement	107	4.36 (1.02)	4.81 [1.19, 6]	-0.96 (0.23)	1.01 (0.46)
Self-Evaluation	107	4.51 (1.04)	6.00 [0, 6]	-1.28 (0.23)	3.19 0(.46)
BISS Total	1388	3.34 (1.42)	6.00 [0, 6]	0.08 (0.07)	-0.58 (0.13)

*Note.* BSQ Total = Body Shape Questionnaire-16 total score, BSQ Categorical = Body Shape Questionnaire-16 total score categorized, BSQ Sq. Total = Body Shape Questionnaire-16 total scores squared, PACSR Total = Physical Appearance Comparison Scale- Revised total scores, PACSR Sq. Total = Physical Appearance Comparison Scale- Revised total scores squared, IPAQ Total = Internal Physical Activity Questionnaire total scores, IPAQ Categorical = Internal Physical Activity Questionnaire total scores categorized, IPAQ Sq. Total = IPAQ total scores squared, Step Count = daily step count, Exercise Minutes = daily minutes in moderate and vigorous exercise, Exercise Intentions = daily intentions to exercise the next day, Prox. Des. Norm = proximal descriptive subjective norm, Dis. Des. Norm = distal descriptive subjective norm, Prox Inj. Norm = proximal injunctive subjective norm, Dis. Inj. Norm = distal injunctive subjective norm, Exercise Thoughts = momentary thoughts of exercising, Self-Improvement = ratings of self-improvement motivation to engage in comparisons, Self-Evaluation = ratings of self-evaluation motivation to engage in comparisons, BISS Total = Body Image State Scale total scores (lower scores indicate greater body dissatisfaction).

Table 2

*Momentary Survey Compliance*

	<i>N</i>	Percentage of Sample
<i>Total Compliance</i>		
Completed 100%	11	14.3
Completed at least 85%	47	61.0
Completed at least 50%	71	92.2
Completed at least 20%	75	97.4
Completed $\leq$ 20%	2	2.4
<i>Timely Compliance</i>		
Completed 100%	3	3.8
Completed at least 85%	18	23.4
Completed at least 50%	59	76.6
Completed $\leq$ 20%	2	2.4

*Note.* Total Compliance = the total number of surveys participants' completed, Timely Compliance = the total number of surveys participants' completed within an hour of being notified.

Table 3

*End of Day Survey Compliance*

	<i>N</i>	Percentage of Sample
<i>Total Compliance</i>		
Completed 100%	23	29.9
Completed at least 75%	53	68.8
Completed at least 40%	70	90.9
Completed at least 30%	73	94.8
Completed $\leq$ 15%	4	5.2

*Note.* Total Compliance = the total number of surveys participants' completed.

Table 4

*Demographics of Study Sample*

	<i>N</i>	Percentage
<i>Race/Ethnicity</i>		
Black or African American	44	59.5
White or Caucasian	31	41.9
Asian or Asian American	2	2.7
American Indian or Alaska Native	1	1.4
Native Hawaiian or Other Pacific Islander	1	1.4
Other	1	1.4
Hispanic or Latina	4	5.4
<i>Enrollment</i>		
Full-time	72	97.3
Part-time	2	2.7
<i>Year</i>		
Freshman	25	33.8
Sophomore	19	25.7
Junior	23	31.1
Senior	7	9.5
<i>Living Location</i>		
On campus	43	58.1
Off campus	31	41.9
<i>Living Arrangement</i>		

Table 4 Continued

	<i>N</i>	Percentage
Live alone	3	4.1
With female roommate(s)	49	66.2
With male roommate(s)	1	1.4
Family members	15	20.3
Partner/significant other	6	8.1
<i>Employment</i>		
Full-time paying job	5	6.8
Part-time paying job	34	45.9
Full-time volunteer position	4	5.4
Part-time volunteer position	70	94.6
Not employed or volunteering	33	44.6
<i>Relationship Status</i>		
Single (not dating)	32	43.2
Dating one partner	33	44.6
In a monogamous relationship	9	44.6
<i>Sexual Orientation</i>		
Only homosexual/lesbian/gay	5	6.8
Mostly homosexual/ lesbian/ gay	1	1.4
Bisexual	7	9.5
Mostly heterosexual	6	8.1
Only heterosexual	55	74.3

*Note.* Percentages do not add to 100% in the Race/Ethnicity and Employment sections because participants were able to select more than one option.

Table 5

*Summary of Linear Regression Analyses for Upward Body-Focused Comparison Frequency Predicting Body Dissatisfaction and Exercise Thoughts, Intentions, and Behaviors*

Outcomes	B	<i>t</i>	<i>F</i>	<i>p</i>
<i>Moment-level</i>				
BISS Total Scores	-0.30	-2.68*	7.19	.009
Exercise Thoughts	0.16	0.97	0.94	.340
<i>Day-level</i>				
Exercise Intentions	0.01	0.05	0.00	.960
Step Count	0.06	0.47	0.22	.640
Exercise Minutes	0.03	0.25	0.06	.805

*Note.*  $N = 74$ . BISS Total Scores = Body Image State Scale total scores (lower scores equal greater body dissatisfaction).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ .

Table 6

*Summary of Day-level Multilevel Analyses for Upward Body-Focused Comparison Frequency Predicting Body Dissatisfaction and Exercise Thoughts, Intentions, and Behaviors*

Outcomes	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
<i>Moment-level</i>					
BISS Total Scores	-0.22	0.08	-2.91***	396	.000
Exercise Thoughts	0.44	0.10	4.26***	396	.000
<i>Day-level</i>					
Exercise Intentions	0.05	0.11	0.51	396	.610
Step Count	-348.77	309.61	-1.13	396	.261
Exercise Minutes	-0.23	1.91	-0.12	396	.906

*Note.* BISS Total Scores = Body Image State Scale total scores (lower scores equal greater body dissatisfaction).

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ .

Table 7

*Summary of Multilevel Analyses for Upward Body-Focused Comparison Motivations Predicting Body Dissatisfaction and Exercise Thoughts, Intentions, and Behaviors*

Predictors	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
<b><i>Moment-level</i></b>					
<i>Body Dissatisfaction</i>					
Self-Improvement	0.05	0.11	0.43	32	.668
Self-Evaluation	0.02	0.20	0.13	32	.901
<i>Exercise Thoughts</i>					
Self-Improvement	0.83	0.27	3.08**	73	.003
Self-Evaluation	0.58	0.24	2.36**	32	.025
<b><i>Day-level</i></b>					
<i>Exercise Intentions</i>					
Self-Improvement	0.02	0.19	0.14	41	.886
Self-Evaluation	0.03	0.20	0.14	41	.289
<i>Step Count</i>					
Self-Improvement	-1602.49	875.93	-1.83†	41	.075
Self-Evaluation	-519.39	1299.97	-0.40	41	.692
<i>Exercise Minutes</i>					
Self-Improvement	-4.88	5.92	-1.82	78	.472
Self-Evaluation	-0.51	7.03	-0.07	78	.955

*Note.* Body Dissatisfaction was measured with Body Image State Scale total scores (lower scores indicate greater body dissatisfaction).

†*p* < .10, \**p* < .05, \*\**p* < .01, \*\*\**p* < .001.

Table 8

*Summary of Multilevel Analyses for Aim 2 Moderated by Baseline Body Dissatisfaction*

Predictors	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
<b><i>Moment-level</i></b>					
<i>Body Dissatisfaction</i>					
Self-Improvement*BSQ Total	-0.00	0.01	-0.52	31	.607
Self-Improvement*BSQ Categorical	-0.00	0.14	-0.07	31	.948
Self-Improvement* BSQ Sq. Total	-0.00	0.00	-0.36	31	.342
Self-Evaluation*BSQ Total	-0.00	0.02	-0.27	31	.792
Self-Evaluation*BSQ Categorical	0.09	0.20	0.44	31	.662
Self-Evaluation*BSQ Sq. Total	-0.00	0.00	-0.49	31	.625
<i>Exercise Thoughts</i>					
Self-Improvement*BSQ Total	0.08	0.03	2.48*	31	.019
Self-Improvement*BSQ Categorical	0.80	0.27	2.94**	31	.006
Self-Improvement* BSQ Sq. Total	0.00	0.00	1.99†	31	.056
Self-Evaluation*BSQ Total	0.01	0.05	0.11	31	.913
Self-Evaluation*BSQ Categorical	0.16	0.42	0.37	31	.712
Self-Evaluation*BSQ Sq. Total	-0.00	0.00	-0.05	31	.960
<b><i>Day-level</i></b>					
<i>Exercise Intentions</i>					
Self-Improvement*BSQ Total	-0.00	0.01	-0.35	40	.701
Self-Improvement*BSQ Categorical	-0.12	0.16	-0.74	40	.464
Self-Improvement* BSQ Sq. Total	-0.00	0.00	-0.43	40	.672

Table 8 Continued

Predictors	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
Self-Evaluation*BSQ Total	0.01	0.01	1.14	40	.262
Self-Evaluation*BSQ Categorical	0.06	0.19	0.30	40	.766
Self-Evaluation*BSQ Sq. Total	0.00	0.00	1.27	40	.212
<i>Step Count</i>					
Self-Improvement*BSQ Total	67.01	67.94	0.99	40	.330
Self-Improvement*BSQ Categorical	1060.21	925.16	1.15	40	.259
Self-Improvement* BSQ Sq. Total	0.50	0.65	0.77	40	.443
Self-Evaluation*BSQ Total	47.29	53.08	0.89	40	.378
Self-Evaluation*BSQ Categorical	888.98	987.62	0.90	40	.373
Self-Evaluation*BSQ Sq. Total	0.24	0.41	0.60	40	.551
<i>Exercise Minutes</i>					
Self-Improvement*BSQ Total	0.26	0.52	0.51	40	.611
Self-Improvement*BSQ Categorical	5.01	7.68	0.65	40	.518
Self-Improvement* BSQ Sq. Total	0.00	0.00	0.29	40	.774
Self-Evaluation*BSQ Total	0.31	0.34	0.91	40	.368
Self-Evaluation*BSQ Categorical	5.57	7.20	0.77	40	.443
Self-Evaluation*BSQ Sq. Total	0.00	0.00	0.58	40	.564

*Note.* BSQ Total = Body Shape Questionnaire-16 total score, BSQ Categorical = Body Shape Questionnaire-16 total score categorized, BSQ Sq. Total = Body Shape Questionnaire-16 total scores squared, Self-Improvement = ratings of self-improvement motivation to engage in comparisons, Self-Evaluation = ratings of self-evaluation motivation to engage in comparisons. Momentary Body Dissatisfaction was measured with Body Image State Scale total scores (lower scores indicate greater body dissatisfaction).

† $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

Table 9

*Summary of Multilevel Analyses for Aim 2 Moderated by Baseline Appearance Comparison Tendency*

Predictors	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
<b><i>Moment-level</i></b>					
<i>Body Dissatisfaction</i>					
Self-Improvement*PACS-R Total	-0.06	0.01	-5.31***	31	.000
Self-Improvement*PACS-R Sq. Total	-0.00	0.00	-2.75**	31	.010
Self-Evaluation*PACS-R Total	-0.07	0.04	-1.99*	72	.023
Self-Evaluation*PACS-R Sq. Total	-0.00	0.00	-1.43	31	.162
<i>Exercise Thoughts</i>					
Self-Improvement*PACS-R Total	0.05	0.06	0.84	31	.408
Self-Improvement*PACS-R Sq. Total	0.00	0.00	0.28	31	.778
Self-Evaluation*PACS-R Total	-0.07	0.04	-1.99*	72	.051
Self-Evaluation*PACS-R Sq. Total	-0.00	0.00	-3.81***	72	.000
<b><i>Day-level</i></b>					
<i>Exercise Intentions</i>					
Self-Improvement*PACS-R Total	-0.00	0.02	-0.05	40	.960
Self-Improvement*PACS-R Sq. Total	-0.00	0.00	-0.21	40	.837
Self-Evaluation*PACS-R Total	0.01	0.01	1.67	40	.103
Self-Evaluation*PACS-R Sq. Total	0.00	0.00	1.57	40	.124
<i>Step Count</i>					
Self-Improvement*PACS-R Total	34.38	107.75	0.32	40	.751

Table 9 Continued

Predictors	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
Self-Improvement*PACS-R Sq. Total	0.06	2.30	0.03	40	.980
Self-Evaluation*PACS-R Total	38.19	102.82	0.37	40	.712
Self-Evaluation*PACS-R Sq. Total	0.07	1.97	0.04	40	.972
<i>Exercise Minutes</i>					
Self-Improvement*PACS-R Total	-0.13	0.76	-0.17	40	.868
Self-Improvement*PACS-R Sq. Total	-0.01	0.01	-0.34	40	.738
Self-Evaluation*PACS-R Total	0.21	0.61	0.34	40	.734
Self-Evaluation*PACS-R Sq. Total	0.00	0.01	0.05	40	.959

*Note.* PACSR Total = Physical Appearance Comparison Scale- Revised total scores, PACSR Sq. Total = Physical Appearance Comparison Scale- Revised total scores squared, IPAQ Total = Internal Physical Activity Questionnaire total scores, Self-Improvement = ratings of self-improvement motivation to engage in comparisons, Self-Evaluation = ratings of self-evaluation motivation to engage in comparisons. Momentary Body Dissatisfaction was measured with Body Image State Scale total scores (lower scores indicate greater body dissatisfaction).

†*p* < .10, \**p* < .05, \*\**p* < .01, \*\*\**p* < .001.

Table 10

*Summary of Multilevel Analyses for Aim 2 Moderated by Baseline Exercise Behaviors*

Predictors	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
<b><i>Moment-level</i></b>					
<i>Body Dissatisfaction</i>					
Self-Improvement*IPAQ Total	0.00	0.00	0.28	31	.781
Self-Improvement*IPAQ Categorical	0.01	0.07	0.10	31	.919
Self-Improvement* IPAQ Sq. Total	-0.00	0.00	-0.31	31	.763
Self-Evaluation*IPAQ Total	-0.00	0.00	-0.60	31	.556
Self-Evaluation*IPAQ Categorical	-0.09	0.17	-0.54	31	.592
Self-Evaluation*IPAQ Sq. Total	-0.00	0.00	-1.75†	31	.090
<i>Exercise Thoughts</i>					
Self-Improvement*IPAQ Total	-0.00	0.00	-2.73*	31	.010
Self-Improvement*IPAQ Categorical	-0.58	0.17	-3.36**	31	.002
Self-Improvement* IPAQ Sq. Total	-0.00	0.00	-2.80**	31	.009
Self-Evaluation*IPAQ Total	-0.00	0.00	-0.95	31	.350
Self-Evaluation*IPAQ Categorical	-0.36	0.21	-1.70	31	.099
Self-Evaluation*IPAQ Sq. Total	-0.00	0.00	0.43	72	.667
<b><i>Day-level</i></b>					
<i>Exercise Intentions</i>					
Self-Improvement*IPAQ Total	-0.00	0.00	-1.38	40	.175
Self-Improvement*IPAQ Categorical	-0.03	0.27	-0.10	40	.923
Self-Improvement* IPAQ Sq. Total	-0.00	0.00	-1.70†	40	.097

Table 10 Continued

Predictors	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
Self-Evaluation*IPAQ Total	0.00	0.00	1.18	40	.247
Self-Evaluation*IPAQ Categorical	0.29	0.25	1.13	40	.265
Self-Evaluation*IPAQ Sq. Total	0.00	0.00	0.52	40	.604
<i>Step Count</i>					
Self-Improvement*IPAQ Total	-2.47	1.67	-1.48†	36	.057
Self-Improvement*IPAQ Categorical	-1318.96	1168.27	-1.13	40	.266
Self-Improvement* IPAQ Sq. Total	-0.00	0.00	-1.46	36	.154
Self-Evaluation*IPAQ Total	0.99	1.17	0.84	40	.404
Self-Evaluation*IPAQ Categorical	1054.08	1457.21	0.72	40	.474
Self-Evaluation*IPAQ Sq. Total	-0.00	0.00	0.64	36	.529
<i>Exercise Minutes</i>					
Self-Improvement*IPAQ Total	-0.02	0.01	-1.79†	40	.081
Self-Improvement*IPAQ Categorical	-9.75	9.69	-1.01	40	.320
Self-Improvement* IPAQ Sq. Total	-0.00	0.00	-2.21*	36	.033
Self-Evaluation*IPAQ Total	-0.01	0.01	-0.89	40	.382
Self-Evaluation*IPAQ Categorical	-2.31	10.26	-0.23	40	.823
Self-Evaluation*IPAQ Sq. Total	-0.00	0.00	-0.91	36	.369

*Note.* IPAQ Total = Internal Physical Activity Questionnaire total scores, IPAQ Categorical = Internal Physical Activity Questionnaire total scores categorized, IPAQ Sq. Total = IPAQ total scores squared, Self-Improvement = ratings of self-improvement motivation to engage in comparisons, Self-Evaluation = ratings of self-evaluation motivation to engage in comparisons. Momentary Body Dissatisfaction was measured with Body Image State Scale total scores (lower scores indicate greater body dissatisfaction).

† $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

Table 11

*Summary of Moderator Follow-up Analyses*

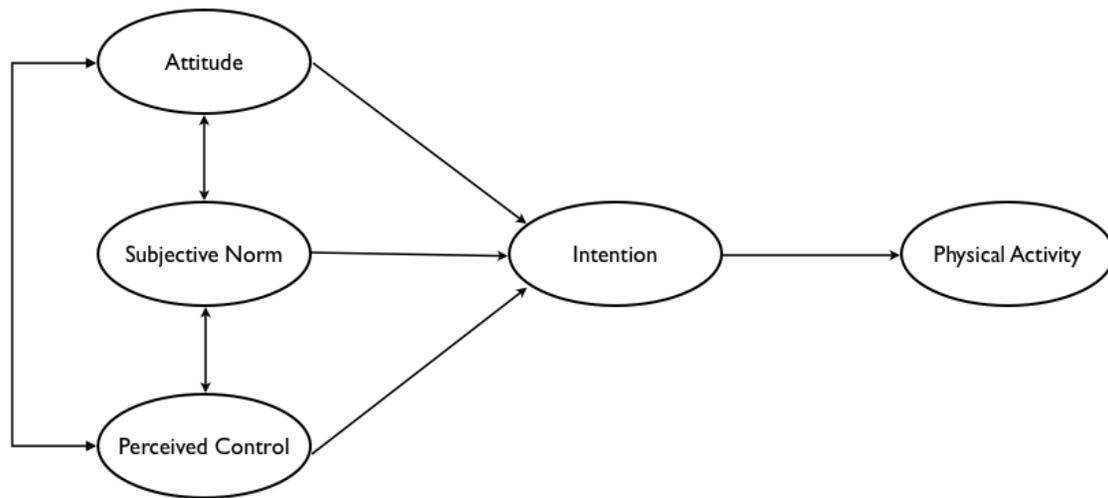
Predictors	B	SE B	t	df	p
<i>Moment-level</i>					
<i>Body Dissatisfaction*Self-Improvement</i>					
PACSR Total 1 SD Above Mean	-0.88	0.17	-5.18***	31	.000
PACSR Total 1 SD Below Mean	0.34	0.11	3.15**	31	.004
PACSR Sq. Total 1 SD Above Mean	-1.04	0.35	-2.95**	31	.006
PACSR Sq. Total 1 SD Below Mean	0.35	0.18	1.95†	31	.060
<i>Body Dissatisfaction*Self-Evaluation</i>					
PACSR Total 1 SD Above Mean	-0.61	0.23	-2.64*	31	.013
PACSR Total 1 SD Below Mean	0.27	0.22	1.26	31	.217
<i>Exercise Thoughts*Self-Improvement</i>					
BSQ Total 1 SD Above Mean	1.65	0.60	2.74*	31	.010
BSQ Total 1 SD Below Mean	-0.81	0.41	-1.98†	31	.057
IPAQ Sq. Total 1 SD Above Mean	-0.81	0.28	-2.87**	31	.007
IPAQ Sq. Total 1 SD Below Mean	1.12	0.43	2.59*	31	.015
<i>Exercise Thoughts*Self-Evaluation</i>					
PACSR Sq. Total 1 SD Above Mean	-1.03	0.51	-2.02*	72	.047
PACSR Sq. Total 1 SD Below Mean	1.39	0.35	4.01***	72	.000
<i>Day-level</i>					
<i>Exercise Minutes*Self-Improvement</i>					

Table 11 Continued

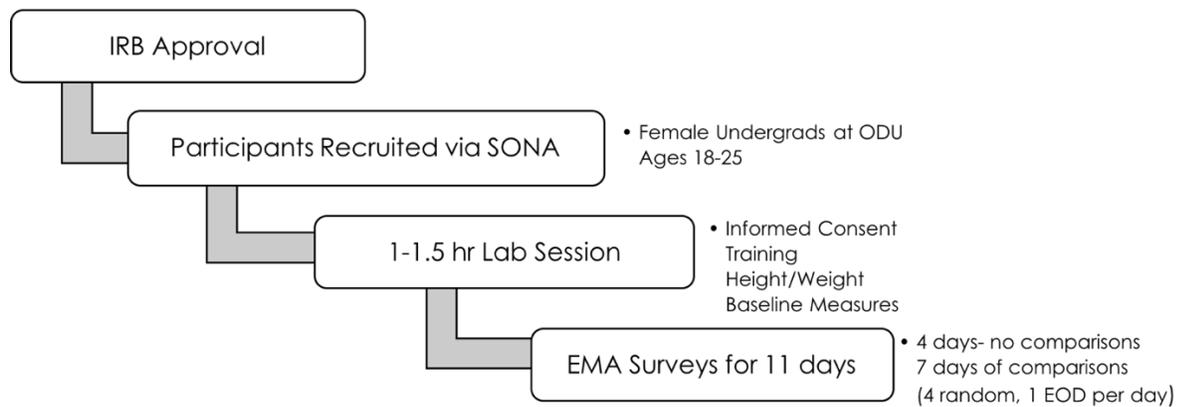
Predictors	B	SE B	<i>t</i>	<i>df</i>	<i>p</i>
IPAQ Sq. Total 1 SD Above Mean	-22.46	10.24	-2.19*	36	.035
IPAQ Sq. Total 1 SD Below Mean	7.11	11.26	0.63	36	.532

*Note.* BSQ Total = Body Shape Questionnaire-16 total score, BSQ Categorical = Body Shape Questionnaire-16 total score categorized, BSQ Sq. Total = Body Shape Questionnaire-16 total scores squared, PACSR Total = Physical Appearance Comparison Scale- Revised total scores, PACSR Sq. Total = Physical Appearance Comparison Scale- Revised total scores squared, IPAQ Total = Internal Physical Activity Questionnaire total scores, IPAQ Categorical = Internal Physical Activity Questionnaire total scores categorized, IPAQ Sq. Total = IPAQ total scores squared, Self-Improvement = ratings of self-improvement motivation to engage in comparisons, Self-Evaluation = ratings of self-evaluation motivation to engage in comparisons. 1 SD Above Mean = scores were centered 1 SD above the mean, 1 SD Below Mean = scores were centered 1 SD below the mean. Momentary Body Dissatisfaction was measured with Body Image State Scale total scores (lower scores indicate greater body dissatisfaction).

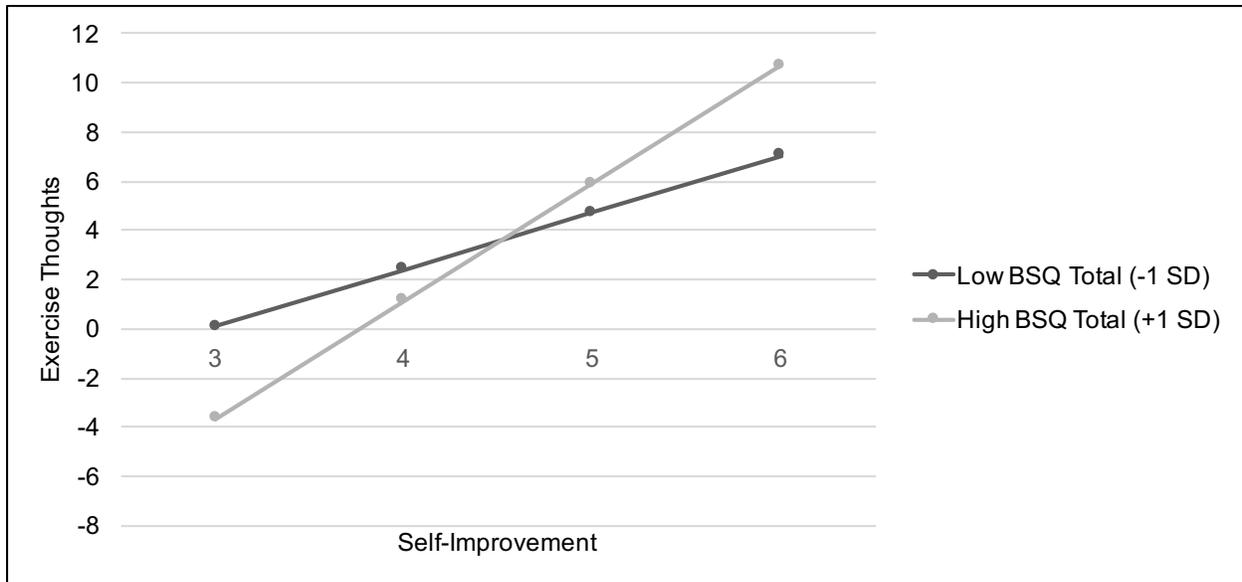
†*p* < .10, \**p* < .05, \*\**p* < .01, \*\*\**p* < .001.



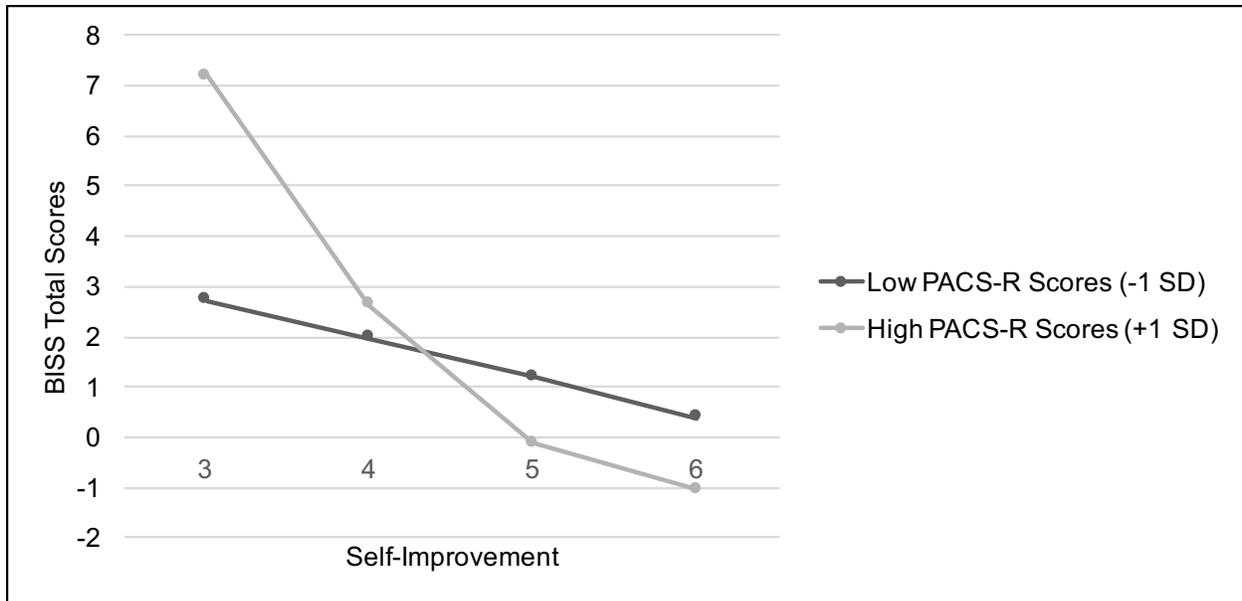
*Figure 1.* An illustration of the components of the theory of planned behavior in the context of physical activity. A person's engagement in physical activity is dependent upon the strength of their intentions. There is strong evidence that one's intentions are influenced by their attitude and perceived control regarding physical activity, but there is less support for the subjective norms component (Ajzen, 1991).



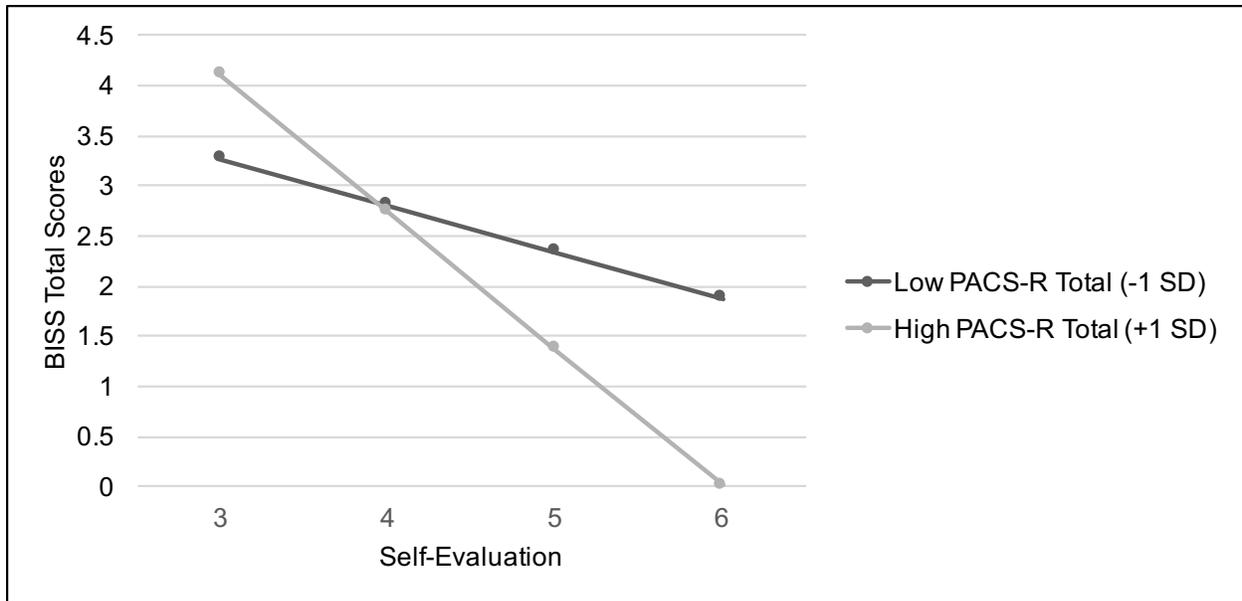
*Figure 2.* The study procedures.



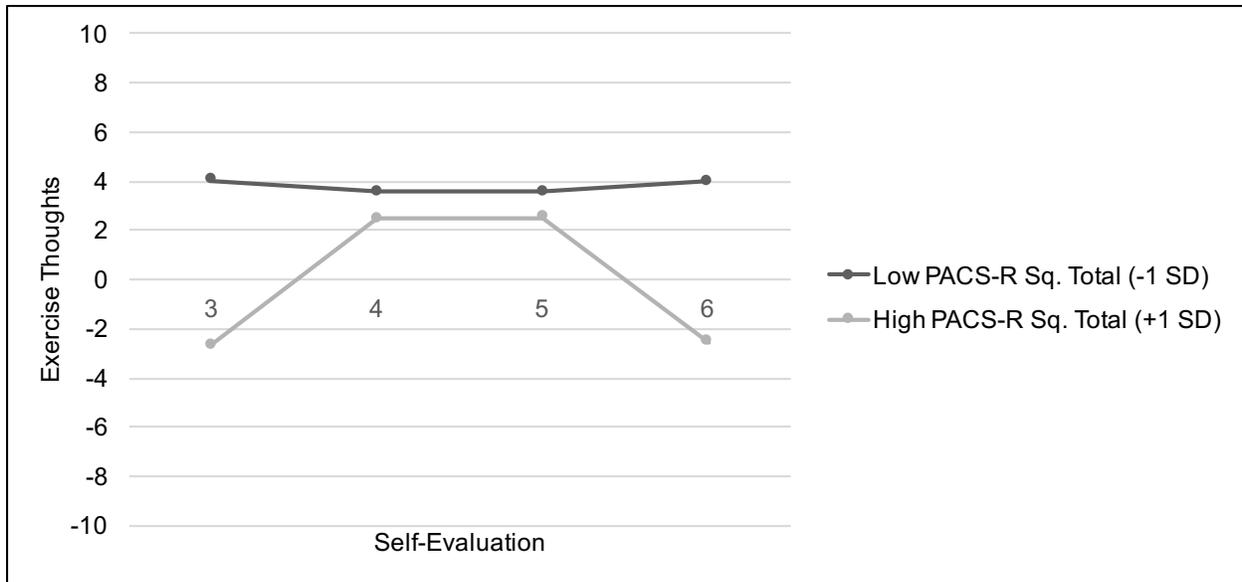
*Figure 3.* The association between self-improvement comparisons and exercise thoughts moderated by baseline body dissatisfaction. The x-axis represents self-improvement ratings, higher scores equal higher ratings of self-improvement. The y-axis represents exercise thoughts, higher scores equal greater thoughts of exercising. As shown in the legend, the Low BSQ Total line represents lower levels of baseline body dissatisfaction, measured by the Body Shape Questionnaire-16, and the High BSQ Total line represents greater levels of baseline body dissatisfaction.



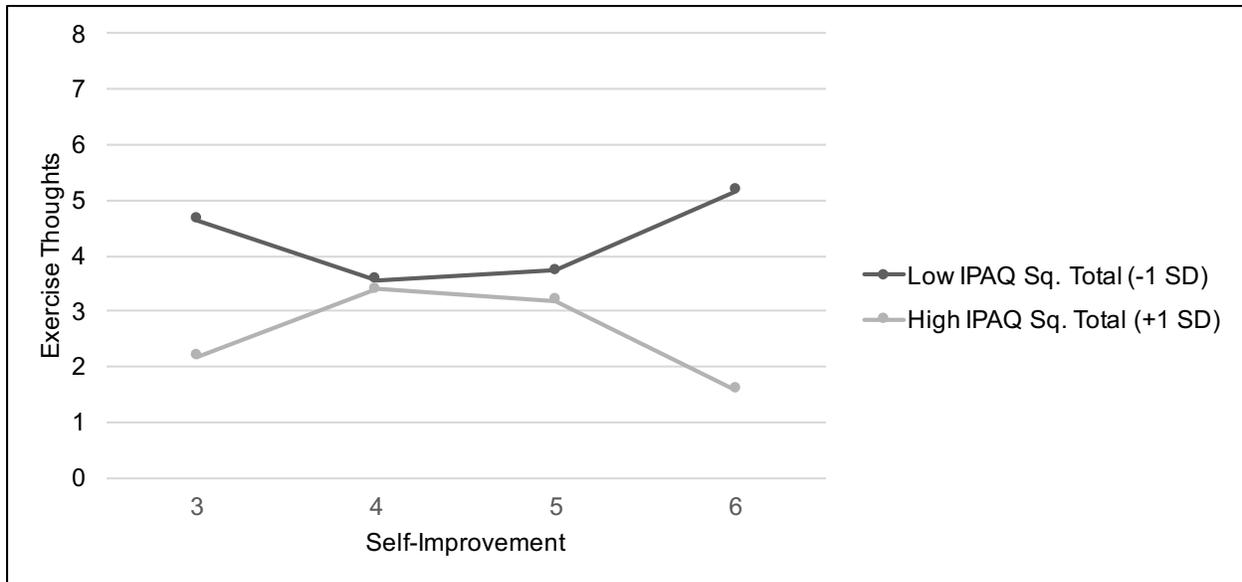
*Figure 4.* The association between self-improvement comparisons and BISS total scores moderated by baseline appearance comparison tendency. The x-axis represents self-improvement ratings, higher scores equal higher levels of self-improvement. The y-axis represents BISS total scores, lower scores equal greater body dissatisfaction. As shown in the legend, the Low PACS-R Scores line represents lower levels of appearance comparison tendency, measured by the Physical Appearance Comparison Scale- Revised total scores and squared total scores, and the High PACS-R Scores line represents greater levels of appearance comparisons tendency.



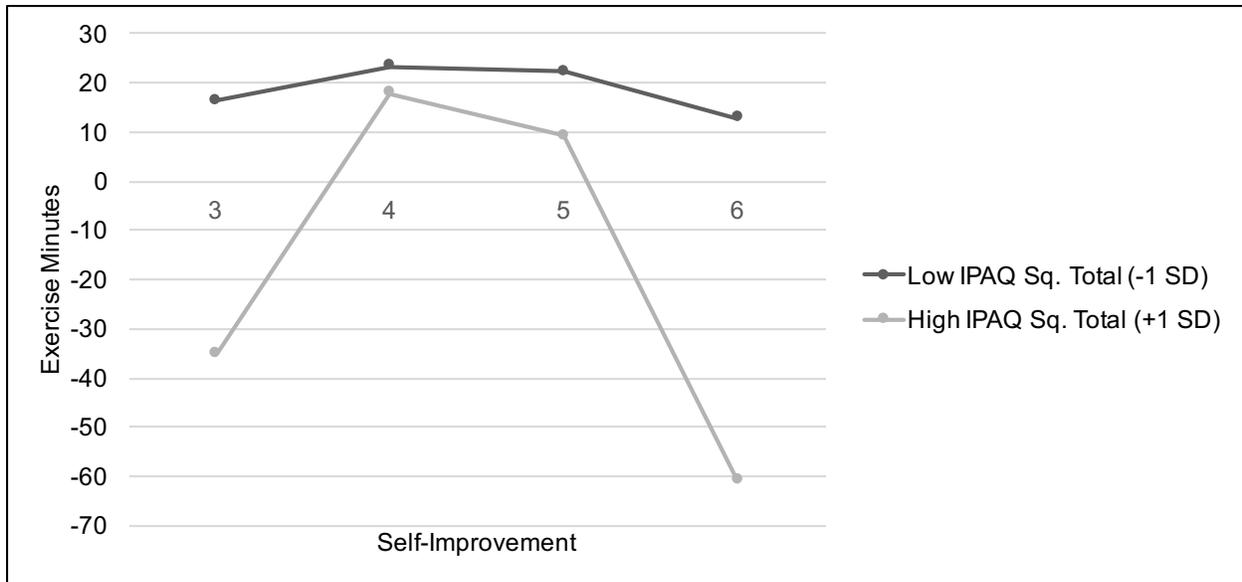
*Figure 5.* The association between self-evaluation comparisons and BISS total scores moderated by baseline appearance comparison tendency. The x-axis represents self-evaluation ratings, higher scores equal higher ratings of self-evaluation. The y-axis represents BISS total scores, lower scores equal greater body dissatisfaction. As shown in the legend, the Low PACS-R Total line represents lower levels of appearance comparison tendency, measured by the Physical Appearance Comparison Scale- Revised, and the High PACS-R Total line represents greater levels of appearance comparisons tendency.



*Figure 6.* The association between self-evaluation comparisons and exercise thoughts moderated by baseline appearance comparison tendency. The x-axis represents self-evaluation ratings, higher scores equal higher ratings of self-evaluation. The y-axis represents exercise thoughts, higher scores equal greater thoughts about exercising. As shown in the legend, the Low PACS-R Sq. Total line represents lower levels of appearance comparison tendency, measured by the Physical Appearance Comparison Scale- Revised, and the High PACS-R Sq. Total line represents greater levels of appearance comparisons tendency. PACS-R squared total scores were used in this model.



*Figure 7.* The association between self-improvement comparisons and exercise thoughts moderated by baseline exercise behaviors. The x-axis represents self-improvement ratings, higher scores equal higher ratings of self-improvement. The y-axis represents exercise thoughts, higher scores equal greater thoughts of exercising. As shown in the legend, the Low IPAQ Sq. Total line represents lower levels of baseline exercise behaviors, measured by the International Physical Activity Questionnaire, and the High IPAQ Sq. Total line represents greater levels of baseline exercise behaviors. IPAQ squared total scores were used in this model.



*Figure 8.* The association between self-improvement comparisons and exercise minutes moderated by baseline exercise behaviors. The x-axis represents self-improvement ratings, higher scores equal higher ratings of self-improvement. The y-axis represents exercise minutes, higher scores equal more minutes in moderate and vigorous exercise. As shown in the legend, the Low IPAQ Sq. Total line represents lower levels of baseline exercise behaviors, measured by the International Physical Activity Questionnaire, and the High IPAQ Sq. Total line represents greater levels of baseline exercise behaviors. IPAQ squared total scores were used in this model.

## APPENDIX A

### PHYSICAL APPEARANCE COMPARISON SCALE-REVISED (PACS-R)

People sometimes compare their physical appearance to the physical appearance of others. This can be a comparison of their weight, body size, body shape, body fat, or overall appearance. Thinking about how you generally compare yourself to others, please use the following scale to rate how often you make these kinds of comparisons.

	Never		Seldom		Sometimes		Often		Always
1. When I'm in public, I compare my physical appearance to the appearance of others. .....	0	1	2	3	4				
2. When I meet a new person (same sex), I compare my body size to his/her body size. .....	0	1	2	3	4				
3. When I'm at work or school, I compare my body shape to the body shape of others. .....	0	1	2	3	4				
4. When I'm out in public, I compare my body fat to the body fat of others. .....	0	1	2	3	4				
5. When I'm shopping for clothes, I compare my weight to the weight of others. .....	0	1	2	3	4				
6. When I'm at a party, I compare my body shape to the body shape of others. .....	0	1	2	3	4				
7. When I'm with a group of friends, I compare my weight to the weight of others. .....	0	1	2	3	4				
8. When I'm at work or school, I compare my body size to the body size of others. .....	0	1	2	3	4				

9. When I'm with a group of friends, I compare my body shape to the body shape of others. 0 1 2 3 4  
.....
10. When I'm eating in a restaurant, I compare my body fat to the body fat of others. 0 1 2 3 4  
.....
11. When I'm at the gym, I compare my physical appearance to the appearance of others. 0 1 2 3 4  
.....

## APPENDIX B

### BODY SHAPE QUESTIONNAIRE-16 (BSQ-16)

We should like to know how you have been feeling about your appearance over the **PAST FOUR WEEKS**. Please read each question and circle the appropriate number to the right. Please answer all the questions.

		Never		Rarely		Sometimes		Often		Very often		Always
<b>OVER THE PAST <u>FOUR WEEKS</u>:</b>												
1. Have you been so worried about your shape that you have been feeling you ought to diet?.....		1		2		3		4		5		6
2. Have you been afraid that you might become fat (or fatter)?.....		1		2		3		4		5		6
3. Has feeling full (e.g. after eating a large meal) made you feel fat?.....		1		2		3		4		5		6
4. Have you noticed the shape of other women and felt that your own shape compared unfavorably?.....		1		2		3		4		5		6
5. Has thinking about your shape interfered with your ability to concentrate (e.g. while watching television, reading, listening to conversations)?.....		1		2		3		4		5		6
6. Has being naked, such as when taking a bath, made you feel fat?.....		1		2		3		4		5		6
7. Have you imagined cutting off fleshy areas of your body?.....		1		2		3		4		5		6
8. Have you not gone out to social occasions (e.g. parties) because you have felt bad about your shape?.....		1		2		3		4		5		6
9. Have you felt excessively large and rounded?.....		1		2		3		4		5		6
10. Have you thought that you are in the shape you are because you lack self-control?.....		1		2		3		4		5		6
11. Have you worried about other people seeing rolls of fat around your waist or stomach?.....		1		2		3		4		5		6
12. When in company have your worried about taking up too much room (e.g. sitting on a sofa, or a bus seat)?.....		1		2		3		4		5		6

13. Has seeing your reflection (e.g. in a mirror or shop window) made you feel bad about your shape?..... 1 2 3 4 5 6
14. Have you pinched areas of your body to see how much fat there is?..... 1 2 3 4 5 6
15. Have you avoided situations where people could see your body (e.g. communal changing rooms or swimming baths)?..... 1 2 3 4 5 6
16. Have you been particularly self-conscious about your shape when in the company of other people?..... 1 2 3 4 5 6

## APPENDIX C

## INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (IPAQ)

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you typically spend being physically active during a usual week. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you do in a **usual week**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. **During a usual week**, on how many days do you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

\_\_\_\_\_ **days per week**

No vigorous physical activities      **→** *Skip to question 3*

2. How much time do you usually spend doing **vigorous** physical activities on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

Don't know/Not sure

Think about all the **moderate** activities that you do in a **usual week**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

3. **During a usual week**, on how many days do you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

\_\_\_\_\_ **days per week**

No moderate physical activities      **→** *Skip to question 5*

4. How much time do you usually spend doing **moderate** physical activities on one of those days?

\_\_\_\_\_ **hours per day**  
 \_\_\_\_\_ **minutes per day**

Don't know/Not sure

Think about the time you spent **walking in a usual week**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. **During a usual week**, on how many days do you **walk** for at least 10 minutes at a time?

\_\_\_\_\_ **days per week**

No walking → *Skip to question 7*

6. How much time do you usually spend **walking** on one of those days?

\_\_\_\_\_ **hours per day**  
 \_\_\_\_\_ **minutes per day**

Don't know/Not sure

The last question is about the time you spend **sitting** on weekdays during **a usual week**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. **During a usual week**, how much time do you spend **sitting** on a **week day**?

\_\_\_\_\_ **hours per day**  
 \_\_\_\_\_ **minutes per day**

Don't know/Not sure

## APPENDIX D

### EMA QUESTIONNAIRES

**Question in bold are for the proposed study.**

Questions not in bold are filler questions.

Survey 1: 4 times a day for 7 days (morning, early afternoon, late afternoon, early evening)

#### [LOCATION/ACTIVITY QUESTIONS]

What were you doing when you received this notification?

- In class
- Other school activity
- Working
- House or yard work
- Socializing
- Relaxing
- Eating/Drinking
- Physical Activity
- Watching TV/Movie
- Other Activity

Where were you doing this activity?

- At home or in dorm room
- Other person's home/dorm
- On-campus academic building
- On-campus non-academic building
- Restaurant or bar
- Outside
- Other location on campus
- Other location off campus

#### [SOCIAL COMPARISON QUESTIONS]

**Have you compared your body weight or shape to someone else since the last notification?**

- **Yes or No**

**YES:**

*Think about the most recent time you compared your body weight/shape to someone else.*

- **About how long has it been since you compared your body weight/shape to someone else?**
  - **Amount of time selector (hours and minutes)**
- **Was the other person a...**
  - **Woman**
  - **Man**

- **I don't know**
- **How would you classify the person?**
  - **Friend**
  - **Acquaintance**
  - **Family member**
  - **Non-famous stranger**
  - **Famous stranger**
- **Was this someone you saw in person or through a media source?**
  - **In person**
  - **Media**
- **Compared to the other person, I looked: Much worse, Worse, Same, Better, Much better.**
  - **IF WORSE OR MUCH WORSE ARE SELECTED:**
    - **I thought that person was thinner or more physically fit than me.**
      - **0 (Not at all) to 6 (Very much)**
    - **I negatively judged my own body compared to that person.**
      - **0 (Not at all) to 6 (Very much)**
    - **I would like my body to be as thin or physically fit as that other person's.**
      - **0 (Not at all) to 6 (Very much)**
    - **I thought about ways I could change my body to look like theirs.**
      - **0 (Not at all) to 6 (Very much)**
  - **IF BETTER OR MUCH BETTER ARE SELECTED:**
    - **I thought I was thinner or more physically fit than that person.**
      - **0 (Not at all) to 6 (Very much)**
    - **I had positive thoughts about my body.**
      - **0 (Not at all) to 6 (Very much)**
    - **I would like to maintain my body shape so I do not look like them.**
      - **0 (Not at all) to 6 (Very much)**
    - **I thought about the things I do to maintain a thinner or more physically fit body.**
      - **0 (Not at all) to 6 (Very much)**
  - **IF SAME IS SELECTED:**
    - **I thought I was just as thin or physically fit as that person.**
      - **0 (Not at all) to 6 (Very much)**
    - **I am happy that my body is similar to theirs.**
      - **0 (Not at all) to 6 (Very much)**
    - **I thought about other things I may have in common with them.**
      - **0 (Not at all) to 6 (Very much)**

NO:

Have you compared your academic performance to someone else since the last notification?

- NO:
  - Do you think you do well in school?
    - 4- Yes, very well
    - 3- Yes, well
    - 2- Yes, acceptable
    - 1- No, poor
    - 0- No, very poor
  - How satisfied are you with the work you've done since the last notification?
    - 4- Yes, very well
    - 3- Yes, well
    - 2- Yes, acceptable
    - 1- No, poor
    - 0- I haven't had class yet
  - About how much time have you spent doing school work today?
    - Time selector (hours and minutes)
  - How much time have you spent in class today?
    - Time selector (hours and minutes)
  - Did you feel well-prepared for your classes today?
    - 0 (Not at all) to 6 (Very much)
  
- YES:
  - About when was the last time you compared your academic performance to someone else?
    - Time selector (hours and minutes)
  - Was the other person a...
    - Woman
    - Man
    - I don't know
  - How would you classify the person?
    - Friend
    - Acquaintance
    - Family member
    - Stranger
  - Compared to the other person, my academic performance is: Much worse, Worse, Same, Better, Much Better
    - IF WORSE OR MUCH WORSE ARE SELECTED:
      - I thought that person was more hardworking or smarter than me.
        - 0 (Not at all) to 6 (Very much)
      - I negatively judged my own academic performance.
        - 0 (Not at all) to 6 (Very much)
      - I would like to be as hardworking or smart as them.
        - 0 (Not at all) to 6 (Very much)
      - I thought about ways I could improve my academic performance.
        - 0 (Not at all) to 6 (Very much)

- IF BETTER OR MUCH BETTER ARE SELECTED:
  - I thought that person was not as smart or as hardworking as me.
    - 0 (Not at all) to 6 (Very much)
  - I had positive thoughts about my performance in class.
    - 0 (Not at all) to 6 (Very much)
  - I thought about the things I do to get good grades.
    - 0 (Not at all) to 6 (Very much)
  
- IF SAME IS SELECTED
  - I thought I was just as smart or as hardworking as the other person.
    - 0 (Not at all) to 6 (Very much)
  - I am happy my academic performance is similar to theirs.
    - 0 (Not at all) to 6 (Very much)
  - I think about other things I may have in common with them.
    - 0 (Not at all) to 6 (Very much)

*[MOOD QUESTIONS]*

On the following pages are words that describe how you may feel right now. Rate how you are feeling RIGHT NOW.

Right now I feel:

- Depressed or sad
  - 0 (Not at all) to 6 (Extremely)
- Excited
  - 0 (Not at all) to 6 (Extremely)
- Worried or anxious
  - 0 (Not at all) to 6 (Extremely)
- Angry or hostile
  - 0 (Not at all) to 6 (Extremely)
- Relaxed
  - 0 (Not at all) to 6 (Extremely)
- Unhappy
  - 0 (Not at all) to 6 (Extremely)
- Enthusiastic
  - 0 (Not at all) to 6 (Extremely)
- Frustrated
  - 0 (Not at all) to 6 (Extremely)
- Content
  - 0 (Not at all) to 6 (Extremely)

**[BODY IMAGE STATE SCALE-BISS QUESTIONS]**

**Right now, how do you feel about your physical appearance?**

- 0 (Extremely dissatisfied) to 6 (Extremely satisfied)

**Right now, how do you feel about your body size and shape?**

- 0 (Extremely dissatisfied) to 6 (Extremely satisfied)

**Right now, how do you feel about your weight?**

- 0 (Extremely dissatisfied) to 6 (Extremely satisfied)

**Right now, how physically attractive do you feel?**

- 0 (Extremely unattractive) to 6 (Extremely attractive)

**Right now, how do you feel about your looks compared to how you usually feel?**

- 0 (A great deal worse) to 6 (A great deal better)

**Right now, how do you feel about your looks compared to the average person?**

- 0 (A great deal worse) to 6 (A great deal better)

*[STRESS QUESTIONS]*

The next several questions will ask you about some of the experiences you have had during the last several hours.

*Since the last notification, has anything stressful or unpleasant happened?*

- Yes or No

YES:

Please indicate whether you had the following experiences since the last notification.

- Have you had difficulties involving school or work?
  - Yes or no
- Have you had problems with a significant other?
  - Yes or no
- Have you had problems with a friend/peer?
  - Yes or no
- Have you problems with a family member?
  - Yes or no
- Have you had medical or health problems?
  - Yes or no
- Have you experienced a negative event that happened to others?
  - Yes or no
- Have you missed a loved one?
  - Yes or no
- Have you had another type of experience not listed?
  - Yes or no

*Now think about the MOST stressful or unpleasant experience or thought you have had since the last notification.*

- What is the MOST stressful experience you have had since the last notification?
  - Difficulties involving school or work
  - Problems with significant other
  - Problems with friend/peer
  - Problems with family members
  - Medical or health problems
  - Negative event that happened to others
  - Missing a loved one
  - Other
  
- How unpleasant was this experience for you when it happened?
  - 0 (Not at all) to 6 (Extremely)
- How unpleasant is this experience for you NOW.
  - 0 (Not at all) to 6 (Extremely)
- Were you able to resolve this difficulty or problem?
  - Yes or No
  
  - NO:
    - How confident are you that you will be able to resolve this difficulty or problem?
      - 0 (Not at all) to 6 (Extremely)
  
- Do you think that you will have anything stressful or unpleasant happen in the next few hours?
  - Yes or No
  
  - YES:
    - How stressful or unpleasant do you expect it to be?
      - 0 (Not at all) to 6 (Extremely)
    - How confident are you that you will be able to manage or deal with this experience?
      - 0 (Not at all) to 6 (Extremely)
  
  - NO:
    - If an unexpected stressful or unpleasant event happens, how confident are you that you will be able to manage or deal with it?
      - 0 (Not at all) to 6 (Extremely)
  
- Do you think that you will have anything pleasant happen in the next few hours?
  - Yes or No

- YES:
  - How pleasant do you expect it to be?
    - 0 (Not at all) to 6 (Extremely)
- Have you watched TV since the last notification?
  - Yes or No
  - YES:
    - When did you last watch TV?
      - I am currently watching TV
      - Less than 1 hour ago
      - 1-3 hours ago
      - More than 3 hours ago
- Have you read a magazine since the last notification?
  - Yes or No
  - YES:
    - When did you last read a magazine?
      - I am currently reading a magazine
      - Less than 1 hour ago
      - 1-3 hours ago
      - More than 3 hours ago
    - Which type(s) of magazines did you read?
      - Beauty/Fashion
      - Gossip/Tabloid
      - Health/Fitness
      - Hobbies
      - News/Politics
      - Sports/Outdoors
      - Other
- Have you used the Internet since the last notification?
  - Yes or No
  - YES:
    - When did you last use the Internet?
      - I am currently using the Internet
      - Less than 1 hour ago
      - 1-3 hours ago
      - More than 3 hours ago
    - What was the purpose of using the Internet?
      - Check e-mail
      - Use social network site
      - View videos or pictures
      - Shopping

- Read gossip site
- Read or post blog
- Read news site
- Play internet game
- Academic information search
- Other information search

**[SOCIAL INTERACTION QUESTIONS]**

- Are you with other people RIGHT NOW?
  - Yes or No
  - YES:
    - Who are you with right now? (Check all that apply).
      - Significant other
      - Friend(s)
      - Family member(s)
      - Roommate(s)
      - Classmate(s)
      - Professor(s)
      - Coworker(s)
      - Acquaintance(s)
      - Stranger(s)
      - Other(s)
    - Are you with:
      - Male(s) only
      - Female(s) only
      - Both males and females
    - How pleasant is this company?
      - 0 (Not at all) to 6 (Extremely)

**[PHYSICAL ACTIVITY QUESTION]**

**Have you thought about being more physically active since the last notification?**

- 0 (Not at all) to 6 (Very much)

*[EATING BEHAVIOR QUESTIONS]*

*Have you eaten any food (including meals or snacks) since the last notification?*

YES:

- When did you last eat?
  - I am currently eating
  - Less than 1 hour ago
  - 1-3 hours ago

- More than 3 hours ago
- When you most recently ate, how much did you try to limit the amount of food you ate?
  - 0 (Not at all) to 6 (Very much)
- Were you concerned about other people seeing you eat?
  - 0 (Not at all) to 6 (Very much)
- Did you binge eat, or eat unusually large amount of food given the circumstances?
  - 0 (Not at all) to 6 (Very much)
- Were you been afraid of losing control over your eating?
  - 0 (Not at all) to 6 (Very much)
- Did you try to follow rules regarding your eating (e.g., calorie limit, rules about what or when to eat)?
  - 0 (Not at all) to 6 (Very much)

NO:

- How typical or normal is it for you to not eat during the last several hours?
  - 0 (Not at all typical) to 6 (Very typical)
- How much did each of the following factors influence you to NOT eat since the last beep?
  - I was not feeling hungry.
    - 0 (Not at all) to 6 (Very much)
  - I am trying to control my weight and/or shape.
    - 0 (Not at all) to 6 (Very much)
  - I did not like the food options available.
    - 0 (Not at all) to 6 (Very much)
  - I did not have time to prepare or eat food.
    - 0 (Not at all) to 6 (Very much)

### Survey 2: Once a day for 7 days in the evening

#### [LOCATION/ACTIVITY QUESTIONS]

What were you doing when you received this notification?

- In class
- Other school activity
- Working
- House or yard work
- Socializing
- Relaxing
- Eating/Drinking
- Physical Activity
- Watching TV/Movie
- Other Activity

Where were you doing this activity?

- At home or in dorm room

- Other person's home/dorm
- On-campus academic building
- On-campus non-academic building
- Restaurant or bar
- Outside
- Other location on campus
- Other location off campus

[SOCIAL COMPARISON QUESTIONS]

Have you compared your body weight or shape to someone else since the last notification?

- Yes or No

**YES:**

*Think about the most recent time you compared your body weight/shape to someone else.*

- About how long has it been since you compared your body weight/shape to someone else?
  - Amount of time selector (hours and minutes)
- Was the other person a...
  - Woman
  - Man
  - I don't know
- How would you classify the person?
  - Friend
  - Acquaintance
  - Family member
  - Non-famous stranger
  - Famous stranger
- Was this someone you saw in person or through a media source?
  - In person
  - Media
- Compared to the other person, I looked: Much worse, Worse, Same, Better, Much better.
  - IF WORSE OR MUCH WORSE ARE SELECTED:
    - I thought that person was thinner or more physically fit than me.
      - 0 (Not at all) to 6 (Very much)
    - I negatively judged my own body compared to that person.
      - 0 (Not at all) to 6 (Very much)
    - I would like my body to be as thin or physically fit as that other person's.
      - 0 (Not at all) to 6 (Very much)
    - I thought about ways I could change my body to look like theirs.
      - 0 (Not at all) to 6 (Very much)
  - IF BETTER OR MUCH BETTER ARE SELECTED:
    - I thought I was thinner or more physically fit than that person.

- 0 (Not at all) to 6 (Very much)
- I had positive thoughts about my body.
  - 0 (Not at all) to 6 (Very much)
- I would like to maintain my body shape so I do not look like them.
  - 0 (Not at all) to 6 (Very much)
- I thought about the things I do to maintain a thinner or more physically fit body.
  - 0 (Not at all) to 6 (Very much)
- IF SAME IS SELECTED:
  - I thought I was just as thin or physically fit as that person.
    - 0 (Not at all) to 6 (Very much)
  - I am happy that my body is similar to theirs.
    - 0 (Not at all) to 6 (Very much)
  - I thought about other things I may have in common with them.
    - 0 (Not at all) to 6 (Very much)

NO:

Have you compared your academic performance to someone else since the last notification?

- NO:
  - Do you think you do well in school?
    - 4- Yes, very well
    - 3- Yes, well
    - 2- Yes, acceptable
    - 1- No, poor
    - 0- No, very poor
  - How satisfied are you with the work you've done since the last notification?
    - 4- Yes, very well
    - 3- Yes, well
    - 2- Yes, acceptable
    - 1- No, poor
    - 0- I haven't had class yet
  - About how much time have you spent doing school work today?
    - Time selector (hours and minutes)
  - How much time have you spent in class today?
    - Time selector (hours and minutes)
  - Did you feel well-prepared for your classes today?
    - 0 (Not at all) to 6 (Very much)
- YES:
  - About when was the last time you compared your academic performance to someone else?
    - Time selector (hours and minutes)
  - Was the other person a...

- Woman
- Man
- I don't know
- How would you classify the person?
  - Friend
  - Acquaintance
  - Family member
  - Stranger
- Compared to the other person, my academic performance is: Much worse, Worse, Same, Better, Much Better
  - IF WORSE OR MUCH WORSE ARE SELECTED:
    - I thought that person was more hardworking or smarter than me.
      - 0 (Not at all) to 6 (Very much)
    - I negatively judged my own academic performance.
      - 0 (Not at all) to 6 (Very much)
    - I would like to be as hardworking or smart as them.
      - 0 (Not at all) to 6 (Very much)
    - I thought about ways I could improve my academic performance.
      - 0 (Not at all) to 6 (Very much)
  - IF BETTER OR MUCH BETTER ARE SELECTED:
    - I thought that person was not as smart or as hardworking as me.
      - 0 (Not at all) to 6 (Very much)
    - I had positive thoughts about my performance in class.
      - 0 (Not at all) to 6 (Very much)
    - I thought about the things I do to get good grades.
      - 0 (Not at all) to 6 (Very much)
  - IF SAME IS SELECTED
    - I thought I was just as smart or as hardworking as the other person.
      - 0 (Not at all) to 6 (Very much)
    - I am happy my academic performance is similar to theirs.
      - 0 (Not at all) to 6 (Very much)
    - I think about other things I may have in common with them.
      - 0 (Not at all) to 6 (Very much)

*[MOOD QUESTIONS]*

On the following pages are words that describe how you may feel right now. Rate how you felt OVERALL TODAY.

Today I felt:

- Depressed or sad

- 0 (Not at all) to 6 (Extremely)
- Excited
  - 0 (Not at all) to 6 (Extremely)
- Worried or anxious
  - 0 (Not at all) to 6 (Extremely)
- Angry or hostile
  - 0 (Not at all) to 6 (Extremely)
- Relaxed
  - 0 (Not at all) to 6 (Extremely)
- Unhappy
  - 0 (Not at all) to 6 (Extremely)
- Enthusiastic
  - 0 (Not at all) to 6 (Extremely)
- Frustrated
  - 0 (Not at all) to 6 (Extremely)
- Content
  - 0 (Not at all) to 6 (Extremely)

[DAILY BODY IMAGE STATE SCALE-BISS QUESTIONS]

Overall, how did you feel about your physical appearance today?

- 0 (Extremely dissatisfied) to 6 (Extremely satisfied)

Overall, how did you feel about your body size and shape today?

- 0 (Extremely dissatisfied) to 6 (Extremely satisfied)

Overall, how did you feel about your weight today?

- 0 (Extremely dissatisfied) to 6 (Extremely satisfied)

Overall, how physically attractive did you feel today?

- 0 (Extremely unattractive) to 6 (Extremely attractive)

Overall, how did you feel about your looks today compared to how you usually feel?

- 0 (A great deal worse) to 6 (A great deal better)

Overall, how did you feel about your looks today compared to the average person?

- 0 (A great deal worse) to 6 (A great deal better)

*[STRESS QUESTIONS]*

The next several questions will ask you about some of the experiences you have had during the last several hours.

*Since the last notification, has anything stressful or unpleasant happened?*

- Yes or No

YES:

Please indicate whether you had the following experiences since the last notification.

- Have you had difficulties involving school or work?
  - Yes or no
- Have you had problems with a significant other?
  - Yes or no
- Have you had problems with a friend/peer?
  - Yes or no
- Have you problems with a family member?
  - Yes or no
- Have you had medical or health problems?
  - Yes or no
- Have you experienced a negative event that happened to others?
  - Yes or no
- Have you missed a loved one?
  - Yes or no
- Have you had another type of experience not listed?
  - Yes or no

*Now think about the MOST stressful or unpleasant experience or thought you have had since the last notification.*

- What is the MOST stressful experience you have had since the last notification?
  - Difficulties involving school or work
  - Problems with significant other
  - Problems with friend/peer
  - Problems with family members
  - Medical or health problems
  - Negative event that happened to others
  - Missing a loved one
  - Other
- How unpleasant was this experience for you when it happened?
  - 0 (Not at all) to 6 (Extremely)
- How unpleasant is this experience for you NOW.
  - 0 (Not at all) to 6 (Extremely)
- Were you able to resolve this difficulty or problem?
  - Yes or No

- NO:
  - How confident are you that you will be able to resolve this difficulty or problem?
    - 0 (Not at all) to 6 (Extremely)
- Do you think that you will have anything stressful or unpleasant happen in the next few hours?
  - Yes or No
  - YES:
    - How stressful or unpleasant do you expect it to be?
      - 0 (Not at all) to 6 (Extremely)
    - How confident are you that you will be able to manage or deal with this experience?
      - 0 (Not at all) to 6 (Extremely)
  - NO:
    - If an unexpected stressful or unpleasant event happens, how confident are you that you will be able to manage or deal with it?
      - 0 (Not at all) to 6 (Extremely)
- Do you think that you will have anything pleasant happen in the next few hours?
  - Yes or No
  - YES:
    - How pleasant do you expect it to be?
      - 0 (Not at all) to 6 (Extremely)
- Have you watched TV since the last notification?
  - Yes or No
  - YES:
    - When did you last watch TV?
      - I am currently watching TV
      - Less than 1 hour ago
      - 1-3 hours ago
      - More than 3 hours ago
- Have you read a magazine since the last notification?
  - Yes or No
  - YES:
    - When did you last read a magazine?
      - I am currently reading a magazine

- Less than 1 hour ago
  - 1-3 hours ago
  - More than 3 hours ago
- Which type(s) of magazines did you read?
  - Beauty/Fashion
  - Gossip/Tabloid
  - Health/Fitness
  - Hobbies
  - News/Politics
  - Sports/Outdoors
  - Other
- Have you used the Internet since the last notification?
  - Yes or No
  - YES:
    - When did you last use the Internet?
      - I am currently using the Internet
      - Less than 1 hour ago
      - 1-3 hours ago
      - More than 3 hours ago
    - What was the purpose of using the Internet?
      - Check e-mail
      - Use social network site
      - View videos or pictures
      - Shopping
      - Read gossip site
      - Read or post blog
      - Read news site
      - Play internet game
      - Academic information search
      - Other information search

[SOCIAL INTERACTION QUESTIONS]

- Are you with other people RIGHT NOW?
  - Yes or No
  - YES:
    - Who are you with right now? (Check all that apply).
      - Significant other
      - Friend(s)
      - Family member(s)
      - Roommate(s)
      - Classmate(s)

- Professor(s)
- Coworker(s)
- Acquaintance(s)
- Stranger(s)
- Other(s)
- Are you with:
  - Male(s) only
  - Female(s) only
  - Both males and females
- How pleasant is this company?
  - 0 (Not at all) to 6 (Extremely)

**[PHYSICAL ACTIVITY QUESTION]**

**Have you thought about being more physically active since the last notification?**

- 0 (Not at all) to 6 (Very much)

**Please rate how much you agree with the following statements. 0 (Strongly disagree) to 6 (Strongly agree)**

- **I think a lot of my friends or family members exercised today.**
- **I think a lot of other college students in general exercised today.**
- I saw a lot of people exercising today.
- **My friends or family members expect me to exercise tomorrow.**
- **Other people expect me to exercise tomorrow.**

Did you exercise today?

YES:

- How long did you exercise?
  - Amount of time selector (hours and minutes)
- What type of exercise did you do?
  - Jog or run
  - Walk
  - Hike
  - Lift weights
  - Swim
  - Cycle
  - Yoga
  - Other

NO:

- Why didn't you exercise today?
  - Not enough time

- Feeling fatigued and/or sick
- Preferred to do other things
- Bad weather
- A good location to exercise was unavailable or inaccessible
- I didn't have anyone to exercise with
- Other
- What did you do in your free time instead of exercising?
  - Watched TV show or movie
  - Read
  - Socialized with friends or family
  - Did not have much free time
  - Other

**Do you think you will exercise tomorrow?**

- **4- Definitely will**
- **3- Very probably will**
- **2- Probably will**
- **1- Probably will not**
- **0- Definitely will not**

*[EATING BEHAVIOR QUESTIONS]*

*Have you eaten any food (including meals or snacks) since the last notification?*

YES:

- When did you last eat?
  - I am currently eating
  - Less than 1 hour ago
  - 1-3 hours ago
  - More than 3 hours ago
- When you most recently ate, how much did you try to limit the amount of food you ate?
  - 0 (Not at all) to 6 (Very much)
- Were you concerned about other people seeing you eat?
  - 0 (Not at all) to 6 (Very much)
- Did you binge eat, or eat unusually large amount of food given the circumstances?
  - 0 (Not at all) to 6 (Very much)
- Were you been afraid of losing control over your eating?
  - 0 (Not at all) to 6 (Very much)
- Did you try to follow rules regarding your eating (e.g., calorie limit, rules about what or when to eat)?
  - 0 (Not at all) to 6 (Very much)

NO:

- How typical or normal is it for you to not eat during the last several hours?
  - 0 (Not at all typical) to 6 (Very typical)
- How much did each of the following factors influence you to NOT eat since the last beep?
  - I was not feeling hungry.
    - 0 (Not at all) to 6 (Very much)
  - I am trying to control my weight and/or shape.
    - 0 (Not at all) to 6 (Very much)
  - I did not like the food options available.
    - 0 (Not at all) to 6 (Very much)
  - I did not have time to prepare or eat food.
    - 0 (Not at all) to 6 (Very much)

## VITA

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### Education

- M. S.** Experimental Psychology (*expected December 2017*)  
Department of Psychology  
Old Dominion University
- B. S.** Animal Behavior (awarded January 2013)  
Department of Animal Behavior  
Bucknell University

### Background

Rachel I. MacIntyre is a third year graduate student at the Virginia Consortium Program in Clinical Psychology. She is pursuing her Master's degree in Experimental Psychology from Old Dominion University while also pursuing her Ph.D. in Clinical Psychology from the Virginia Consortium Program. Rachel is a member of the Health Behavior and Technologies Lab at Old Dominion University. Her research interests include body dissatisfaction, disordered eating and exercise behaviors, and college student health.

### Selected Publications

Howard, L. M., Heron, K. E., **MacIntyre, R. I.**, Myers, T. A., & Everhart, R. S. (2017). Is use of social networking sites associated with young women's body dissatisfaction and disordered eating? A look at Black-White racial differences. *Body Image*, 23, 109-113.

### Selected Presentations

- MacIntyre, R. I.**, Heron, K. E. (2017, April). *Feasibility of using ecological momentary assessment to examine appearance-related social comparisons in college women*. Paper presented at the annual Works in Progress Conference, Norfolk, VA.
- Heron, K., Howard, L., & **MacIntyre, R.** (2017, March). *Body dissatisfaction in everyday life: An ecological momentary assessment study*. Poster presented at the annual meeting of the Southeastern Psychological Association, Atlanta, GA.