An Evaluation of Daily Weight Monitoring as a Method of Weight Gain Prevention

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Dedications

I would like to dedicate this thesis to my father, James Katterman, for his steadfast support during all stages of this project and his continued encouragement of my education.

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Abstract

An Evaluation of Daily Weight Monitoring as a
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Objective: Despite significant efforts to reduce obesity, there remains a great need to address the problem on a population level. Thus, it is imperative that interventions be developed that are cost-effective and can be widely disseminated. One group of individuals who appear to be at high risk for weight gain is young adults. In the past, daily weight monitoring has shown a preventative effect in normal weight college students. The current study aimed to replicate and extend these findings by testing the effects of weight monitoring in normal and overweight young adults. Method: College females in the normal and overweight range were randomly assigned to an assessment-only control group, or to an intervention group who monitored their weight daily for 8 weeks and received simple online feedback about their weight trajectory. Results: No statistically significant effect of group assignment on weight change was observed, however, the control group gained more weight on average and a significant effect may have been detected with a larger sample. Of those who gained more than 1 kg, there were no significant differences in which group they had been assigned to. No significant changes in cognitive or behavioral variables were observed as a result of daily weighing. A measure of healthy eating behaviors at baseline was the only measure associated with less weight gain across conditions. Discussion: Though the current study did not reveal a statistically significant effect of daily weight monitoring on weight gain prevention, the

intervention was also not found to be harmful in normal or overweight individuals. Individuals with the highest weight gains were equally distributed across conditions, suggesting that for individuals who are most susceptible, daily weight monitoring may not be sufficient to prevent weight gain. Future research with larger samples is needed to fully elucidate the effects of weight monitoring and how it might be combined with other interventions for those most at risk for future weight gain.

CHAPTER 1: INTRODUCTION

Overweight and Obesity Defined

Obesity can be defined as an excess of adipose tissue. In epidemiological studies, body mass index (BMI) is typically used as an indication of body fatness. BMI is calculated by dividing weight in kilograms by height in meters squared (Bray, 1998). Overweight status is typically defined as having a BMI between 25.0 kg/m^2 and 29.9 kg/m^2 and obesity is typically defined as having a BMI greater than or equal to 30.0 kg/m^2 (Kopelman, 2000).

Prevalence and Trends in Overweight and Obesity

Data demonstrating extremely high rates of overweight and obesity in the United States are unequivocal. Recent data suggests that approximately 68.0% of adults in the United States are overweight or obese (Flegal et al., 2010). These rates have increased almost three-fold over the past two decades (i.e., the prevalence of obesity in 1991 was estimated at 12.0% (Mokdad et al., 1999) and current obesity estimates are approximately 33.8% (Flegal et al., 2010)). Although recent trends in prevalence estimates suggest that the rate of increase may be leveling off to some extent (i.e., reported prevalence rates are similar or slightly increased from 1999-2000 estimates (Flegal et al., 2002) to 2007-2008 estimates (Flegal et al., 2010)), there are no signs that rates are diminishing and therefore, a significant portion of the population is still living with excess body fat.

Perhaps even more troublesome than the overall increase in obesity and overweight is the fact that weight is not increasing uniformly and individuals at higher

weights are actually more likely to get even heavier. That is, instead of a general tendency for individuals to gain a few pounds each (i.e., resulting in a small shift of an identical distribution), individuals who are already on the higher end of the distribution are gaining even more weight than individuals in the lower weight range and are becoming obese and even morbidly obese (i.e., BMI greater than or equal to 40; Kopelman, 2000) (Ogden et al., 2007). Although the rate of overweight has only increased slightly over the last several years, rates of obesity have increased much more, suggesting that those who are already overweight convert to obesity at a faster rate than normal weight individuals become overweight (Ogden et al., 2007).

Obesity as a Public Health Problem

The presence of these high rates of overweight and obesity pose a significant public health problem for several reasons. First, excess body weight has been found to cause or exacerbate several medical problems. Obesity has been linked with the development of Type II diabetes, hypertension, cardiovascular disease, respiratory abnormalities, stroke, arthritis, and several cancers (Calle et al., 1999, Kopelman, 2000; Rapp et al., 2005). Given these associations, it is not surprising that an obese person is at increased risk for an untimely death (Flegal et al., 2005).

Excess weight has also been linked with psychosocial problems. Despite research indicating that obesity has a strong genetic component (Musani, Erickson, & Allison, 2008), there is still significant stigma and prejudice that is overtly expressed towards and experienced by obese persons (Puhl & Brownell, 2001). These stigmatizing attitudes have been documented in persons of normal weight and those who are overweight or

obese (Schwartz, Vartanian, Nosek, & Brownell, 2005) further suggesting the ubiquity of this prejudice. Given this discrimination, it is not surprising that obesity has been associated with reduced quality of life, lower self esteem, and increased depression and binge eating (Friedman & Brownell, 1995; Kolotkin, Meter, & Williams, 2001; Wadden, Womble, Stunkard, & Anderson, 2002).

Obesity as an Economic Problem

Estimates of the health care costs associated with obesity have also indicated a significant burden. Annual obesity-attributable medical expenditures for U.S. adults are estimated at $81.5 billion dollars and if current trends continue, are predicted to increase in subsequent years (Wang et al., 2008). Given the large portion of the population that is currently living with excess body weight and the associated negative consequences of that excess weight, it is imperative that we find ways to reduce this condition to reduce the substantial negative impact it is having on health, mental well-being, and the economy.

Obesity Treatment: Its Shortcomings Exposed

There are several reasons why obesity prevention must be incorporated into the management of the obesity problem. Unfortunately, treatment for obesity has not been found to be effective as a long term solution for the majority of the population. Even the most effective treatments for overweight and obesity typically induce average weight losses of 5 to 10% of initial body weight, which usually is not sufficient to return individuals to a healthy weight. Additionally, the majority of individuals undergoing

these treatments regain the lost weight within five years (Wing et al., 2001; Jeffery et al., 2000).

Furthermore, even if treatments were discovered that had significant and lasting effects, this would likely not provide a practical solution to the problem of obesity. Weight loss treatments usually include significant costs and are labor intensive for both participants and the personnel involved. Therefore, even for those programs that show some success in terms of weight loss and maintenance, their ability to be disseminated to the large numbers of people who might benefit is very limited. Thus, given the size of the problem, the costs of treating all who suffer from overweight and obesity would likely be too great. Taking the above factors into consideration, (i.e., the high prevalence of obesity and its significant health and psychological consequences, the economic burden it is placing on our society, and the failures of treatments to curb this issue), prevention strategies must be incorporated to make a significant difference in future rates of obesity.

Prevention of Obesity

To date, many attempts have been made to evaluate programs aimed at weight gain prevention. However, the results of these attempts have been mixed and further research is needed to determine effective methods. A recent review paper found that of 64 prevention programs targeting children and adolescents, 21% produced significant weight gain prevention effects (Stice, Shaw, & Marti, 2006). Of these programs, those that were relatively brief, that targeted weight control (i.e., as opposed to other health behaviors), children and adolescent females (i.e., as opposed to pre-adolescents) and persons who self selected to be part of the program were more effective (Stice et al.,

2006). This review suggests that although some programs seem to have success with weight gain prevention, more research is needed to further develop and evaluate effective strategies that work for a greater number of individuals.

In addition to examining the effectiveness of a given program, another important point to consider when evaluating prevention strategies is the issue of dissemination. That is, even if a program is found to effectively prevent weight gain, if it involves a significant amount of resources, it is unlikely that it will be applicable to large numbers of people. For example, an intervention that involves attendance at several individual sessions will involve a significantly large number of resources for each participant, which reduces the ability of such a program to be widely distributed. Therefore, another important factor to consider is the ease of which the program is able to be distributed to those in need.

The issue of dissemination is addressed in a review article by Winett and colleagues (2005). The authors identify the internet as one useful way to reach a larger amount of people for less money, producing a more cost-effective intervention. This modality is suggested as a method of distributing relatively high dose interventions over an extended period of time at a cost much lower than if the same intervention was delivered in person (Winett et al., 2005). The authors acknowledge that this intervention would miss some individuals who are most in need (e.g., rates of internet use tend to be lower in African American populations and African American women are particularly at risk for overweight and obesity (Ogden et al., 2007)) (Winett et al., 2005), however, a recent study that involved 3,553 telephone interviews revealed that although rates of use

are still lower in these populations, younger African Americans and Hispanic Americans reported being likely to use the internet in the near future (Lenhart, 2003). These data suggest that the internet could serve as an effective vehicle for distribution of weight gain prevention programs to many of those in need. Thus, the internet may provide a vehicle that allows a large portion of the population to be reached at a relatively low cost.

Another important factor to consider in the prevention of weight gain is the times at which the intervention might be most effective. Therefore, it is important to identify periods of time in which individuals are most susceptible to gaining weight. One period that has been shown to be consistently problematic for weight gain is young adulthood. In a study that examined data from the Behavioral Risk Factor Surveillance System, the greatest increase in obesity prevalence was found in individuals aged 18 to 29 (i.e., 7.1% in 1991 to 12.1% in 1998) (Mokdad et al., 1999). There was also a significant increase in individuals who had completed 'some college education' (i.e., 10.6% in 1991 to 17.8% in 1998) (Mokdad et al., 1999). This data suggests that young adults, and particularly those pursuing a college education, are at a high risk for weight gain.

Other studies further support the notion that young adults attending college are at higher risk for weight gain. In a study conducted in the early 1980's, the weight change of two groups of young adults attending college was compared to two groups of 17 and 18 year old women from the community (Hovell, Mewborn, Randle, & Fowler-Johnson, 1985). Though this study had limitations (e.g., some weights in some of the subgroups were self-reported, the majority of the sample was Caucasian and of higher socioeconomic status), their effect size was large (i.e., college women gained weight at a

rate of .73 pounds per month which was significantly higher than the rate of .02 pounds per month in the community sample) (Hovell et al., 1985), suggesting that the increase in weight over the first year of college may be significantly larger in college women than in young women in the community.

Further support for the idea of young adulthood as a period of increased weight gain comes from a study examining weight gain as a function of age. Levitsky and colleagues (2004) compiled several studies that examined weight gain in adults as a function of age and found a slightly negative slope for men and women, suggesting that overall, rate of spontaneous weight gain tends to decrease as individuals get older. Additionally, individuals aged 17 to 18 had significantly smaller gains than individuals of the age to be in their first year of college, further supporting the idea that this is a time period where individuals are particularly susceptible to weight gain (Levitsky, Halbmaier, & Mrdjenovic, 2004). Taken together with findings from population based studies, these findings suggest that at least in higher socioeconomic status women, the college environment poses additional risks for weight gain in this already at risk age group.

Research has identified risk factors that are unique to the college environment that may mediate the weight gain effect observed in this population. A regression model of freshman weight gain found that eating breakfast and lunch in ‘all-you-can-eat’ dining halls contributes to a significant portion of the variance in weight gain in college freshman (Levitsky et al., 2004). However, when initial weight was included in the model, this factor was no longer a significant predictor. One possible explanation for this is that individuals entering college with higher initial weights may be more likely to use

"all you can eat" cafeterias for breakfast and lunch than individuals entering with lower initial weights, thus accounting for the variance in explained weight gain in the initial model (Levitsky et al., 2004). Though further research is need to completely elucidate this relationship, it appears that individuals in the college environment exposed to such environmental factors, and particularly those at higher weights, may be at risk for weight gain thereby further indicating the need to study weight gain in this population.

Several studies have examined weight change in young adults in college and found significant evidence of weight gain during this time period. In a study by Anderson and colleagues (2003), weight of college males and females was examined across the first year of school. This study found a modest but statistically significant weight gain of 1.3 kg (ranging from -3.6 kg to 5.2 kg) across all participants (Anderson, Shapiro, & Lundgren, 2003). Interestingly, approximately a quarter of the participants experienced a significantly greater weight gain of at least 2.3 kg during the first three months (Anderson et al., 2003), suggesting that some individuals may be particularly susceptible to weight gain. Similar weight gains have been observed in other studies as well (e.g., Hivert et al., 2007, Lowe et al., 2006, Holm-Denoma, Joiner, Vohs, & Heatherton, 2008). These studies suggests that overall, college is a critical period for weight gain and that a subset of students may gain a significant amount of weight and may benefit from weight gain prevention efforts during this time period.

Weight Gain Prevention Trials in College Students

Given the above, there is a need to develop and evaluate effective interventions to prevent weight gain in young adults that can be readily disseminated to the population.

Several studies have indicated that regular weight monitoring may reduce weight gain and weight regain in those trying to control their weight (e.g., Linde, Jeffery, French, Pronk, & Boyle, 2005; VanWormer, French, Pereira, & Welsh, 2008; Wing, Tate, Gorin, Raynor, & Fava, 2006). This approach was applied to a college student population by Levitsky and colleagues (2006). In these studies, participants were randomly assigned to an assessment-only control group, or a group that was instructed to weigh themselves and email their weight to the researcher daily for a period of twelve weeks (Levitsky et al., 2006). After seven days of data collection, participants in the experimental group were given feedback about the trajectory of their weight (i.e., whether it was remaining stable, increasing, or decreasing, and to what extent). Beyond very brief nutrition information (i.e., told to eat three meals a day and avoid snacking), participants were not given any specific advice about eating or physical activity. On average, participants in the experimental condition stayed weight stable over a twelve week period while participants in the control group gained approximately 3.1 kg (Levitsky et al., 2006). Given that this method was found to prevent a weight gain of approximately 3.1 kilograms over twelve weeks, it provides a promising strategy for weight gain prevention that is simple and able to be disseminated.

In an effort to replicate these findings, Butryn (2006) conducted a study examining the effectiveness of weight monitoring for weight gain prevention in a separate college sample. Interestingly, although the same weight monitoring procedures were used, the same prevention effect was not observed over an eight week period. Although participants gained a small amount of weight, there was no significant

difference between groups (Butryn, 2006). There are several potential explanations for this difference from findings by Levitsky and colleagues (2006). First, participants were offered monetary compensation for participating, whereas in the work by Levitsky, participants volunteered simply for the sake of receiving the intervention (Levitsky et al., 2006. Therefore, there could be a primary difference in motivation to participate, that is, participants in the study by Butryn and colleagues may have been motivated more by the money and less by the desire to prevent weight gain. This hypothesis is supported by the fact that the adherence to the requirement of daily emailing of weights was much better in the study by Levitsky and colleagues. Additionally, participants in the Butryn study had lower starting BMIs and gained less weight than individuals in the study by Levitsky (Butryn, 2006) which may also reflect an inherent and notable difference in these populations. That is, participants in the study by Butryn may have been from a population at less risk for weight gain and thus the same prevention effects in Levitsky's sample could not be observed.

Recently, another study attempted to examine daily weight monitoring as a method of weight gain prevention but reduced the frequency with which participants were required to weigh themselves. This study randomly assigned 159 freshman students (118 females and 41 males) to one of three 6-week intervention conditions or an assessment-only control group (Gow, Trace, & Mazzeo, 2010). Participants in the first condition (the feedback group) were asked to weigh themselves at the school gym once a week and report their weight to the researchers on a secure website. They were then emailed a graph showing individualized changes in their weight and a corresponding

statement regarding the caloric equivalent to this change (i.e., with 3500 kcals = 1 lb). Participants in the second condition (the online intervention group) were asked to log on to a secure website and view lessons once a week for six weeks that were designed to last 45 minutes. Participants in the third condition (the combined group) were asked to do both of the tasks listed in the above conditions. Participants in the control group were simply measured at the beginning and the end of the 6 week intervention period. Results revealed a significant difference in BMI between the combined group and the control group over the 6 weeks of the intervention, after controlling for initial BMI. However, there was not a significant difference in BMI change for the online intervention group or the feedback group compared to the control group (Gow et al., 2010). Of note is the fact that adherence was significantly higher in the combined group and the feedback group compared with the online intervention group. The percentage of participants who completed four or more weeks of participation was: 82.1% in the combined intervention group, 65.8% in the internet intervention group, and 89.9% in the feedback group (Gow et al., 2010). These results should be compared to the above studies with caution, given that the study examined males and females who volunteered for class credit, again potentially targeting a different population. Additionally, the intervention lasted 6 weeks instead of previous studies lasting eight or twelve weeks, and participants ranged in starting BMI from underweight (BMI = 17.82 kg/m^2) to severely obese (BMI = 41.01 kg/m^2), with a mean BMI of 24.38 kg/m^2, reflecting further differences from previous studies of weight monitoring. However, findings from this study suggest that weighing oneself and receiving feedback may have a weight gain prevention effect in males and

females when paired with educational materials surrounding weight gain prevention. Given these considerations and differences in the above studies, further study is warranted to elucidate the effects of weight monitoring on weight change in these populations over longer periods of time.

Of importance is the fact that there is some indication that weight monitoring may produce deleterious effects in some individuals. A few studies have found that providing inaccurate feedback on weight (e.g., categorizing individuals based on a fictional height-weight chart; Ogden & Evans, 1996; altering scales so that individuals weigh in at five (McFarlane, Polivy, & Herman, 1998) or seven (Winstanley & Dives, 2005) pounds heavier than their actual weight had a negative impact on mood and self esteem (Ogden & Evans, 1996; Winstanley & Dives, 2005) and in restrained eaters, actually was associated with increased eating in a subsequent taste task (McFarlane, Polivy, & Herman, 1998). However, it should be noted that daily weight monitoring should address this problem by focusing individuals on the trend of their weight over time and not on the specific number at one time point, as these studies did.

Another study had results that were potentially indicative of deleterious effects of weighing and more relevant to the current study. This study randomly assigned participants to weigh themselves daily for two weeks and found that those participants experienced an increase in depression, anxiety, and self esteem that was independent of changes in body dissatisfaction (Ogden & Whyman, 1997). Although this study had limitations (e.g., a small sample size; a sample of college students invited to participate in a study of "seasonal weight fluctuations" and not necessarily motivated to control their

weight) and awaits replication, it does suggest that for some individuals, weighing oneself daily over a period of two weeks may have a negative effect on mood and self esteem. Additionally, the recent study noted above by Gow and colleagues (2010), published after the current study was conducted, also revealed a potentially iatrogenic effect of daily weighing. In this study, there was a significant difference in the number of cigarettes smoked per day at post-intervention in the feedback only group (M = 3.76, SD = .44) compared to the control group (M = 1.45, SD = .56), suggesting that requiring weekly weighing in the absence of education and support could result in an increase in unhealthy weight control behaviors. Given these potentially iatrogenic effects, additional research is needed to determine whether these effects are truly present in response to being assigned to weight monitoring.

Additionally, it is unclear whether a brief negative mood state is problematic in terms of weight control, as a large population based study found no interaction with self monitoring of weight and depression scores in predicting body mass index (Linde et al., 2007). Given these discrepant findings and the research supporting the benefit of weight monitoring for weight control, it is important to note this finding and examine mood in the current study to examine whether mood is affected in individuals motivated to prevent weight gain throughout the intervention period, or whether individuals adjust after a few weeks and negative impacts of daily weighing are reduced. Additionally, it is important to examine whether this potential increase in negative mood predicts weight gain over time.

Finally, although some research indicates an effect of weight monitoring on mood, other research suggests that regular weight monitoring does not have an impact on body dissatisfaction or unhealthy weight control behaviors. The study mentioned above by Butryn (2006) found no association between group assignment and change over time in scores on a body dissatisfaction measure, or measure of use of unhealthy strategies to control their weight (e.g., skipping meals). Additionally, the recent study by Gow and colleagues (2010) found no significant differences in body dissatisfaction, disordered eating symptoms, or healthy eating behaviors between the intervention groups. Therefore, although some studies suggest that weight monitoring may have an impact on mood, self esteem, and cigarette smoking, it does not seem to impact dissatisfaction with one's body or adoption of other unhealthy behaviors. Taking these discrepant findings into consideration, the current study aimed to examine these variables more closely to determine which effects are present in response to weight monitoring.

Given the initial indications of the effectiveness of weight monitoring, and the appearance of these disparate findings, there is a need to determine whether this strategy is in fact a promising method for weight gain prevention in normal and overweight college students. Additionally, it is important to examine psychological variables (e.g., mood, self esteem, body dissatisfaction, weight control behaviors) associated with the intervention to determine both which constructs are predictive of success with this method and to examine whether the intervention is producing negative psychological effects. Thus, the current investigation aimed to use a controlled pre-test post-test

experimental design to the effect of daily weight monitoring in normal and overweight college females.

Specific Aims

Primary Aim

The primary aim of the current study is to examine whether daily weight monitoring is an effective method for preventing weight gain in normal and overweight females. It was hypothesized that participants assigned to monitor their weight daily will maintain their weight over the 8 week intervention period, whereas participants assigned to the assessment-only control group will gain weight comparable to previous observations in this population (i.e., a modest but significant average of 1.3 kg was observed in college freshman in a study by Andersen and colleagues (2003) and a gain of 3.1 kg was observed in the control group in the weight monitoring study by Levitsky and colleagues (2006)).

Secondary Aims

Testing for Iatrogenic and Positive Effects. A secondary aim of the current study is to test whether daily weight monitoring has iatrogenic or positive effects in this population. Previous research has produced mixed findings regarding whether monitoring one's weight daily has iatrogenic effect (Ogden & Whyman, 1997, Butryn, 2006; Gow et al., 2010). An additional question of interest is whether the intervention might have a positive impact on psychological variables. Therefore, it is important to examine changes in psychological variables in the current study to examine whether these effects are

present. Scores on measures of uncontrolled eating, emotional eating, level of satisfaction with one's body, healthy and unhealthy eating behaviors, mood, and levels of appetitive responsiveness to the food environment will be examined over time by intervention group to test for these potential effects.

Testing for Moderation and Mediation: An Exploratory Approach. A third aim of the current study is to examine variables that might mediate or predict/moderate the effectiveness of weight monitoring as a method for weight gain prevention. Potential mediator or moderator variables include levels of appetitive responsiveness to the food environment, cognitive dietary restraint, uncontrolled eating, emotional eating, level of satisfaction with one's body, healthy eating behaviors, unhealthy eating behaviors, weight suppression, current dieting, and dieting history. These analyses will be exploratory given what little is known about the effectiveness of the proposed intervention and the large number of variables being tested.

CHAPTER 2: METHODS

Participants

Recruitment. Freshman female students at Drexel University and Cornell University were recruited for the current study. At both campuses, fliers advertising the study (see Appendix A for flier used at Drexel University) were distributed around campus. Emails were also sent out to eligible students for an additional recruitment method. All advertisements emphasized that participants may learn ways to prevent weight gain in college. There was no mention of monetary compensation even though monetary compensation was offered for completing the post-intervention and follow up assessments. This was done to capture a sample that is motivated more by a desire to prevent weight gain than by monetary gains.

Inclusion and exclusion criteria. Inclusion criteria were: (1) female gender, (2) in their first year of college and between the ages of 18 and 25, (3) living on campus, and (4) a BMI of 20 to 29.9 kg/m^2, a value that includes both normal weight and overweight participants but not obese participants based on guidelines set by the National Institutes of Health, and is sufficiently above the weight criteria threshold for anorexia nervosa (American Psychiatric Association, 2000). Obese persons were not included because overweight, unlike obesity, is not strongly associated with adverse health conditions. Therefore, it is desirable to prevent weight gain in the overweight, but those who are obese should, for health reasons, lose weight, thus prevention in this population is less desirable. Exclusion criteria were: (1) self-reported history of an eating disorder (anorexia

nervosa, bulimia nervosa, or binge eating disorder), and (2) self-reported current eating disorder. Additionally, participants were required to email the researcher on at least five of seven consecutive days before they were formally eligible to participate. This was done to allow them to demonstrate that they are ready to make a small yet consistent daily commitment to the study if they are randomized to the experimental group. See below for details on this requirement.

Procedures

Participants were instructed to call the research office if they are interested in participating in the study or getting more information about the study. The following study description was given over the phone:

The study is interested in examining methods of weight gain prevention in college students. In the past, research has shown that simply monitoring your weight daily and receiving daily feedback about it prevents weight gain. If you choose to participate, you will either be assigned to weigh yourself daily over a period of 8 weeks or you will be assigned to an assessment-only group. If you are assigned to weigh yourself daily, you will be asked to log into a secure website and enter your weight each morning for 8 weeks. Does this sound like something you might be interested in?

There are also a few other things we will ask you to do during your participation in this study. You will be asked to come into the lab to be weighed before and after the study period and at this time will be asked to complete a few short questionnaires. If you complete the 8 weeks of the intervention period, you will receive $5, and if you come back

12 weeks later, you will receive an additional $15[1]*. Do you have any questions? Does this sound like something you might be interested in?*

Next, contact information was gathered, as well as self-reported age, height and weight. Participants were also asked if they are currently dieting, and whether they have ever been diagnosed with an eating disorder. Participants who met eligibility criteria were scheduled for a date and time to come into the lab for the initial assessment. Although the original plan in the proposed study was to give preference for enrollment to individuals who are more likely to gain weight based on previous research (i.e., current dieters (Lowe et al., 2006), individuals with a higher body mass index (Ogden et al., 2007)) all interested and eligible individuals were included due to concern about reaching an adequate sample size and achieving adequate power.

Consent Process and Baseline Weighing

Participants came to the lab at their respective campuses for their initial assessment. Participants were asked to avoid eating or drinking anything in the two hours before the start of their assessment. During this assessment, they were given a detailed description of the study and were taken through the consent process and given the opportunity to ask questions. They were asked when they last ate to confirm that it was at least 2 hours before their assessment began. Their height and weight were measured at this time (see below for details). Next, they were told that since this study may require a

[1] The current study included a follow up period of 12 weeks, however, the follow up period was not part of the current thesis.

daily commitment, they will be asked to email the researcher each morning when they wake up for the next 7 days. Participants were told that this will help us determine who is most appropriate for the study and that those who are unable to respond on most of these occasions will not be eligible. Participants were given a handout (see Appendix B) to help them track this requirement. If they did not email on a given day during the next week, they were sent one reminder email emphasizing the importance of responding daily and then were not reminded again. Finally, participants were given a link with instructions on how to complete the baseline questionnaires online (see Appendix B). Baseline measures included the following: a demographics questionnaire, a measure assessing weight control behaviors, a measure of dieting history, the Power of Food Scale, a revised version of the Three-Factor Eating Questionnaire, and a measure of body satisfaction (see below for details on all of these measures). As specified in their handout (see Appendix B), participants were told that if they complete the questionnaires and the emailing task, they will be randomized to the intervention or control group.

Assignment to Intervention Condition

Participants were assigned to the experimental or control conditions using a matched pair approach to random assignment. At approximately day 5 of 7 of the behavioral run-in week, participants who were emailing the researcher most mornings were listed in an excel file with their identification number and body mass index based on their initial assessment measurements. Participants with similar body mass indexes were paired together and a random numbers table was used to assign one of the pair to the experimental group and the other to the control group.

Of those assigned to the experimental group, none had daily access to a digital scale and therefore came in to the lab to pick up a scale they could use for the duration of the study. Those assigned to the control group were simply called and told that they would be contacted in 8 weeks for their next assessment. To replicate methods used by Levitsky and colleagues (2006), participants were not given any specific nutrition guidance except to try to avoid weight gain.

Weight Monitoring Intervention

The intervention was similar to procedures used in a previous trial by Levitsky and colleagues (2006), however, a website developed by Levitsky and colleagues was used so that hand calculation of slope was not required (See http://www.weightloss.human.cornell.edu/). Participants were instructed to log on to the website each morning and enter their weight. The site plots the participants' actual weight, their goal weight (i.e., a straight horizontal line at their starting weight), and for the last 7 weights provided, a linear regression that shows the trend of their weight. The actual slope of the line is also provided (e.g., 0.50 lb/day). If a participant misses entering their weight on a day, they can go back and enter weight from previous dates but they were instructed to only do this if they are in a place where they do not have internet access but were still able to weigh themselves and record their weights offline. If participants did not log their weight for 3 consecutive days, an email was sent to them reminding them the importance of logging their weight daily, based on the procedures of Levitsky and colleagues (2006).

Two Week Mood Assessment

To test whether there is an increase in negative mood after two weeks of being assigned to weigh themselves daily, as was found previously (Ogden & Whyman, 1997), the Profile of Mood States measure was administered online to participants after 2 weeks of the intervention period. Participants were emailed a link to complete the measure using the same online site where they completed their initial assessment measures (i.e., Sona Systems).

Post Intervention Assessment

After eight weeks of the intervention period, all participants came back to the lab for their post intervention assessment. At this assessment, their height and weight were measured using the same scale and stadiometer that was used at baseline. They were asked to complete the same questionnaires that they completed at the initial assessment, minus the demographics questionnaire. All participants also underwent a brief semi-structured interview (see Appendix I) where they were asked questions about their experience in the study and a few questions to characterize the participants and potential differences between Drexel and Cornell participants. Participants in both conditions were asked to describe in general the types of behaviors they did or did not use to control their weight during the study's duration and were then asked about the frequency with which they engaged in specific unhealthy weight control practices (See Appendix I). Both conditions were also asked about the frequency of meals eaten in the all-you-can-eat cafeteria and to-go school meal places, as well as weekends over the past 8 weeks spent

away from campus. These questions were added to examine any potential differences between individuals or between schools in exposure to the college food environment. Participants in the experimental condition were asked to give their opinions about the usefulness of daily weighing (e.g., Did they find it helpful? Harmful? Make them feel more in control? Less in control?). To assess for contamination of the control group, control participants were asked how often they weighed themselves during the 8 week period and how often they recorded this value. All participants received $5 for completing the post-intervention assessment.

Measures

Anthropometrics. Height was measured without shoes using a stadiometer. Weight was measured in light clothing using a digital scale. BMI was calculated by dividing weight in kilograms by the square of height in meters. BMI has been shown to have adequate convergent validity with more direct measures of body fat including dual energy x-ray absorptiometry (Pietrobelli et al., 1998).

Demographics. Demographic variables (e.g., ethnicity, family weight history, family income) were measured using a self report questionnaire (see Appendix C).

Dieting and Weight History Variables. The Dieting and Weight History Questionnaire was used to assess whether participants are currently dieting and how often they have dieted (and how much weight was lost) in the past. This measure also classifies dieting in terms of the goals of dieting, that is, whether it is done to lose weight or to maintain weight (see Appendix D). This measure provides information about weight

suppression (i.e., participants' highest weight ever minus their current weight) which has been shown to predict weight gain (Lowe et al., 2006).

Weight Control Behaviors. Previous work has suggested that having participants monitor their weight daily does not result in unhealthy weight control efforts in college females (Butryn, 2006). However, other studies have found that weekly weighing may have iatrogenic effects on cigarette smoking (Gow et al., 2010). Weight control behaviors were measured in the current study to examine whether there are iatrogenic effects of the intervention in normal and overweight individuals. Additionally, this measure was used to test whether healthy or unhealthy weight control behaviors mediate any weight gain prevention effect that is observed.

The frequency of use of different weight control behaviors was assessed using a modified version of the Weight Control Behavior Questionnaire (WCBQ; Stice & Presnell, 2004). The WCBQ is a 15-item self-report scale for which participants report whether or not they have engaged in each of 15 weight control behaviors in the previous 30 days. If they reported engaging in the behavior, they were asked to report how many days in the past 30 they engaged in that behavior. One item was typed incorrectly on the online survey (i.e., 'Taking dietary supplements' was typed instead of 'Taking dieting supplements') and therefore this item was removed from the Unhealthy Behavior index. After removal of this item, four items made up the Unhealthy Behavior index (i.e., skipping breakfast, skipping lunch, skipping dinner, and smoking) and the remaining 10 items make up the Healthy Behavior index and include items like 'eating less fat' and

'drinking more water' (see Appendix E). Indices represent a frequency of how many of each behavior in the index had been engaged in over the past 30 days.

Susceptibility to the Food Environment. The Power of Food Scale (PFS) is a self report measure that assesses an individuals' level of appetitive responsiveness to a food environment where palatable foods are readily available and abundant. The scale is divided into three domains based on the location and availability of food: (1) the more abstract implicit food environment where food is always available (i.e., in a grocery store, refrigerator) but not physically present; (2) food that is physically present but has not yet been tasted; and (3) food as it is first tasted but not yet consumed. The measure does not include any items that assess restrained eating or actual consumption of food, but rather measures the extent to which one has thoughts, feelings and motivations related to the drive to consume food, making it distinct from other previously developed scales of eating restraint and disinhibited eating. The PFS has shown good internal consistency in obese and nonobese individuals (Chronbach's $\alpha = 0.81$ to 0.91; Cappelleri et al., 2009a) (see Appendix F). It has also shown incremental validity in that it remained a significant predictor of scores on the Three-Factor Eating Question (TFEQ) disinhibition scale, the TFEQ hunger scale, the Dutch Eating Behavior Questionnaire (DEBQ) emotional eating scale and the DEBQ external eating scale, even when controlling for the effects of the Restraint Scale (Cappelleri et al., 2009a). Finally, it has also shown predictive validity. Scores on the PFS have been shown to predict success in an acceptance-based intervention for controlling food cravings, that is, participants who scored high on the PFS had greater success with the intervention than those who scored low on the PFS

(Forman et al., 2007). In another study, the PFS predicted consumption of dessert foods after participants had been fed a satisfying meal (i.e., it predicted eating past energy repletion) (Levitsky & Shen, 2008).

In the current study, this measure was used to assess whether changes in the PFS are related to our intervention and whether individual levels of appetitive responsiveness to the food environment moderates an individual's success with the current intervention.

Measures of Eating Behavior. A revised version of the Three-Factor Eating Questionnaire (TFEQ) was used to assess various aspects of eating behavior (see Appendix G). The revised version has 18 items and consists of three subscales: cognitive restraint, uncontrolled eating, and emotional eating (Cappelleri et al., 2009b). It has shown robust factor structure and adequate reliability (Cappelleri et al., 2009b). This measure was used as one method for examining the potential increase in problematic eating behaviors (e.g., uncontrolled eating, emotional eating). It was also used to test whether changes in certain subscales (e.g., increased cognitive restraint, decreased uncontrolled eating) are correlated with weight change in the experimental group to gain further information about what behaviors or cognitions might be influencing participants weight change over time.

Body Satisfaction. Satisfaction with one's body was measured using the Berscheid Body Satisfaction Test (BBS; Berscheid, Walster & Bohrnstedt, 1973). This measure assesses participant's level of satisfaction with various parts of one's body (see Appendix H). This measure was used to test the effect of the intervention, including the possibility

of iatrogenic effects (i.e., an increase in body dissatisfaction over the course of the study in the daily weight monitoring group). It was also used to examine whether the opposite effect is present, that is, whether participants in the experimental group gain a greater feeling of control over their weight over the intervention period and thus experience increased body satisfaction.

Mood. To test for potential iatrogenic effects of daily weighing on mood, the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971) was measured at the initial assessment and two weeks into the intervention period. The anxiety and depression subscales were be used to assess whether there is an increase in negative mood following 2 weeks of daily weighing in this population, as was found in previous research (Ogden & Whyman, 1997). The anxiety and depression subscales both had positively skewed distributions at several of the assessment points (i.e., most of the participants scored very low on the scales) and therefore a normalizing $\log_{10}$ transformation was applied to these subscales at all time points.

Post-intervention Semi-structured Interview. Participants were asked to report the frequency with which they engaged in the following unhealthy weight control behaviors over the past 8 weeks: going for long periods of time (i.e., 6 or more waking hours) without eating, skipping meals, using laxatives or dietary supplements, not eating after a certain time of day, and smoking (See Appendix I). Participants were given a Likert scale to refer to and were asked to report a number from 0 (Never) to 8 (Constantly). If participants reported engaging in these behaviors, the interviewer would clarify whether these behaviors were engaged in for the purpose of weight control or for another reason

(e.g., going for long periods of time without eating because they happened to be in a place where food was not available). Responses to these items were added to create an additional unhealthy weight control index.

Statistical Analyses

Data verification. Prior to analysis, all data were checked for out-of-range values. Frequency distributions and histograms were generated to gather information on data distributions and search for unusual data points.

Preliminary analyses. Several preliminary analyses were conducted. First, descriptive analyses were conducted to characterize the sample. Second, to test whether significant differences existed between data collection sites, a 2 (Group: Experimental or Control) x 2 (Site: Cornell or Drexel) analysis of variance (ANOVA) was used to examine whether there was a main effect of group assignment or site of data collection and also whether there was an interaction effect between group assignment and site on weight change. The dependent variable for this analysis was weight change (in pounds) from pre- to post-intervention. Third, the groups were compared on pre-intervention measures to determine if differences existed despite randomization. These comparisons were done using independent samples t-tests for continuous variables and chi-square tests for categorical variables. Fourth, the validity of the assumptions underlying each statistical procedure to be used was tested. Finally, attrition was examined to determine if attrition rates differ between groups. All hypothesis testing was conducted using

completer analyses (i.e., at post-intervention, including data only for participants who completed that assessment).

Primary analyses. To test the primary hypotheses, an analysis of covariance (ANCOVA) was used to examine differences in the changes in weight (i.e., from the initial assessment to the post-intervention assessment) between the experimental and control groups. The dependent variable for this analysis was weight at post-intervention. The covariate was pre-intervention weight and independent variable was group assignment (i.e., weight monitoring group or assessment-only control group). This analysis is recommended by Kraemer in an article on Pretest-Posttest Comparison Group Designs (Gliner, Morgan & Harmon, 2003) because variability due to error is reduced, giving the analysis greater power to detect significant effects. Due to limitations in the amount of overweight individuals included in the current study, descriptive analyses and an independent samples t-test will be used to examine weight change across condition in this sub-group.

Secondary analyses. ANCOVA was also used to examine changes in dependent variables that indicate either iatrogenic effects (e.g., increased body dissatisfaction) or positive effects (e.g., an increase in healthy weight control behaviors) of the intervention. Variables used to test for these effects were the healthy and unhealthy weight control behavior subscales of the WCBQ, body satisfaction scores from the BBS, and uncontrolled eating and emotional eating from the TFEQ to test whether group assignment interacted with changes in these variables. Additionally, an independent samples t-test was used to examine whether there was a significant difference in the

groups in unhealthy weight control behaviors at post-intervention, as determined by the unhealthy weight control index collected during the semi-structured interview.

Additionally, in an attempt to replicate a previous finding where daily weighing was found to have a negative effect on mood (Ogden & Whyman, 1997) and further examine potential iatrogenic effects of daily weighing, a repeated measures ANOVA was conducted on state measures of anxiety and depression at pre-intervention and at two weeks after the intervention period began.

Exploratory analyses. Finally, additional exploratory analyses were conducted to test for pre-intervention predictors of change in weight or changes in variables from pre- to post-intervention that mediated changes in weight. Pearson product moment correlations were used to examine whether changes in weight are correlated with pre-intervention levels of cognitive restraint, uncontrolled eating, and emotional eating scales from the TFEQ, the healthy and unhealthy eating behavior subscales of the WCBQ, individual appetitive responsiveness from the PFS, body satisfaction scores from the BBS, weight suppression, parental BMIs, mood, and current dieting or dieting history variables from the dieting and weight history questionnaire. To explore what cognitive or behavioral changes were associated with changes in weight, bivariate correlations were conducted between change scores for each of these variables and change in weight. Partial correlations were also conducted for the change scores variables while controlling for weight at pre-intervention.

CHAPTER 3: RESULTS

Sample Description

Response rate. One hundred and twenty three women (95 at Drexel and 28 at Cornell) expressed interested in the study and provided their contact information to receive more information about participation. Twenty of these women were never reached, 7 of whom did not provide valid contact information and 13 of whom did not respond to attempts at contact. Phone screens were conducted with 103 women (75 at Drexel and 28 at Cornell). Thirteen women were no longer interested in participating after receiving more information about the study. Twenty-two women were not eligible to participate (11 at Drexel and 5 at Cornell had a BMI lower than 20 kg/m^2, 3 at Drexel had a BMI higher than 30 kg/m^2, 1 at Cornell was over the age of 25, and 2 women, one at each university, reported a history of an eating disorder). Sixty-six women (47 at Drexel and 19 at Cornell) were scheduled for an in-person assessment and 58 attended the pre-intervention assessment. Of those 58, 7 women did not complete the behavioral run-in week (5 at Drexel and 2 at Cornell) and therefore, 51 participants (34 at Drexel and 17 at Cornell) were enrolled in the study and randomized to the experimental or control group.

Demographic characteristics of participants. Enrolled participants ranged from 18 to 19 years of age at the time of the pre-intervention assessment (M = 18.04, SD = 0.20). Fifty-eight percent of participants identified themselves as Caucasian, 17.5% as Asian, 9.8% as African American, 7.8% as Hispanic, and 5.8% as another ethnicity.

Comparison of Drexel and Cornell samples. Several analyses were conducted to test whether it was appropriate to combine samples from Drexel and Cornell universities. First, a 2 (Group: Experimental or Control) x 2 (Site: Cornell or Drexel) ANOVA revealed no significant main effects for group assignment ($F(1,46) = 1.9$, $p = 0.17$, $\eta^2 = .04$), school ($F(1,46) = 1.0$, $p = 0.31$, $\eta^2 = 0.02$), or the interaction between group assignment and school on weight change over the eight week observation period, ($F(1,46) = 0.55$, $p = 0.46$, $\eta^2 = 0.01$), suggesting that there was not a statistically significant difference among school, condition, or the combination of school and condition on weight change. Despite this lack of a significant difference in weight change across sites, additional analyses and methodological considerations were examined to aid in the decision of whether the samples should be combined.

In addition to examining weight change in each sample, pre-intervention weights and BMIs were also examined. Pre- and post-intervention means and standard deviations for primary outcome variables (i.e., weight, BMI, and weight change) for each school are presented in Table 1. Descriptively, the percentage of participants in Drexel's sample who were overweight (5 of 34 or 15%) was lower than the percentage of participant's in Cornell's sample who were overweight (7 of 17 or 41%). However, although the mean pre-intervention BMI for Cornell participants was slightly higher (See Table 1), this difference was not statistically significant ($t(49) = -1.48$, $p = 0.14$, *ns* (two-tailed). To examine the potential for this small pre-intervention difference between the schools to affect weight change, the correlation between starting BMI and weight change was examined across the entire sample and within each experimental condition. None of the

correlations were statistically significant (Total sample (N = 50): r = -0.20, p = 0.16; Experimental group (n = 26): r = -0.22, p = 0.27; Control group (n = 24): r = -0.18, p = 0.39), indicating that pre-intervention differences in BMI were not significantly related to weight change. However, it should be noted that all correlations were negative and it is possible that this relationship with starting BMI and weight change is present, but too small to be detected with the current sample size. Taken together, though there are small pre-intervention differences in BMI, these differences and their correlation with weight change are not statistically significant.

Second, questions regarding where meals were consumed over the 8 weeks of the intervention were also examined to look for differences between the schools. Questions during the post-intervention semi-structured interview (see Appendix I) included questions about the average number of meals per week eaten in the all-you-can-eat dining hall, the average number of meals per week eaten at 'to go' school meal places, and the number of weekends spent away from campus over the past 8 weeks. Descriptive analyses for these variables are listed in Table 2. Independent samples t-tests suggest the schools do not differ significantly except for on weekends spent away from campus, where Drexel participants spent an average of approximately one additional weekend away from campus over Cornell participants. Though these results were statistically significant, one additional weekend away from campus is unlikely to be clinically significant. Therefore, the questions in the post-intervention semi-structured interview revealed few compelling differences between the schools with regards to location of meals consumed over the 8 week intervention period.

Finally, when considering the differences between the two sites, one methodological difference between the samples should be taken into consideration. Cornell participants had their pre-intervention assessment later in the term and had therefore been on their campus and attending classes for a longer period of time before being measured. Specifically, classes began at Cornell on August 27, 2009 and participants' pre-intervention assessments occurred between September 25, 2009 and October 6, 2009. In contrast, at Drexel, instruction started on September 21, 2009 and participants' pre-intervention assessments occurred between September 18, 2009 and October 9, 2009. Thus, Drexel participants were weighed anywhere from 3 days before starting classes to 18 days after starting classes, whereas Cornell participants were weighed 29 to 40 days after starting classes. This difference could partially account for the higher weights observed in Cornell participants and could also partially explain the slightly higher weight gains observed in Drexel participants (although these higher means were not statistically significant).

Taken together, although there was not a significant interaction between school and intervention group on weight change, there was a methodological difference between the samples in terms of time of data collection and small baseline difference in BMI that was not statistically significant. Given these differences, all primary analyses were conducted with the combined sample as well as for each sub-sample to examine the possibility that primary effects might be present within schools but not across schools due to differences in time of pre-intervention weight measurement.

Pre- and post-intervention descriptive statistics. Pre- and post-intervention means and standard deviations for all outcome variables are presented in Table 4 to characterize the combined sample. At pre-intervention, enrolled participants had a mean BMI of 23.58 kg/m^2 (*SD* = 2.49) and a mean weight of 62.12 kg. During the intervention period, participants' BMI increased, on average, by 0.15 kg/m^2 (*SD* = 0.63) and their weight increased by 0.58 kg (*SD* = 1.77).

Preliminary Analyses

Pre-intervention differences between groups. Intervention groups were compared on pre-intervention measures to determine if differences between groups existed despite random assignment. Independent samples t-tests and chi square tests revealed no significant differences between conditions on any of the variables used in primary, secondary, or exploratory analyses.

Attrition. Of the 51 participants who enrolled in the study and were randomized to a condition, 50 completed the post-intervention assessment, representing a 98% completion rate. The 1 participant who did not complete the post-intervention assessment was in the control group and did not complete the 2 week mood assessment, suggesting that she considered herself removed from the study early on in the intervention period. She did not respond to attempts to schedule the post-intervention assessment.

Compliance. Although participants were instructed to enter their weights online, the database from which their weights were retrieved did not have a timestamp function and therefore, there was no way of documenting whether weights were truly tracked each

day or entered at a later date. Thus, true compliance with daily weighing instructions could not be assessed.

Primary Analyses

Given the methodological differences between data collection site noted above, the primary analysis was conducted for the entire sample combined, as well as each site separately. An ANCOVA revealed no significant effect of condition on weight in the combined sample ($F(1,47) = 1.5$, $p = 0.22$, $\eta^2 = 0.03$; See Table 3). Results were essentially unchanged within the school sub-samples (Drexel: $F(1,30) = 0.29$, $p = 0.59$, $\eta^2 = 0.01$; Cornell: $F(1,14) = 1.6$, $p = 0.22$, $\eta^2 = 0.11$). Though the analyses were not statistically significant, it should be noted that in the combined sample and each subsample, weight change was in the hypothesized direction. That is, the experimental group gained an average of 0.39 kg ($SD = 1.82$) and the control group gained an average of 0.90 kg ($SD = 1.78$).

Given the large amount of variability in weight gain across the sample, one additional descriptive analysis was conducted to examine the proportion of individuals who gained more than 1.0 kg (2.2 lbs) over the 8 week intervention period. Seventeen of the 50 participants (34%) who completed the intervention gained 1.0 kg or more, hereafter referred to as "gainers." Of those 17 "gainers", 8 (47%) were in the daily weighing group and 9 (53%) were in the control group. This finding provides preliminary evidence that in individuals most susceptible to weight gain over the 8 week intervention

period, daily weight monitoring was not sufficient to prevent weight gain in this sub-group.

Interestingly, all of these "gainers" had a starting BMI of 20.5 to 25.02, suggesting that only one participant who started the intervention categorized as "overweight" gained more than 1.0 kg during the intervention period. To further examine the weight trajectory in individuals categorized as overweight at pre-intervention, an independent samples t-test was conducted for the 12 individuals (5 experimental and 6 control) who fit this description. Results suggested an average difference between the groups that did not reach statistical significance ($t(1,9) = -1.89$, $p = 0.09$). That is, overweight participants assigned to the experimental group lost 2.02 pounds ($SD = 3.25$) whereas overweight participants assigned to the control group gained 1.67 pounds ($SD = 3.18$). These results provide very preliminary evidence that daily weight monitoring might facilitate weight loss in overweight individuals, but given the very small sample size and very self selected sample, results should be interpreted with caution.

Contamination. All participants in the control group were asked during the post-intervention semi-structured interview how often they weighed themselves over the past 8 weeks (See Appendix H). One control participant reported weighing herself daily over the past 8 weeks but did not record her weight. Primary analyses were conducted without this participant and results were similar (i.e., no significant main effect for Condition: ($F(1,46) = 1.04$, $p = 0.31$, $\eta^2 = 0.02$)).

Power Considerations. A priori power analyses suggested that this study would have greater than 80% power to detect group differences of large effect (*d*= 1.0) with a sample size of 34 (17 experimental and 17 controls). However, this analysis was conducted based on the large effect size found in previous studies examining daily weight monitoring as a method of weight gain prevention (i.e., Levitsky et al., 2006). Levitsky and colleagues (2006) observed an effect size of 4.0 and for the current study's a priori power analyses a more conservative yet still large effect size of 1.0 was used to determine an adequate sample size. Although the sample size was exceeded in the current study, the weight gains observed were much lower and variability in weight change was much higher than previous studies. Thus, the observed effect size in the current study was much smaller (*d*= 0.28) and therefore, though the current sample would be adequate to detect a large effect, it was insufficient to produce statistical significance in the current study.

Secondary Analyses

Secondary analyses were not conducted separately for each school since doing so would greatly increase the number of analyses being conducted and increase the probability of a Type I error. Additionally, many of the methodological issues between the data collection sites were related to the weight measurements and therefore do not apply to these analyses because weight variables were not included.

No significant main effects for condition were found for any of the variables that would indicate iatrogenic or positive effects of the intervention (see Table 5). That is, there were no significant differences between the conditions in changes in body

dissatisfaction, healthy or unhealthy weight control behaviors, uncontrolled eating, emotional eating, cognitive restraint, or appetitive responsiveness to the food environment. There were also no significant differences at post-intervention in reports of unhealthy weight control behaviors, $t(1,46) = -0.11$, $p = 0.91$. Finally, the repeated measures ANOVA revealed no significant differences between the groups on changes in state measures of anxiety and depression from pre-intervention to the two week assessment (see Table 6).

Exploratory analyses

Pearson product moment correlations revealed a significant relationship between healthy behaviors at pre-intervention and weight change over the 8 week intervention ($r = -0.48$, $p < 0.01$), suggesting that participants who reported more healthy weight control behaviors at pre-intervention (e.g., drinking more water, eating less fat) gained less weight over the 8 weeks. There were no significant relationships between weight change and any of the other variables at pre-intervention (see Table 7). Bivariate and partial correlations revealed no significant differences in weight change and change in any of the measured cognitive or behavioral changes over the 8 weeks, even when pre-intervention weight was controlled. This suggests that changes over 8 weeks in the variables measured in the current study do not significantly mediate the observed weight changes over the 8 weeks of the intervention period (see Table 8).

Acceptability of the Intervention

Participants in the experimental condition were asked to rate whether they found daily weighing to be helpful or not helpful (e.g., in controlling their weight or affecting

other things, like their mood, that might impact their weight, see Appendix I). Of these participants, 26 reported daily weighing to be “helpful”, 2 were “neutral” or “indifferent”, and 0 participants reported that it was “not helpful”. When asked if daily weighing was “harmful” or “not harmful,” all 28 participants reported that it was “not harmful.” Twenty-two participants said it made them feel more in control of their weight, and four said it did not make them feel more in control of their weight.

CHAPTER 4: DISCUSSION

Several conclusions can be drawn from the results of the current study. First, although the average weight change across the experimental and control group were in the hypothesized direction, daily weighing did not produce a statistically significant prevention effect in this population. Additionally, a significant portion of both groups gained more than 1.0 kg over 8 weeks (2.2 lbs) and these individuals were equally distributed across conditions, suggesting that daily weight monitoring may not be powerful enough to prevent impending weight gain for the sub-sample who needs it most. Finally, though relatively few overweight individuals volunteered and enrolled in the current study, descriptive analyses of this sub-sample suggest that those overweight individuals that completed the study experienced weight loss as a result of being required to monitor their weight daily.

Importantly, daily weight monitoring was not found to have any significant iatrogenic or positive effects on cognitive or behavioral variables. Taken together, daily weight monitoring does not appear to be a harmful intervention, but also may not be sufficient to prevent weight gain in some individuals who are most susceptible to gain weight in the freshman year. Additionally, it may facilitate weight loss in overweight individuals, however, the number of overweight individuals made up a small proportion of the population studied. Because overweight individuals may incur more immediate risk of continued weight gain and obesity than those of normal weight (Ogden et al., 2007), this population is particularly important to study in the future.

There are a few explanations for our lack of a statistically significant weight gain prevention effect. First, variability in weight change was large, suggesting that if an effect of daily weight monitoring was present, it was too small to be detected with the current sample size. Other sources of variability in the sample were also high in terms of starting BMI, location (i.e., Drexel versus Cornell) and time of pre-intervention measurement. This variability in weight change (i.e., with the experimental group gaining 0.39 kg (*SD*= 1.82) and the control group gaining 0.90 kg (*SD* = 1.78)) represents a deviation from some of the previous research examining daily weight monitoring as a method of weight gain prevention. Previous samples reported smaller measures of variability in weight change (e.g., Levitsky et al., 2006: SDs for weight change within groups ranged from 0.51 to 0.99). However, in the dissertation conducted at Drexel University by Butryn in 2006, variability was of similar magnitude to that found in the present study (Butryn, 2006: *SD*s ranged from 1.2 to 2.5). Of note is the fact that many of these previous studies were only examining the effects of this intervention in normal weight individuals, thus potentially providing additional insight into the increased heterogeneity in the current study.

Additionally, the current study examined these changes in individuals at Cornell and Drexel University and although few statistically significant differences were found between the schools, methodological differences in time of measurement and other variables not accounted for may have accounted for additional variability in the current sample, reducing the ability to detect statistical significance. Finally, it is important to note that overall, larger weight gains have been observed at Cornell University compared

to Drexel University in a series of studies (i.e., Levitsky et al., 2006; Butryn, 2006, the current study). Given the differences in dining hall environments at these schools (i.e., personal communications from students and faculty at both universities suggest that Cornell cafeterias have greater variety and availability of palatable options than Drexel cafeterias), and the previous finding that frequency of eating at the dining hall predicted weight gain (Levitsky et al., 2004), one possible explanation is that the dining halls at Drexel University are not producing weight gain sizeable enough for a prevention effect to be detected. Given these various sources of variability, it is certainly possible than an effect was present, but could not be detected due to the noise in the current study.

Additionally, the current sample gained less weight than freshman females in previous reports. The average amount of weight gained in the control group was .90 kg (*SD* = 1.78) whereas previous studies have observed much larger weight gains (e.g., Levitsky et al., 2006: 3.1 kg (*SD* = 0.51) and 2.0 kg (*SD* = 0.65) in untreated control groups; Anderson et al., 2003: 1.3 kg (*SD* not provided); Butryn, 2006: 1.0 kg (*SD* = 1.2 kg). Although the study purposefully recruited individuals inherently motivated to receive the intervention by not offering monetary or course credit as compensation in initial advertisements, very few individuals in the current study gained a significant amount of weight. If the criteria suggested by Anderson et al (2003) is used to delineate a "significant" amount of weight gain of 2.3 kg (i.e., 5 lbs), only 8 of the 50 completers (16%) gained this amount, suggesting that few individuals in the current study were actually highly prone to weight gain. This relatively smaller weight gain observed in the control group further detracts from our ability to detect effects. Therefore, although it is

possible that an effect was not present, it is also possible that one exists and simply could not be detected.

Despite the possibility that an effect was present but not detected in the current study, it is also possible that daily weight monitoring is not enough to prevent weight gain those that are susceptible. To further examine this issue, smaller sub-samples were examined to reduce the heterogeneity of the sample. In the small sub-sample that did gain a significant amount of weight (i.e., with a cut off of 1.0 kg or 2.2 lbs), daily weight monitoring did not appear descriptively to have a significant effect based on the fact that these "gainers" were almost equally distributed across conditions. Though these numbers should be interpreted with caution (i.e., due to limitations including sample size and the post-hoc nature of this analysis), they suggest that for at least some of the participants who are most susceptible to gaining weight, daily weight monitoring might not be sufficient to prevent it.

A few studies have examined daily weight monitoring in combination with another intervention to provide more guidance on how to control weight (i.e., Gow et al., 2010, Butryn, 2006). In the study by Gow and colleagues (2010), findings suggested that when combined with a 6 week source of psychoeducational material surrounding issues related to weight gain prevention, daily weighing had a weight gain prevention effect, but alone it did not. Alternatively, in the study by Butryn (2006), a weight gain prevention effect of daily weighing was not observed when combined with additional guidance regarding healthy eating. However, in the study by Butryn (2006), daily weighing alone did not have a weight gain prevention effect, and compliance with weight monitoring and

attendance at the healthy eating intervention sessions were low, making it impossible to determine whether this combination of interventions would have been helpful if adhered to. Results from the current study and the study by Gow and colleagues (2010) suggest again that for individuals who are most in need of weight gain prevention daily weight monitoring might be best combined with an appropriate source of information on appropriate and healthy weight control. Further study is needed with larger sample sizes to further clarify these questions.

Findings have been mixed on whether or not this type of intervention has iatrogenic effects and the current study sheds additional light on this issue. Results suggest that in this population of normal and overweight college females, daily weighing did not have any of the iatrogenic effects observed in previous studies. In an exact replication of the finding by Odgen & Whyman (1997), no increase in state anxiety or depression was observed after two weeks of daily weighing. Additionally, self reported online questionnaires and semi-structured in-person interviews found no difference in reports of number of cigarettes smoked between the experimental and control groups, as observed in the study by Gow and colleagues (2010). Finally, not only did self report questionnaire data suggest no significant effect of the intervention on healthy or unhealthy weight control behaviors, body satisfaction levels, mood, or uncontrolled or emotional eating, findings from in person interviews where each participant was specifically asked about a list of unhealthy weight control behaviors and whether they thought the intervention was ‘harmful’ or ‘not harmful’ further suggested that this intervention was not harmful to participants. Importantly, the potential lack of power that

was present in primary analyses may also be present in secondary analyses and therefore the possibility that iatrogenic or positive effects were present but not detected in the current sample should not be ruled out. However, regardless of the lack of power, the personal interviews represent a potentially more valid measure of the true effect of the intervention and further corroborate this lack of iatrogenic effects beyond that observed in previous research.

Exploratory analyses revealed that across the entire sample, higher reports of healthy weight control behaviors at baseline were associated with less weight gain over time. No other cognitive or behavioral variables were associated with weight change over time. This finding should be interpreted with caution due to the large number of statistical tests that were conducted in the exploratory analyses. However, if replicated, it does suggests that individuals who report engaging in healthy behaviors at the start of college (e.g., eating less fat, eating more vegetables) are less likely to gain weight in their first term at college which could aid future prevention efforts in helping to determine who is less susceptible to gaining weight over the first 8 weeks of the freshman year.

Beyond limitations based on the small observed effect size and resulting reduction in power, there are a few other limitations to the current study that should be considered. First, measurements of weight at pre- and post-intervention were somewhat discrepant and even though participants were asked to refrain from eating in the two hours before the assessment, the difference in time of day that the weight measurement was taken may have had an influence on weight change. Additionally, these measurements were more discrepant from pre- to post-intervention at Cornell than they were at Drexel. It is

possible that this caused an increase in measurement error in one sample but not the other because weight changes were measured over a relatively short period of time (i.e., 8 weeks), and for many individuals weight can fluctuate substantially within a day. Descriptive values for absolute time difference between measurements are listed in Table 2. An independent samples t-test revealed a significant difference between the schools ($t(48) = -5.6$, $p < 0.001$), where Cornell participants were measured, on average, at time points that were much further apart than participants at Drexel. The mean difference in time between the pre- and post-intervention assessments for Drexel participants was 35.0 minutes ($SD = 36.18$) compared to 134.12 ($SD = 90.07$) for Cornell participants. This represents an average difference of approximately 100 minutes or about an hour and a half. Put more simply, Cornell participants were more likely to have been measured at 12:00pm for their pre-intervention assessment and 2:00pm for the post-intervention assessment and Drexel participants were more likely to be measured at 10:00am and then 10:30am. Although it is unknown how much this discrepant time increased measurement error in the Cornell participant's weights, it is worth noting given that weight was measured over a relatively short period of time.

Additionally, the study was conducted over a period of 8 weeks whereas previous research examined weight change over longer periods of time (i.e., 12 weeks or 1 year). The current sample will be examined after a longer follow up period (i.e., 20 weeks after pre-intervention), however, these results are not included in the current thesis. Research examining weight monitoring has spanned time periods varying from 6 weeks to 1 year and therefore, results have varied with regards to average weight changes as well as

variability. It is possible that regular self-weighing may be a health habit that needs to be maintained for life (like brushing one's teeth) and existing research has yet to test long-term weight monitoring as a method of obesity prevention. Thus, future research examining this question over longer periods of observation is needed.

It should also be noted that the current study was conducted only in first year college females and therefore results should be extended to males and other age ranges with extreme caution. The recent study by Gow and colleagues (2010) suggests that weekly weighing in combination with psychoeducational information regarding weight gain prevention might be an effective method of weight gain prevention in males over 6 weeks, however, much more research is needed to determine how daily weighing might influence males and other age groups over longer periods of observation.

Finally, in terms of the lack of other significant mediating or moderating variables, this lack of findings should be interpreted with caution as well. Since current findings differed from the more robust effect of daily weight monitoring observed by Levitsky and colleagues (2006), it would be difficult to observe a variable moderating or mediating an effect that is as small as the effect observed in the current study. Thus, if this intervention is in fact helpful to a given population of individuals, the actual effect it has on these individuals' behavior remains elusive. Anecdotal reports during the post-intervention interview provide some basis for hypotheses regarding how this intervention could be helpful for some individuals. For example, upon seeing a weight increase, some participants reported altering their behavior in a small way the following day (e.g., choose to take the stairs instead of the elevator; had a salad at lunch) to counteract this

increase. However, the current study lacked sufficient statistical power to detect this effect.

Taken together, daily weight monitoring was not found to have any statistically significant effects on weight, or cognitive or behavioral variables. Given the large amount of heterogeneity in the current sample, it is unknown if a small effect was present, yet undetected given the current sample size. However, there is some indication that daily weight monitoring alone may not be sufficient to prevent weight gain in individuals who are most susceptible. Overall, more research is needed to examine the effect in larger samples over longer periods of time to further discover disseminable methods for weight gain prevention in normal and overweight individuals.

Table 1

Weight and BMI at Pre- and Post-Intervention by Data Collection Site

School	Pre-Intervention	Post-Intervention	Change
Weight (kg)			
Drexel	61.08 (7.78)	61.56 (7.82)	0.77 (1.83)
Cornell	64.21 (7.08)	64.41 (7.60)	0.20 (1.66)
BMI (kg/m^2)			
Drexel	23.22 (2.25)	23.35 (2.30)	0.22 (0.66)
Cornell	24.31 (2.84)	24.32 (2.72)	0.01 (56)

Note. Weight change calculated as post-intervention weight minus pre-intervention weight. There were no significant differences between the data collection sites on any of the reported variables.

Table 2
Means (SDs) for Descriptive Variables by Data Collection Site

	Drexel	Cornell
Time difference in weight measurement	35.0 (36.18)	134.12 (90.07)*
Meals per week in 'all-you-can-eat' dining halls	6.3 (3.93)	8.24 (3.78)
Meals per week in 'to go' school meal places	3.65 (3.29)	3.29 (2.42)
Weekends away from campus	3.15 (2.08)	2.06 (1.30)*

Note. Time difference in weight measurement is reported as the absolute value of the difference (in minutes) between the time of day each participant completed their pre- and post-intervention assessment appointment. *indicates a significant difference between the schools.

Table 3
Weight and BMI at Pre- and Post-Intervention by Condition

Measure/Item	Pre-Intervention	Post-Intervention	Change
Weight (kg)			
Experimental	61.47 (7.15)	61.87 (7.13)	0.39 (1.82)
Control	62.91 (8.06)	63.48 (8.46)	0.90 (1.78)
BMI (kg/m^2)			
Experimental	23.54 (2.46)	23.62 (2.40)	0.08 (0.67)
Control	23.63 (2.57)	23.74 (2.58)	0.22 (0.59)

Note. Weight change calculated as post-intervention weight minus pre-intervention weight.

Table 4
Pre- and Post-Intervention Means (SDs) for All Participants

Measure/Item	Pre-Intervention Mean (*SD*)	Post-Intervention Mean (*SD*)
Weight (kg)	62.12 (7.63)	62.53 (7.79)
BMI (kg/m^2)	23.58 (2.49)	23.67 (2.46)
TFEQ-Cognitive Restraint	7.35 (2.07)	7.18 (2.34)
TFEQ-Uncontrolled Eating	17.80 (4.59)	18.06 (4.56)
TFEQ-Emotional Eating	11.94 (4.51)	12.55 (5.07)
PFS Total Score	34.28 (10.67)	34.23 (12.91)
BBS Total Score	25.78 (7.26)	27.39 (7.63)
WCBQ – Unhealthy Index	1.60 (1.16)	1.81 (1.00)
WCBQ – Healthy Index	4.79 (2.35)	4.13 (2.72)

Note. TFEQ = Three-Factor Eating Questionnaire. PFS = Power of Food scale. BBS = Berscheid Body Satisfaction Test. WCBQ = Weight Control Behavior Questionnaire.

Table 5
Analysis of Co-Variance for Iatrogenic or Positive Effects

Measure	*df*	*F*	*p*	η^2
Body dissatisfaction	(1,45)	0.44	0.51	0.01
Healthy weight control behaviors	(1,44)	0.64	0.43	0.01
Unhealthy weight control behaviors	(1,43)	0.06	0.81	0.00
Uncontrolled Eating	(1,46)	1.20	0.27	0.03
Emotional Eating	(1,46)	2.67	0.11	0.05

Note. Sample sizes vary due to missing data.

Table 6
Analysis of Variance for Iatrogenic Effects on Mood

Profile of Mood States Subscale	*df*	*F*	*p*
Anxiety/tension			
Time	(1,45)	0.17	0.68
Condition	(1,45)	0.69	0.41
Time x Condition	(1,45)	0.01	0.94
Depression/dejection			
Time	(1,45)	0.16	0.69
Condition	(1,45)	0.32	0.58
Time x Condition	(1,45)	0.07	0.79

Table 7
Correlations Between Pre-Intervention Variables and Weight change

Measure/Item	*r*	*p*
Weight	-0.01	0.93
BMI	-0.20	0.16
TFEQ-Cognitive Restraint	-0.19	0.19
TFEQ-Uncontrolled Eating	0.03	0.84
TFEQ-Emotional Eating	-0.12	0.40
Power of Food Scale	-0.10	0.49
Body Satisfaction	0.20	0.17
WCBQ-Healthy Behavior Index	-0.48	<0.01
WCBQ-Unhealthy Behavior Index	-0.09	0.54
Mother BMI	0.02	0.92
Father BMI	0.10	0.63
Weight Suppression	0.12	0.40
Current dieting	0.17	0.23
Ever been on a diet?	0.19	0.18
POMS-Tension/anxiety	-0.12	0.41
POMS-Depression/dejection	-0.06	0.66

Note. TFEQ = Three-Factor Eating Questionnaire. WCBQ = Weight Control Behavior Questionnaire. POMS = The Profile of Mood States. Current dieting was assessed by asking participants, "Are you currently on a diet to lose weight or prevent weight gain?" Past dieting was assessment by asking participants, "Have you ever been on a diet to control your weight?" Weight change calculated as post-intervention weight minus pre-intervention weight.

Table 8
Correlations Between Pre- to Post-Intervention Changes in Measures and Change in Weight

	Bivariate		Partial correlations*	
Measure/Item	*r*	*p*	*r*	*p*
TFEQ-Cognitive Restraint	-0.13	0.38	-0.13	0.38
TFEQ-Uncontrolled Eating	-0.18	0.21	-0.18	0.22
TFEQ-Emotional Eating	0.09	0.52	0.10	0.51
Power of Food Scale	-0.05	0.71	-0.07	0.64
Body Satisfaction	-0.19	0.20	-0.19	0.20
WCBQ-Healthy Behavior Index	0.02	0.89	-0.00	0.99
WCBQ-Unhealthy Behavior Index	-0.05	0.71	-0.15	0.32
POMS-Tension/anxiety	0.15	0.30	0.13	0.42
POMS-Depression/dejection	-0.11	0.44	-0.15	0.32

Note. TFEQ = Three-Factor Eating Questionnaire. BBS = Berscheid Body Satisfaction Test. WCBQ = Weight Control Behavior Questionnaire. POMS = The Profile of Mood States. All changes calculated as post-intervention minus pre-intervention values. *Partial correlations conducted controlling for pre-intervention weight.

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APPENDIX A: RECRUITMENT FLIER

Women:

Do you want to avoid weight gain during the freshman year?

Participate in a research study conducted by the Department of Psychology where you may learn strategies that could help you avoid weight gain during the freshman year.

The purpose of this research, An Evaluation of Weight Gain Prevention in College Females, is to find out if certain procedures can help prevent weight gain in college females. The research team wants to find out if having people monitor their weight and receive feedback about weight change will prevent weight gain.

To be eligible to participate, you must be a Drexel University freshman student, age 18-25, and have a body mass index of 20-30 kg/m^2. You must not have a history of an eating disorder or currently have an eating disorder.

Ask for more information or call Shawn: (215) 762-1190.

This research is conducted by a researcher who is a member of Drexel University.

APPENDIX B: BEHAVIORAL RUN IN HANDOUT

Drexel Weight Gain Prevention Study

Thanks for your interest in the Weight Gain Prevention Study! In order to be officially enrolled in this study, you must complete the following 2 tasks:

1. Complete questionnaires online via Sona Systems (will take 20-30 minutes, see attached instructions)
   DUE: _____
   Check when completed: ☐
2. Email shawn.katterman@gmail.com each morning when you wake up for the next 7 days. You don't have to put anything in the body of the email, just make the subject 'Morning Check In'.

Date	'Morning Check In' email sent?

After you complete these 2 things, you will be contacted with your group assignment! In the meantime, please email shawn.katterman@gmail.com if you have any questions!

APPENDIX C: DEMOGRAPHICS QUESTIONNAIRE

Ethnicity. Please circle all that apply:

American Indian
Asian
African American
Hispanic
Caucasian
Other, specify: _____

Family Weight History: Please indicate the following information for your biological parents:

	Height	Weight	Current Age
Mother	_____	_____	_____
Father	_____	_____	_____

Income. Approximate average annual combined income of your parents: _____

APPENDIX D: DIETING AND WEIGHT HISTORY QUESTIONNAIRE

1. What is the most you have ever weighed since reaching you current height (do not count any weight gains due to medical conditions or medication)? The most I have weighed since reaching my current height is:

   _____ pounds

2. What is your current weight? _____ pounds

3. Please determine the difference between your answer to number 1 and number 2. If this difference is less than 5 lbs. skip this item and go to item 4. If the difference is 5 lbs. or more, indicate which of the three following statements describe you best:

   a. The difference between my highest weight and my current weight is due to weight that I lost on purpose.

   b. The difference between my highest weight and my current weight is due to weight I lost even though I wasn't trying to.

   c. I'm not sure why I weight less than I once did.

4. For about how long have you been at or close (within 2 lbs.) to your present weight? _____

5. Which of these statements best describe what has happened to your weight during the past 6 months? (circle one)

   a. My weight has stayed about the same
   b. I've been losing weight
   c. I've been gaining weight
   d. My weigh has fluctuated a lot

6. Are you currently on a diet? (circle one) Yes No (If no, go to number 8)

7. Are you currently dieting to lose weight or to avoid gaining weight? (circle one)

   To lose weight (go to # 9) To avoid gaining weight (go to # 8)

8. Have you ever been on a diet to control your weight?

   Yes No (skip 9 and 10; you are done)

9. About how old were you when you went on your first diet? _____ years old

10. Please estimate as best you can the number of times in your life you have dieted and lost the indicated amount of weight:

    How many times have you dieted and lost:

    ____ 1-4 pounds

    ____ 5-10 pounds

    ____ 11-15 pounds

    ____ 16 or more pounds

APPENDIX E: WEIGHT CONTROL BEHAVIOR QUESTIONNAIRE

Indicate two things for each item:

1) **Did you engage in over the last 30 days?**

   Yes, I engaged in this behavior in the last 30 days

   No, I did not engage in this behavior in the last 30 days

2) **On how many days of the past 30 days did you engage in the behavior?**

Item No.	Item	Yes/No	How many days?
1	Skipping breakfast		
2	Skipping lunch		
3	Skipping dinner		
4	Eating less at mealtimes		
5	Eating less fat		
6	Snacking less		
7	Not eating after a certain time of day		
8	Smoking		
9	Drinking more water		
10	Eating less caloric foods		
11	Eating many small meals		
12	Eating more vegetables		
13	Taking dieting supplements		
14	Cut out butter/syrup/sugar		
15	Exercise more than usual		

APPENDIX F: POWER OF FOOD SCALE

Please indicate the extent to which you agree that the following items describe you. Use the following scale from 1−5 for your responses.

		I don't agree (1)	I agree a little (2)	I agree somew hat (3)	I agree quite a bit (4)	I strongly agree (5)
Q1	I find myself thinking about food even when I'm not physically hungry.	(1)	(2)	(3)	(4)	(5)
Q2	I get more pleasure from eating than I do from almost anything else.	(1)	(2)	(3)	(4)	(5)
Q3	If I see or smell a food I like, I get a powerful urge to have some.	(1)	(2)	(3)	(4)	(5)
Q4	When I'm around a fattening food I love, it's hard to stop myself from at least tasting it.	(1)	(2)	(3)	(4)	(5)
Q5	It's scary to think of the power that food has over me.	(1)	(2)	(3)	(4)	(5)
Q6	When I know a delicious food is available, I can't help myself from thinking about having some.	(1)	(2)	(3)	(4)	(5)
Q7	I love the taste of certain foods so much that I can't avoid eating them even if they're bad for me.	(1)	(2)	(3)	(4)	(5)
Q8	Just before I taste a favorite food, I feel intense anticipation.	(1)	(2)	(3)	(4)	(5)
Q9	When I eat delicious food I focus a lot on how good it tastes.	(1)	(2)	(3)	(4)	(5)
Q10	Sometimes, when I'm doing everyday activities, I get an urge to eat "out of the blue" (for no apparent reason).	(1)	(2)	(3)	(4)	(5)

Q11	I think I enjoy eating a lot more than most other people.	(1)	(2)	(3)	(4)	(5)
Q12	Hearing someone describe a great meal makes me really want to have something to eat.	(1)	(2)	(3)	(4)	(5)
Q13	It seems like I have food on my mind a lot.	(1)	(2)	(3)	(4)	(5)
Q14	It's very important to me that the foods I eat are as delicious as possible.	(1)	(2)	(3)	(4)	(5)
Q15	Before I eat a favorite food my mouth tends to flood with saliva.	(1)	(2)	(3)	(4)	(5)

APPENDIX G: THREE-FACTOR EATING QUESTIONNAIRE

1. I deliberately take small helpings to control my weight.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
2. I start to eat when I feel anxious.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
3. Sometimes when I start eating, I just can't seem to stop.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
4. When I feel sad, I often eat too much.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
5. I don't eat some foods because they make me fat.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
6. Being with someone who is eating, often makes me want to also eat.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
7. When I feel tense or "wound up", I often feel I need to eat.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
8. I often get so hungry that my stomach feels like a bottomless pit.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
9. I'm always so hungry that it's hard for me to stop eating before finishing all of the food on my plate.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
10. When I feel lonely, I console myself by eating.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
11. I consciously hold back on how much I eat at meals to keep from gaining weight.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
12. When I smell a sizzling steak or see a juicy piece of meat, I find it very difficult to keep from eating – even if I've just finished a meal.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
13. I'm always hungry enough to eat at any time.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
14. If I feel nervous, I try to calm down by eating.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
15. When I see something that looks very delicious, I often get so hungry that I have to eat right away.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
16. When I feel depressed, I want to eat.
(1) Definitely true, (2) Mostly true, (3) Mostly false, (4) Definitely false
17. Do you go on eating binges even though you're not hungry?
(1) Never, (2) Rarely, (3) Sometimes, (4) At least once a week
18. How often do you feel hungry?
(1) Only at mealtimes, (2) Sometimes between meals (3) Often between meals (4) Almost always

APPENDIX H: BERSCHEID BODY SATISFACTION TEST

How satisfied are you with your:	**extremely dissatisfied**	**moderately dissatisfied**	**neutral**	**moderately satisfied**	**extremely satisfied**
1. Weight	1	2	3	4	5
2. Figure.	1	2	3	4	5
3. Body build.	1	2	3	4	5
4. Stomach.	1	2	3	4	5
5. Waist	1	2	3	4	5
6. Thighs	1	2	3	4	5
7. Buttocks.	1	2	3	4	5
8. Hips.	1	2	3	4	5
9. Legs.	1	2	3	4	5

APPENDIX I: POST-INTERVENTION INTERVIEW

AN EVALUATION OF WEIGHT GAIN PREVENTION IN COLLEGE FEMALES: SEMI STRUCTURED INTERVIEW

Module:	Assesses:
A	Behaviors used to control weight
B	Frequency of meals eaten in the cafeteria
C	Experience of daily weighing
D	Frequency of daily weighing in controls

Experimental Group - administer Modules A, B & C
Control Group - administer Modules A, B & D

MODULE A: BEHAVIORS USED TO CONTROL WEIGHT

In the past 8 weeks, what did you do to try to control your weight?

_____

_____

Using Scale A as a guide, in the past 8 weeks, how often did you _____ to control your weight?

(SCALE A)

0--------1---------2----------3----------4----------5----------6----------7----------8

Never Rarely Occasionally Frequently Constantly

FREQUENCY

a. Go for long periods of time (i.e., 6 or more waking hours) without eating? _____

b. Skip meals? _____

c. Use laxatives or dietary supplements? _____

d. Not eat after a certain time of day? _____

e. Smoke? _____

f. Exercise more than usual? How much more (rate excessive or driven exercise)? _____

MODULE B: FREQUENCY OF USE OF CAMPUS CAFETERIAS

How many meals/week do you eat in the school all-you-can-eat cafeteria? ____

What about To-Go school meal places? ____

How many weekends in the past 8 weeks did you spend away from campus? ____

Where were you during those weekends? What type of food environment was it?_____

MODULE C: EXPERIENCE OF DAILY WEIGHING (EXPERIMENTAL GROUP ONLY)

What has it been like having to weigh yourself daily over the past 8 weeks?

_____

_____

Did you find weighing and recording your weight helpful or not helpful (e.g., in controlling your weight or affecting other things, like your mood, that might impact your weight)?

YES ___ NO ___

If yes, how so?_____

If no, why not?_____

Using Scale B as a guide, in the past 8 weeks, how helpful did you find daily weighing to be?

(SCALE B)

0--------1---------2----------3----------4----------5----------6----------7----------8

Not at All Helpful | Slightly Helpful/ Not really Helpful | Occasionally/ Somewhat Helpful | Very/Usually Helpful | Extremely/ Always Helpful

Did you find weighing and recording your weight harmful or not harmful? YES ___ NO ___

If yes, how so?_____

Using Scale C as a guide, in the past 8 weeks, how <u>harmful</u> did you find daily weighing to be?

(SCALE C)

0--------1---------2----------3----------4----------5----------6----------7----------8

Not at All Harmful — Slightly Harmful/ Not really Harmful — Occasionally/ Somewhat Harmful — Very/Usually Harmful — Extremely/ Always Harmful

Did it make you feel more in control of your weight? YES ___ NO ___

If yes, how so?_____

Did it make you feel less in control of your weight? YES ___ NO ___

If yes, how so?_____

<u>MODULE D: DAILY WEIGHING CONTAMINATION CHECK (CONTROL GROUP ONLY)</u>

How often did you weigh yourself during the past 8 weeks? _____

Did you record your weight? How much of the time? Where did you record it?

_____