PREVENTING THE FRESHMAN 15: THE EFFECT OF LIFESTYLE INTERVENTION ON FRESHMAN-YEAR WEIGHT GAIN

By

KATHRYN ROSS MIDDLETON

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Kathryn Ross Middleton

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Prevention of initial excess weight gain has received increased focus as a method for addressing the current obesity epidemic. Due to the slow, incremental nature of weight gain experienced by most individuals, prevention studies have encountered difficulties assessing program impact. An emerging strategy has been to conduct weight gain prevention interventions with individuals at high-risk for gaining excess weight, such as college freshmen. Thus, the current study was a randomized controlled trial investigating the effect of an innovative, short-term lifestyle intervention on weight gain in freshman college students. Participants included 95 students (mean ± SD BMI = 26.80 ± 6.45 kg/m^2) randomized to a five-session, four-week treatment or to wait-list control. We hypothesized that there would be a significant difference in weight between groups at immediate post-test and end-of-semester follow-up. The hypothesized group by time interaction was not significant, p = .393, suggesting that there were no statistically significant differences in weight between groups at post-test or follow-up. Non-significant trends in the data suggested, however, that while participants in the control group tended to maintain their baseline weight, participants in the intervention group initially lost weight from baseline to post-test (mean ± SE change -2.07 ± 2.52 kg)

but then regained weight from post-test to follow-up (1.05 ± 2.42 kg) such that change from baseline to follow-up was only -1.02 ± 2.61 kg. In terms of caloric intake and physical activity, again there were no significant group by time interactions (*ps* = .763 and .259, respectively). Significantly more participants in the treatment group decreased their caloric intake by at least 200 kcal/day from baseline to post-test compared to participants in the control group, z = 1.96, *p* = .050, which suggests that participants were responding to intervention. Further, participants who were overweight or obese in the treatment group lost a mean of -4.22 ± 2.53 kg from baseline to post-test, demonstrating that these participants may benefit more from intervention than normal weight participants. Future studies should investigate lengthening the intervention to enhance effectiveness and, given the wide variability in response to treatment, increasing recruitment to improve statistical power.

CHAPTER 1
INTRODUCTION

The Obesity Epidemic

As of 2010, 36% of adults in the United States were obese (defined as a body mass index [BMI] of ≥ 30.0 kg/m^2; Flegal, Carroll, Kit, & Ogden, 2012). This large prevalence of obesity has led to growing public health concern as excess weight is associated with adverse health outcomes and decreased life expectancy (Haslam & James, 2005). Obesity is associated with 5 of the 10 leading causes of death (National Heart, Lung, and Blood Association, 1998) and may soon pass smoking as the most preventable cause of disease and death (Jia & Lubetkin, 2010).

While there is a significant genetic contribution to body weight (Bouchard & Perusse, 1993), substantial environmental and behavioral influences, including increased portion sizes, food availability, fast-food consumption and high-fat diets have been increasing concordant with the prevalence of obesity (Hill & Peters, 1998). There has been a steady increase in food dollars spent outside of the home, from an average of $1,664 per family in 1991 to $2,698 per family in 2008 (U.S. Department of Labor, 2001, 2008), which is particularly concerning given that individuals who frequently consume food outside of the home (e.g., in fast food restaurants) have been found to have higher BMIs and caloric intakes than those who do not (Bowman & Vinyard, 2004; Jeffery & French, 1998; Schmidt et al., 2005). Portion sizes for foods eaten both inside and outside of the home have further increased substantially; from 1977 to 1996, energy intake of salty snacks increased by 93 kcal, soft drinks by 49 kcal, hamburgers by 97 kcal, French fries by 68 kcal, and Mexican food by 133 kcal (Nielsen & Popkin, 2003).

Since the 1980s, there has been increased focus on interventions to help overweight and obese individuals lose weight. These programs have overall been successful, with participants achieving, on average, clinically significant weight losses of 8-10% of their initial body weight (Butryn, Webb, & Wadden, 2011). Despite this success, however, long-term maintenance of lost weight remains an issue (Butryn, Webb, & Wadden, 2011; Jeffery et al., 2000; Perri, 1998). Individuals who are initially successful at weight loss typically regain one-third to one-half of this lost weight within a year after initial intervention ends, and generally return to their baseline weight within 3-5 years (Institute of Medicine, 1995). Accordingly, researchers have argued that obesity must be treated as a chronic condition using a continual-care model of treatment (Perri & Corsica, 2002; Perri, Nezu, & Viegener, 1992). This model would necessitate increases in cost as interventions expand to include more sessions and increased opportunities for provider contact over longer periods of time. These increases in cost, coupled with moderate long-term effectiveness indicate that behavioral interventions alone may not be the solution to decreasing the population-wide obesity epidemic.

As individuals are generally unsuccessful at maintaining lost weight, the key to addressing the population-wide obesity epidemic may be preventing individuals from initially gaining excess weight. Primary-level interventions (e.g., prevention programs) generally have a much wider reach, increased cost-effectiveness, and a heightened ability to influence population-wide change relative to tertiary-level interventions (that treat individuals with an existing health condition). While increasing research has focused on preventing weight regain after initial weight loss, there has been limited

research on the prevention of initial excess weight gain in adults. The following sections review the research that has been done to date in the area of weight gain prevention.

Weight Gain Prevention Programs

The Pound of Prevention pilot study (POP; Forster, Jeffery, Schmid, & Kramer, 1988) was one of the first randomized controlled trials aimed at the prevention of adult weight gain. During this pilot study, 211 participants were randomized to either an intervention group or a no-contact control group. Participants in the intervention group received a monthly mailing including a newsletter focused on weight management techniques and a postage-paid postcard. Investigators requested that participants record their current weight and strategies used to control their weight on this postcard and mail it back to the researchers. Participants were also given the option to attend a four-session educational weight-management course halfway through the intervention year. Finally, financial incentives were used with this intervention group; participants consented to have $10 withdrawn from their checking account monthly that they could receive back at the end of the study, with interest, if they remained at or below their baseline weight. Alternatively, participants could withdraw this money earlier if still at or below their baseline weight at the time of withdrawal.

After adjusting for height, participants in the intervention group lost significantly more weight than participants in the control group (mean ± SE = -1.0 ± 0.3 kg and -0.1 ± 0.3 kg for participants in the intervention group and the control group, respectively). Results of this study demonstrated differential treatment effects by gender. Men in the intervention group lost significantly more weight than men in the control group during the year of study (mean ± SE = -2.1 ± 0.7 kg and -0.6 ± 0.6 kg for the intervention and control groups, respectively); however, there was no significant treatment effect for

women (mean ± SE = -0.5 ± 0.4 kg and -0.1 ± 0.3 kg in the intervention and control groups, respectively).

Interestingly, the weight changes observed in the control group of the POP pilot study do not reflect the 0.5 - 0.9 kg gained per year by the average adult (Forster et al., 1988; Garn et al., 1976; Lewis et al., 2000), which may have led to the difficulty in finding significant group differences, especially in women. One potential issue may have been recruitment; the study sample was recruited from the Minnesota Heart Health Program, and these participants may have been more health conscious than the average person. This health consciousness may have led individuals in both groups to be more aware of their weight than the average individual, and thus to actively work on weight maintenance with or without intervention.

A follow-up study to the POP pilot study examined the effect of this one-year educational intervention plus the additional effect of financial incentives through a lottery condition on weight gain in a sample of 1226 men and women (Jeffery & French, 1997). Participants were randomized either to a no-contact control condition, an education plus monthly newsletter/postcard condition (as with the original POP study design, this also included optional semiannual classes on nutrition and exercise), or an education plus lottery condition that included the same content as the education condition but added a lottery component as a financial incentive. Participants in the lottery condition were offered the chance to win $100 each month if their postcard was returned.

Unlike the results of the POP pilot study, there was no significant difference between groups in terms of weight change during the year of the intervention (Jeffery & French, 1997). Nevertheless, weight change trends were in the hypothesized direction

(mean ± SE weight change = 0.9 ± 0.4, 0.3 ± 0.5, and 0.1 ± 0.6 kg, respectively, in the control, education, and education + lottery conditions). The intervention additionally demonstrated impact on health behaviors; participants in the intervention groups significantly increased their self-monitoring of weight as compared to control participants. No other significant behavioral changes were found between groups.

A three-year follow-up of the second POP study (Jeffery & French, 1999) found no significant differences between the control and intervention groups in terms of weight change over the 3-year period (mean ± SE = 1.8 ± 0.3 kg in the control condition, 1.6 ± 0.5 kg in the education condition, and 1.5 ±0.5 kg in the education + lottery condition). The researchers did find, however, that participants in the intervention group were more likely to participate in “healthy weight control practices” (defined as reducing calories, increasing exercise, increasing fruit and vegetable intake, decreasing fat intake, watching portion sizes, and cutting out sweets and junk food) compared to participants in the control group.

Taken together, the results from these trials have demonstrated that education interventions alone may not be sufficient to prevent weight gain in adults. Apart from the original pilot, these studies did not yield significant differences in weight between groups over time. This may have been due, in part, to the slow, incremental change in body weight experienced by most individuals. In all but the original POP pilot, weight gain in the control group reflected national trends of 0.5 - 0.9 kg of weight gain per year (Garn et al., 1976; Lewis et al., 2000). This small change, while clinically significant in the long-term, can lead to small effect sizes in prevention programs and make observing statistically significant changes difficult (Hill, Wyatt, Reed, & Peters, 2003). To reach

sufficient power to detect a significant difference, studies must have an extremely large sample, or follow a group of subjects for a long time (e.g., over several years). As a result, attempts to study weight gain prevention in adults may require a new approach, instead focusing on times when individuals tend to gain a large amount of weight.

One successful example of this model was demonstrated in the Women's Healthy Lifestyle Project (WHLP; Simkin-Silverman, Wing, Boraz, & Kuller, 2003). As women tend to gain significant amounts of weight during menopause (Wing, Matthews, Kuller, Meilahn, & Plantinga, 1991), this population was chosen to help establish a successful model of weight gain prevention. Noting that previous low-intensity, educational interventions (e.g., the POP studies) were largely unsuccessful, the WHLP researchers proposed an intervention based on the intensive lifestyle programs used for weight management in obese populations. The researchers randomized 535 women aged 44 to 50 to either a lifestyle intervention group that received a 5-year lifestyle program or to an assessment-only control group. The lifestyle intervention consisted of 15 group meetings over 20 weeks followed by several 6-week "refresher" programs offered over the following 5 years. Initially, participants were encouraged to lose small amounts of body weight (2.3, 4.5, or 6.8 kg, for participants in "normal," "overweight," and "obese" BMI categories, respectively) to counteract the weight gain normally experienced during menopause. Thus, "prevention" in this study was conceptualized as losing weight to offset expected weight gains.

After 6 months, participants in the intervention group had lost an average of 4.8 kg, 95% CI -5.4, -4.3, which was significantly greater than the -0.22 kg, 95% CI -0.59, -0.15,of weight change experienced in the control group (Simkin-Silverman et al., 1995).

Normal weight women in the intervention group experienced a mean (± SD) weight change of -4.1 ± 3.1 kg, while overweight women in this group experienced a mean (± SD) weight change of -5.3 ± 4.9 kg and obese women experienced a mean (± SD) weight change of -7.4 ± 7.2 kg (Simkin-Silverman et al., 2003). Women in the intervention group reported significant increases in physical activity (mean ± SD = 383 ± 1086 kcal per day) and significant decreases in daily calories consumed (mean ± SD = 249 ± 480 kcal per day).

After five years, researchers found that the mean (± SD) weight change in the intervention group was -0.1 ± 5.2 kg while the mean weight change in the control group was 2.4 ± 4.9 kg (Simkin-Silverman et al., 2003). Further, 55% of participants in the intervention group were at or below their baseline weight compared to 26% of participants in the control group. This study demonstrated that promoting weight loss to buffer future weight gains may be a viable method of weight gain prevention. Exploratory analyses of intervention effects further demonstrated that long-term adherence to physical activity and a low-fat eating pattern was associated with improved weight maintenance.

Recently, Gokee LaRose, Tate, Gorin, and Wing (2010) conducted a pilot study that assessed the use of a 2.3 - 4.5 kg weight loss as a method to buffer future weight gain against a “small changes” approach designed to prevent incremental weight gain. For this study, researchers randomized 52 young adults aged 18-35 to either a “small changes” or “large changes” intervention group. Participants in the small changes group were asked to make daily changes in their caloric intake equal to approximately 200 calories and to increase steps by 2,000 steps per day. Participants in the large changes

group were asked to follow guidelines similar to those of traditional behavioral interventions; specifically, they were asked to keep daily food diaries, cut 500-1,000 calories from daily intake, and exercise at least 5 days per week (for a total of 250/minutes per week). Participants in both groups were asked to monitor their weight daily and compare this weight to their baseline weight to monitor program progress. Participants in the large changes group lost significantly more weight after 8 weeks (mean weight change ± SD = -3.2 ± 2.5 kg for those in the large changes group, compared to -0.68 ± 1.5 kg for participants in the small changes group, $p < .001$) and 16 weeks (-3.5 ± 3.1 kg in the large changes group compared to -1.5 ± 1.8 kg in the small changes group). One limitation to this study, however, was the lack of a control group including participants who were recruited but randomized to a contact control condition (e.g., a similar contact schedule but with sessions focused on unrelated health education sessions). Participants who were interested in taking part in this study may have had higher motivation and self-efficacy for weight management, which may have led them to be successful at weight gain prevention despite intervention. The effectiveness of this study for women who are interested in preventing weight gain but not given access to either of the two interventions is therefore unknown.

Given the aforementioned research, future studies of weight gain prevention should focus on times when individuals tend to gain large amounts of weight. Weight loss at this time could be used as a buffer for future weight gain, or skills learned at this time (such as those learned in the small changes approach) could be used to help individuals prevent incremental weight gain. Additionally, the effectiveness of weight loss as a buffer for future weight gain suggests that individuals should be taught not

only how to maintain weight, but further how to lose weight. Behavioral mastery of weight loss techniques can be demonstrated during the primary intervention through participants' initial weight losses.

Key Times for Weight Gain

Rates of weight gain are generally highest among young adults, stabilize around middle age, and then decrease in old age (Sheehan, DuBrava, DeChello, & Fang, 2003). For many individuals, young adulthood represents a pivotal time in development and behavior change. This age is associated with changes ranging from increases in independence and moving out of the parental home to shifting social groups and relationship statuses. These changes may have substantial impact on weight; epidemiological researchers have found an increase in obesity incidence during the transition from adolescence to adulthood (Gordon-Larsen, Adair, Nelson, & Popkin, 2004; Must, Gortmaker, & Dietz, 1994).

This increase in body weight is accompanied and likely affected by unhealthy behavioral changes. During this transition, many individuals demonstrate decreases in physical activity accompanied by significant increases in sedentary behaviors such as weekly television/video viewing and computer/video game use (Gordon-Larsen, Nelson, & Popkin, 2004). Researchers have also found an increased consumption of fast food and other detrimental eating behaviors, such as skipping breakfast, in this population (Niemeier, Raynor, Rogers, & Wing, 2006). Thus, this transitional period represents a time where researchers could intervene to mitigate increases in unhealthy behaviors.

College freshman constitute a subpopulation within this group that has been shown to be at particularly high risk for weight gain. The popular notion of the "freshman 15" alludes to what researchers are increasingly finding is a real and significant weight

gain experienced during the freshman year of college. While there is disagreement about how much weight freshman gain, the literature generally supports the existence of a 0.9 – 1.8 kg weight gain during the first semester of college (Anderson, Shapiro, & Lundgren, 2003; Hovell, Mewborn, Randle, & Fowler-Johnson, 1985; Levitsky, Halbmaier, & Mrdjenovic, 2004; Lloyd-Richardson, Bailey, Fava, & Wing, 2009). Studies looking at the phenomenon of freshman year weight gain, in addition to studies looking at the dietary and activity changes that occur in college students, are reviewed in the following sections.

Weight Gain During the Freshman Year of College

The transition to college presents unique changes in lifestyle behaviors for many young adults. Moving from the parental home to a college campus often represents an environmental upheaval; students change from family-cooked meals to all-you-can-eat cafeteria meals with friends, and may cease participation in sports after leaving their high school teams (Butler, Black, Blue, & Gretebeck, 2004). In line with these changes, weight gain during the freshman year of college has been well documented (Anderson et al., 2003; Butler et al., 2004; Hajhosseini et al., 2006; Hovell et al., 1985; Levitsky et al., 2004; Lloyd-Richardson et al., 2009). The existing literature examining freshman year weight gain is presented in Table 1-1. Of the ten studies, seven found significant weight gains during the first semester of freshman year of college (Anderson et al., 2003; Butler et al., 2004; Hajhosseini et al., 2006; Hovell et al., 1985; Levitsky et al., 2004; Lloyd-Richardson et al., 2009; Racette et al., 2005), two studies reported weight gains but did not perform statistical tests (Hoffman, Policastro, Quick, & Lee, 2006; Megel, 1994), and one did not find significant weight gain during the freshman year of college (Graham & Jones, 2002).

One major limitation of the current literature on freshman year weight gain is the high rate of attrition in these studies. Participant loss-to-follow-up ranged from 12% to 69%, and averaged 37% for the studies that reported attrition (Anderson et al., 2003; Butler et al., 2004; Graham et al., 2002; Hoffman et al., 2006; Hovell et al., 1985; Levitsky et al., 2004; Lloyd-Richardson et al., 2009; Megel, 1994). Two studies did not provide attrition information and only listed participants who had full data (Hajhosseini et al., 2006; Racette et al., 2005). Moreover, all but one of these studies used completers-only analysis (the study by Lloyd-Richardson et al. modeled missing data using a maximum-likelihood approach). Using only participants with full data assumes that participants who drop out are from the same population as those who do not drop out; however, previous research has demonstrated that participants who drop-out of research studies tend to have more adverse health outcomes (Molenberghs & Kenward, 2007). Since this assumption was likely not met in any of these studies, the statistical inferences may not be valid. The repetition of significant findings over several studies, however, provides evidence that there may be a true significant mean weight gain during the freshman year of college. Additionally, if those who drop out tend to have poorer health outcomes (and thus may have gained more weight) the true mean weight gain may be higher than what is currently reported in the literature.

Despite slight variations in mean weight gain by study and methodological challenges due to attrition, the aforementioned studies consistently document a tendency for freshman to gain weight during their first year of college. Consequently, researchers have investigated the eating and exercise habits of college students as a contributing factor to freshman year weight gain.

College students have been found to have suboptimal nutrition and activity habits, which are key areas where interventions could improve health-related behaviors. Over several studies, a large majority (over three-quarters) of undergraduate students reported eating less than 5 servings of fruit and vegetables per day (Anding, Suminski, and Boss, 2001; Huang et al., 2003; Lowry et al., 2000). On average, participants in these studies did not meet national physical activity recommendations and female students were significantly less likely to report regularly engaging in exercise than male students (Anding et al., 2001; Huang et al., 2003; Lowry et al., 2000). Investigating changes reported by freshman due to relocation to college, Butler and colleagues (2004) found that freshman reported a significant decrease in occupational and sports-related activity and a significant increase in percentage fat and alcohol consumed.

Two studies investigated the association between behavioral changes and freshman year weight gain. The first found an association between freshman year weight gain and the number of meals eaten at “all-you-can-eat” cafeterias, consumption of evening snacks, and consumption of “junk food” and high-fat foods (Levitsky et al., 2004). The second found that women who gained weight during the freshman year of college were more likely to consume alcohol, use maladaptive coping behaviors, consume caffeine, and eat foods in low fiber, and were less likely to eat vegetables and avoid high-cholesterol foods (Adams & Rini, 2007).

One potential contributor to poor eating and exercise behaviors may be inadequate health knowledge. In general, high school students and college freshman have been found to have poor nutritional knowledge (Matvienko, Lewis, & Schafer, 2001; Schwartz, 1975). For example, one study found that 25% of female high school

students could not explain the origin of dietary energy, and only 43% recognized that dietary fat is more energy-dense than either carbohydrate or protein (Searles, Terry, & Amos, 1986). Additionally, the ability to apply nutrition knowledge to influence body weight was poor in this sample, as only 22% of these students knew how many calories must be expended to lose one pound of fat.

Possibly as a result of this poor health knowledge, college students have been shown to use suboptimal methods to control their weight. In a representative national sample of college students, approximately half of those trying to lose weight reported using exercise, and one-third reported dieting (Lowry et al., 2000). Only 53.8% of females and 40.9% of males reported using both exercise and diet for weight control. Further, one in seven female students who were trying to lose weight reported using "extreme" methods such as diet pills, vomiting, or laxatives (Lowry et al., 2000). Using data from the Youth Risk Behavior Survey, Serdula et al. (1993) found that 49% adolescent females who were trying to lose weight reported regularly skipping meals. This method of weight control is unhealthy and particularly ineffective as skipping meals has been shown to be inversely related to body weight in young adults (Boutelle, Neumark-Sztainer, Story, & Resnick, 2002) and eating regular meals has been associated with successful prevention of weight regain after weight loss (Klem, Wing, McGuire, Seagle, & Hill, 1997).

A study by Levitsky et al. (2004) found that recent dieting was related to weight gain during the freshman year of college. While Levitsky interpreted this finding to mean that dieting is ineffective for weight management, the findings by Lowry et al. (2000) and Serdula et al. (1993) demonstrate that instead these students may be employing

particularly ineffective dieting techniques. Thus, a short-term intervention introducing effective weight management techniques may be especially beneficial in this population.

Overall, these studies have demonstrated that college students are prone to gaining significant amounts of weight during their first year at college. Moreover, research regarding health knowledge in college students has demonstrated a clear need for education programs in this population. This is a need that may not be met by current university offerings; Lowry et al. (2000) found that while nearly half of all undergraduate participants were trying to lose weight, only 1 in 3 reported getting information about either healthy diet or physical activity from their college or university. The following sections will focus on previous interventions focused on increasing health knowledge, promoting healthy nutrition and exercise behaviors, and/or preventing weight gain in college students.

Previous Interventions in College Students

Matvienko, Lewis, and Schafer (2001) conducted one of the first interventions focusing on the prevention of freshman-year weight gain. For this study, freshman college students were randomized to either a nutrition course designed to increase students' nutrition knowledge or to a control group consisting of general health education. Mean weight changes were not significantly different between the intervention and control group; however, weight change trends were observed in the hypothesized direction (-0.2 kg vs. 1.8 kg at 4 months for the intervention and control groups, respectively, and 0.0 kg vs. 3.2 kg at one year). The lack of statistical significance between groups may have been due to a lack of power, as this study had a small sample size (total N = 40, intervention group n = 21 and control group n = 19).

Despite not finding a significant difference between groups in terms of body weight, this study did find significant differences in daily caloric consumption by group, with participants in the intervention group experiencing a significant decrease in calories consumed compared to the control group (-326 kcal/day vs. 73 kcal/day from baseline to 4 months, respectively). When looking at intervention effects by BMI category, Matvienko et al. found that overweight individuals (defined as BMI ≥ 25 kg/m^2) in the intervention had a mean body weight change of -1.4 kg whereas those in the control group gained, on average, 9.2 kg. Thus, this intervention was beneficial to individuals at higher risk for weight gain.

Levitsky, Garay, Nausbaum, Neighbors, and DeValle (2006) demonstrated feasibility for weight-gain prevention through increasing participants' awareness of their body weight. Through two studies conducted during fall semesters, freshman college students were given body weight scales and asked to monitor their weight daily. Participants were further asked to submit this information to the researchers, who provided regression-line feedback based on the previous 7 days' weights (i.e., researchers visually demonstrated if weight was increasing, decreasing, or staying stable), and provided the daily caloric equivalent for these changes. Individuals in the control group gained significantly more weight than individuals in the intervention group for both studies (mean ± SD weight change = 3.1 ± 0.5 kg and 2.0 ± .7 kg for the control groups, compared to 0.1 ± 1.0 kg and -0.8 ± .6 kg for the intervention groups). Further, individuals in the intervention group did not experience significant weight change during the semester.

Other researchers have investigated the prevention of weight gain in young adults through seminar-based intervention programs. Hivert, Langlois, Berard, Cuerrier, and Carpentier (2007) designed a weight-gain prevention program for 115 first and second-year students in the Faculty of Medicine at a Canadian university. This program involved small group seminars that met biweekly for the first fall semester and then monthly for the next year and a half (excluding small breaks during the summer semester). In total, participants randomized to the seminar group attended twenty-three 45-minute sessions. The first set of sessions involved education on nutrition and physical activity and the remaining seminars focused on group discussion, problem-solving, goal-setting, and self-monitoring strategies. Participants in the intervention group had gained significantly less weight than participants in the control group at 12 months (-0.2 ± 0.4 kg vs. 1.2 ± 0.5 kg, respectively) and at 2 years (0.1 ± 0.6 kg vs. 0.6 ± 0.5 kg, respectively). While participants in the intervention group did not see any significant changes in major health indicators, participants in the control group experienced significant increases in total cholesterol, cholesterol/HDL cholesterol ratio, plasma triglycerides, and LDL cholesterol. No significant differences were found in caloric or macronutrient intake between the groups at 2 years (possibly due to low power following high attrition); however, participants in the intervention group significantly decreased their alcohol consumption as compared to participants in the control group. Further, participants in the control group experienced decreases in physical activity over the course of the intervention while the intervention group maintained their high level of baseline activity.

One difficulty noted in the study by Hivert et al. (2007) concerned the retention of participants. The intervention group experienced considerable difficulties with attendance; nearly half of participants in this study attended less than 60% of the sessions, and attendance at sessions was particularly low during the second year of the intervention. With two-years of sessions and follow-ups, this intervention may have been too burdensome for participants. Such a program's length and cost may also decrease its feasibility in a wider community or university setting.

Taken together, these studies demonstrate the difficulty showing significant effects in weight gain prevention studies. On a positive note, these studies demonstrate preliminary evidence that it is possible to improve the health behaviors of college students. The current study extended the literature in this area by using components of an established, effective weight management program to improve the eating and exercise behaviors of college students during the first semester of the freshman year.

Current Study

The current study assessed the effects of an innovative short-term lifestyle intervention on weight change in freshmen during their first semester at college. The intervention consisted of five 90-minute sessions, delivered over four weeks, which focused on increasing nutritional and physical activity knowledge while improving behavioral-management skills such as self-monitoring, goal-setting, and problem-solving skills (see plan of sessions in Appendix A). The study's specific aims and hypotheses were as follows:

Aim 1: To assess the effect of intervention on weight gain during participants' first semester of college.

Hypothesis 1: Participants in the intervention group would experience significantly less weight gain at post-test and follow-up compared to participants in the control group.

Aim 2: To assess the effect of the intervention on change in caloric intake and levels of physical activity.

Hypothesis 2a: Participants in the intervention group would have significantly greater reductions in calories at post-test and follow-up when compared to participants in the control group.

Hypothesis 2b: Participants in the intervention group would experience significantly greater increases in physical activity (measured in weekly MET minutes) at post-test and follow-up compared to participants in the control group.

Aim 3: To assess the impact of intervention amongst overweight and obese individuals.

Hypothesis 3: Participants who were overweight or obese (defined as BMI ≥ 25) in the treatment group would experience significantly less weight gain at post-test and follow-up compared to overweight or obese participants in the control group.

Exploratory aims: This study had several exploratory aims; (a), to assess the effect of intervention on a measure of eating disorder attitudes, (b) to investigate the impact of intervention on eating habits and weight self-efficacy; and (c) to investigate change in problem-solving skills and nutritional knowledge.

Table 1-1. Summary of studies examining freshman year weight gain

Authors	Follow-up time	Population	Attrition	Weight Change	Significance
Hovell et al. (1985)	12 months	164 freshman women	25%	University women gained a mean of .33 kg/month, community match controls gained a mean of .01 kg/month	< .001*
Megel et al. (1994)	7 months	105 freshman women	51%	Mean weight change = 1.4 kg	n.a.
Graham & Jones (2002)	7 months	81 freshman men and women	40%	Mean weight change = 0.7 kg	*ns*
Anderson et al. (2003)	3 months	192 freshman men and women	30%	Mean weight gain of 1.3 kg	< .01
Butler et al. (2004)	5 months	82 freshman women	34%	Mean weight gain of 0.7 kg	.014
Levitsky et al. (2004)	12 weeks	68 freshman men and women	12%	Mean ± SD weight gain of 1.9 ± 2.4 kg	< .01
Racette et al. (2005)	3.5 years	204 freshman men and women	n.a.	Mean ± SD weight gain of 2.5 ± 5.3 kg	< .001
Hajhosseini et al. (2006)	4 months	27 freshman men and women	n.a.	Mean ± SE weight gain of 1.4 ± 0.3 kg	.001
Hoffman et al. (2006)	7 months	217 freshman men and women	69%	Mean ± SD weight change of 1.3 ± 4.0 kg	n.a.
Lloyd-Richardson et al. (2009)	8 months	912 freshman men and women	59%	Mean weight gain = 3.5 kg, 95% CI 2.8 – 4.6 kg	< .001

** Note: all significance tests were within-group with the exception of Hovell et al., which was between-groups*

CHAPTER 2
METHODS

Participants

Participants in the current study were 95 first-year female undergraduate students recruited from the University of the Florida. An original sample size of 90 was selected to provide a power of .80 (at an alpha level of .05) for detecting a 1.5 ± 2.5 kg mean difference in weight change between the intervention and control groups at follow-up. As several different studies investigating freshman year weight gain have found varying levels of weight gain (likely depending partly on varied demographic composition of samples), several scenarios were used in this power analysis. Ranging from a “worst case” to “best case” scenario, potential means and standard deviations were entered into SAS, which estimated the total number of participants necessary to achieve a power level of .80 at alpha level of .05. For the “worst case” scenario, data from Butler and colleagues (2004) and Graham and Jones (2002) studies were used; to find a significant difference between .7 kg ± 1.5 kg, the current study would need a total N of 148. The “best case” scenario was estimated using data from Levitsky et al. (2004). Based on a mean ± SD weight gain of 1.9 ± 2.4 for women during the first 12 weeks of freshman year, the required N would be 54. To assess mean differences that range between these “best case” and “worst case” scenarios, SAS was used to compute a power analysis (again at power = .80 and alpha = .05) for means of 1.5 and SD of 1.5, 2.0, and 2.5. This analysis resulted in estimated Ns of 34, 58, and 90, respectively. As standard deviations in the previous literature were generally twice the mean weight change, the estimate for the weight change (± SD) of 1.5 ± 2.5 kg was chosen, for a total sample size of 90 participants.

The current study was limited to female students following previous research demonstrating that behavioral interventions involving physical activity have differential effects on men and women (Calfas et al., 2000; Donnelly, et al., 2003). Exclusionary criteria for the current study included BMIs of less than 22 (to avoid participant weight loss to a BMI of below normal range), the presence of an eating disorder or significantly disordered eating patterns, medical conditions that affect weight, current medications that affect weight, serious infectious diseases, or pregnancy (or stated intent to become pregnant during the following year). Individuals who were unwilling to give informed consent or were unwilling to accept randomization into the treatment groups were further excluded from the current study. Finally, only participants who completed baseline assessment measures (including questionnaires and 3 24-hour recalls) were eligible to be randomized for the study.

Recruitment

To achieve the proposed sample size of 90, initial recruitment goals were 130 female undergraduate students (assuming a 15% drop-out/withdrawal rate between recruitment and group start and a 15% attrition rate between group start and the end of the fall semester). Participants were recruited from the University of Florida campus, primarily through flyers placed around campus and in student mailboxes, in-person recruitment on campus, in-person presentations given at start-of-the-year university events and classes, and an ad in The Independent Florida Alligator, a student newspaper distributed on campus.

Prospective participants were instructed to call a local telephone number to get more information about the study and, if interested, to be screened for basic eligibility criteria (e.g., freshman status, BMI, and history of medical disorders/medications that

may affect weight). After this telephone screening, individuals interested in participation were asked to meet for an assessment visit. At this visit, potential participants were asked to read and sign a consent form, after which the project director or a trained research assistant measured and recorded their height and weight. Participants were then asked to fill out questionnaires with information about their demographics, eating habits and dietary patterns (including disordered eating patterns), physical activity, and general health. At the end of this screening visit, participants were given log-in information and a schedule to fill out 3 online dietary recalls (two on a week day and one on a weekend day). Participants were informed that study participation was contingent on the completion of these recalls and questionnaires. All of the above measures were repeated at immediate post-test (October) and the end of the semester (December).

Intervention

The current intervention consisted of a five-session weight gain prevention program, delivered over four weeks, and focused on decreasing caloric intake and increasing physical activity, implementing self-monitoring of weight, and improving self-regulatory skills (see Appendix A for session outlines). Intervention groups of 8-10 participants were led by doctoral-level graduate students in clinical psychology, and co-led by either graduate students in clinical psychology or trained undergraduate research assistants. Initially, participants were taught self-regulatory skills that could be used to lose weight, including goal setting and self-monitoring, and asked to decrease caloric intake to 1,200 kcal/day. Participants were encouraged to meet weight loss goals (i.e., 1.4 – 2.3 kg over the course of the four week intervention) to demonstrate mastery of these weight-regulation skills and to provide a “buffer” to potential later weight gain. To

assess success in changing caloric intake, participants were asked to keep daily food records. Traditional paper or log-based food records would have required individuals to carefully measure foods (e.g., using measuring spoons and cups) and look up caloric values in reference books. This method of self-monitoring may have been too burdensome for participants who were juggling class schedules, jobs, recreational activities, and social commitments. Thus, the current intervention focused on the use of online food records, through FitDay.com or through another recording software of participants' choice (e.g., some participants kept records on their smartphone using an application such as Lose It or Daily Burn). Participants were required to use a recording service that allowed them to see the calories in food as they were adding them to the record and additionally that allowed for food records to be printed and brought to group (for group activities, interventionist monitoring, and data collection to assess program adherence).

After mastering skills to lose weight, participants were taught the Stoplight Diet as a method to increase nutritional quality and lower their dietary fat intake. The Stoplight Diet focused on improving the quality of food consumed by increasing fruits, and vegetables and lean protein ("green" foods), and decreasing high-fat, low-nutrient, high-sodium foods ("red" foods). Participants were encouraged to track their total number and servings of "green," "yellow," and "red" foods from the Stoplight Diet in addition to their daily food logs for the remainder of the program. Introducing the Stoplight Diet was envisioned as a method to reduce participant burden from food records following the end of intervention. In the long-term, daily food records that included the calories of all foods and drinks consumed may have been too burdensome for participants.

Specifically, the cost (significant amounts of time) might have outweighed the perceived benefits, as many participants in this intervention would likely not be trying to lose significant amounts of weight. The Stoplight Diet was thus used as a method to help participants maintain favorable changes in dietary intake long-term without the use of daily food records.

In terms of physical activity, participants were encouraged to increase their daily activity levels to at least 30 minutes/day of moderate-intensity physical activity. For participants who are already at this level or who reached this level during the intervention, this goal was raised to one hour per day of moderate-intensity physical activity. This goal was based on work by Jakicic and Otto (2005) who found that an hour of physical activity per day was associated with long-term weight maintenance in women.

After the end of the five-session, four-week intervention, participants were encouraged to continue to weigh themselves daily and to complete self-monitoring records. Further, participants were given a goal sheet explaining success at long-term maintenance, and created action plans for when weight deviated from of a "maintenance" weight range (e.g., participants created two sets of planned behavioral changes for weight gains > 0.9 kg and > 2.3 kg above weight at week four, respectively). Participants were also encouraged to call or email their group leader if experiencing any difficulties with their weight management.

Participants randomized to the control group were contacted for assessments at post-test and follow-up but received no further contact during the fall semester. These

wait-list control participants then received the five-session, four week intervention during the first month of the spring semester.

Measures

In addition to height and weight measured by project staff, participants were asked to complete several questionnaires either on paper or through SurveyMonkey.com (an online questionnaire tool). As an eligibility requirement, participants were required to complete three online 24-hour recalls (Subar et al., 2007) on two non-consecutive week days and one weekend day. The measures used in this study are listed below (see Appendix B for the full forms). The forms in Appendix B reflect the content but not format of the final forms, as they were available electronically for participants using SurveyMonkey.com during the second wave of the study. All measures (excluding height) were given at baseline (August/September), immediate post-test (October), and follow-up (December); height was measured only at baseline.

Height and Weight

Height was measured to the nearest .01 cm using a digital stadiometer and standardized protocol. Body weight was measured to the nearest 0.1kg using a calibrated digital scale. Participants were weighed in light indoor clothing and without shoes. To assure stability of weight measurements, visits were scheduled early in the morning, and participants were instructed to fast for 10 hours before their visit (starting the night before), avoiding both food and liquid (including water) consumption. Height and weight were used to calculate body mass index.

Caloric Intake

Caloric intake was assessed using the online Automated Self-Administered Dietary Recall (Subar et al., 2007). The ASA-24 used the USDA's multi-pass recall

system, and was fully self-administered through the National Cancer Institute's website. During completion of the ASA-24, participants chose the foods and drinks they consumed from the USDA Food and Nutrient Database, selected portion sizes from Baylor College of Medicine's Food Intake Recording Software, and were led through a "food pathway" which probes individuals for any missing condiments on foods, portions, and snacks eaten between meals (Zimmerman et al., 2009). At each assessment point, participants were asked to complete three 24-hour recalls: two reflecting consumption on weekdays and one reflecting consumption on weekend days.

Physical Activity

The International Physical Activity Questionnaire (IPAQ; Booth, 2000) was used to assess baseline physical activity and changes in activity over time. While several versions of this questionnaire exist, the self-administered long-form was used in the current study. This form had advantages over the short-form in a college student population, as it specifically included time spent biking and walking for transportation each day, items which may be particularly pertinent to freshman who live on campus and use biking and walking as primary modes of transportation. The self-administered long-form IPAQ has been found to have good test-retest reliability (Spearman's rho = .81 across 12 countries; Craig et al., 2003) and has been validated against activity monitor data (Spearman's rho = .55 for all activity) and self-report physical activity log books (Spearman's rho = .67; Hagströmer, Oja, & Sjöström, 2007). Overall, the IPAQ (and other self-report measures of physical activity) has been shown to be more valid for vigorous-intensity physical activity than for moderate-intensity, as the latter tends to accumulate throughout the day and not in planned sessions (Hagströmer et al., 2007).

Eating Disorder Attitudes

Disordered eating patterns and eating disorder symptomatology were measured using the Eating Attitudes Test (EAT; Garner & Garfinkel, 1979; Garner, Olmsted, Bohr, & Garfinkel, 1982). As the short form EAT-26 has been shown to be highly predictive of the long-form EAT-40, r = .98 (Garner et al., 1982), the short form was used to reduce participant burden. Researchers have established a cut-off score of 20, which has been found to have a true positive rate of 84.9% for individuals clinically diagnosed with anorexia nervosa (Garner et al., 1982); this cut-off was used to screen out potential participants who demonstrated disordered eating behaviors at baseline. Despite previous studies that have demonstrated that weight gain prevention interventions were not associated with increases in eating disorder symptomatology (Jeffery & French, 1999; Klem, Wing, Simkin-Silverman, & Kuller, 1997).), there was a fear that some intervention components (e.g., the 1,200 kcal/day intake goal) might lead to increased disordered eating. Thus, we included a measure of eating disorder attitudes to use both as a screening measure and to monitor changes in disordered eating over the course of the intervention.

Eating Habits

The Three Factor Eating Questionnaire (TFEQ) was used to assess eating habits (Stunkard & Messick, 1985). The TFEQ was a 51-item scale that assesses participants' dietary restraint, disinhibition, and hunger ratings. The reliability and validity of the TFEQ has been widely documented (Gorman & Allison, 1995). Researchers found that the TFEQ has high test-retest reliability in a college student sample, ranging from .80 to .93, and good criterion validity to assess binge eating (Stunkard & Messick, 1985).

Problem-Solving Skills

Problem solving skills were assessed using the Social Problem Solving Inventory—Revised (SPSI-R; D'Zurilla, Nezu, & Maydeu-Olivares, 2002). The SPSI-R was a 52 item, self-report measure that assessed participants' positive and negative problem orientation, skills at rational problem solving, impulsivity/carelessness style, and avoidance style. The internal consistency of the SPSI-R has been shown to range from of .76 to .92 and researchers have demonstrated sound test-retest reliability (ranging from .72 to .88; D'Zurilla, Nezu, & Maydeu-Olivares, 2002). Further, researchers have found that the SPSI-R is able to detect changes in skills due to clinical training in problem solving (Nezu, Nezu, Friedman, Faddis, & Houts, 1998).

Weight Self-Efficacy

Participants' self-efficacy for weight management was assessed using the Weight Efficacy Lifestyle Questionnaire (WEL; Clark, Abrams, Niaura, Eaton, & Rossi, 1991). This 20-question measure assessed weight self-efficacy across five domains: availability, negative emotions, physical discomfort, positive, activities, and social pressure. This measure was found to have a stable five-factor structure, acceptable internal consistency, and a test-retest reliability of .92 (Clark et al., 1991; Fontaine & Cheskin, 1997).

Nutrition Knowledge

Nutrition knowledge was assessed using the Nutrition Knowledge Questionnaire (Parmenter & Wardle, 1999). The Nutrition Knowledge Questionnaire was a 50-item questionnaire that covered (a) knowledge of recommendations for increasing and decreasing intake of different food groups, (b) nutrient knowledge, (c) food choice, and (d) beliefs about which foods are associated with particular diseases. Only the first two

sections (covering knowledge of recommendations and nutrient knowledge) were used for the current study. This measure has been found to be reliable and have acceptable internal consistency (Cronbach's alpha = 0.70 – 0.97; Parmenter & Wardle, 1999). Further, nutrition students were found to have significantly higher scores than students in other disciplines, demonstrating good construct validity (Parmenter & Wardle, 1999). As this questionnaire was created in the United Kingdom, colloquial vernacular (e.g., "chips" and "digestive biscuits") were replaced with the phrases that were more easily recognized by U.S. college students (e.g., "fries" and "cookies").

Adherence

Adherence to intervention strategies was assessed using weekly records of caloric intake, physical activity, and body weight. The number of total days of completed food records (defined as days with at least two meals recorded) was counted for each participant. Adherence to the intervention was assessed for the intervention group in terms of attendance at group meetings, which was recorded at each meeting by the group leader or co-leader.

Statistical Analysis

Baseline differences between treatment groups were assessed using t-tests. Any baseline differences were controlled by entering these variables into the following analyses as covariates.

Results of this study were assessed using an intent-to-treat approach, thus data from all participants randomized to either the intervention or control groups were used in the final model. For the primary outcome, missing data at post-test and follow-up were multiply imputed (Rubin, 1976) by SAS proc MI. Missing data in this study could not be assumed to be missing at random (MAR), an assumption of the multiple imputation

process; however, simulation studies have demonstrated that even under not-missing-at-random (NMAR) conditions, multiple imputation produces less biased estimates than other commonly-used-procedures such as mean-imputation, last-observation-carried-forward, or hot-deck imputation (Schafer & Graham, 2002; Tang, Song, Belin, & Unützer, 2005). Missing data from both the treatment and control group were estimated from the distribution of control group data, assuming that participants who did not return from the treatment group had similar outcomes to those in the control group. For secondary outcomes, missing data were handled under a MAR approach, using SAS PROC MIXED. All analyses were completed in SAS version 9.2 for Windows XP Professional (SAS Institute, 2008).

Primary Aim

The primary aim was analyzed using a repeated measures ANOVA (using SAS PROC MIXED) to examine change in weight from baseline to post-test and follow-up by treatment group. We hypothesized that there would be a significant interaction between treatment group and time. Planned contrasts were used to assess differences between groups in body weight at post-test and follow-up. Change in weight from baseline to post-test, from post-test to follow-up, and from baseline to follow-up were assessed by group.

Secondary Aim

In order to assess the impact of the intervention on behavioral changes, two repeated measures ANOVAs (using SAS PROC MIXED) were used to assess change in caloric intake and physical activity by treatment group. The main effects for time and treatment were evaluated, as well as the interaction effects of treatment group and time for each outcome.

Tertiary Aim

To assess treatment effect within participants who were overweight or obese at baseline, these participants (with BMI ≥ 25 at baseline) were separately analyzed with an identical model to that used for the primary aim.

Exploratory Analyses

To assess clinical significance in weight gain between groups, a chi square was used to assess whether significantly more participants in the treatment group attained a -1.5 kg weight loss from baseline to post-test compared to the control group. Similarly, two chi square analyses were used to assess 1) whether participants in the treatment group were significantly more likely to decrease caloric intake by 200 kcal/day compared to the control group, and 2) whether participants in the treatment group were significantly more likely to increase or maintain baseline levels of physical activity compared to participants in the control group. To assess the effect of intervention on disordered eating behaviors, changes in EAT score by group were assessed at post-test and follow-up using a similar repeated measures ANOVA to the secondary aim analyses. Changes by treatment group in weight loss self-efficacy (using the Weight Loss Efficacy questionnaire) and eating habits (as measured by the Three Factor Eating Questionnaire) were similarly assessed with repeated measures ANOVAs. Finally, as a manipulation check, change in nutritional knowledge and problem solving skills from baseline to post-test were assessed using similar models.

CHAPTER 3
RESULTS

Participants

Three hundred and sixty-four participants completed initial phone screens for the current study. Out of these participants, 168 attended an in-person assessment visit and signed an informed consent form (Figure 3-1 shows participant flow through assessment and randomization). These participants were recruited over two waves, in August/September 2010 and August/September 2011. After completion of baseline measures, 95 participants were randomized into the treatment (n = 47) or control (n = 48) groups. See Figure 3-1 for a CONSORT diagram detailing participant randomization and follow-up.

At baseline, the mean (± SD) age of participants was 18.53 ± .35, the mean weight was 69.41 ± 12.57 kg, and mean BMI was 26.80 ± 6.45 kg/m^2. Using WHO categories (World Health Organization, 1995), 40 (42.1%) of participants were normal weight, 44 (46.3%) were overweight, and 11 (11.6%) were obese. In terms of race/ethnicity, 23 (24.2%) participants self-identified as African-American, 41 (43.2%) as Caucasian, 21 (22.1%) as Hispanic, 5 (5.3%) as Asian, and 5 (5.3%) reported multiple race/ethnicity categories. There were no differences at baseline between groups for weight, p = .691, age, p = .430, race/ethnicity, p = .618, physical activity, p = .203, or caloric intake, p = .448.

At baseline, 61.1% of participants reported eating in on-campus, all-you-can-eat style dining halls less than 3 times per week, 9.5% reported 3-5 times per week, 9.5% reported 6-10 times per week, and 20.0% reported 11+ times per week (overall mean ± SD dining hall meals consumed per week was 4.59 ± 6.65). Participants reported eating

in their dorm rooms 9.02 ± 6.66 meals per week, with 20% reporting less than 3 meals eaten in dorm rooms per week, 16.8% reporting 3-5 meals per week, 27.4% reporting 6-10 times per week, and 35.8% reporting 11+ meals per week. Finally, participants reported eating 3.85 ± 3.50 meals per week at fast food establishments; 41.1% reported eating meals at fast food establishments less than 3 times per week, 37.9% reported 3-5 meals per week, 15.8% reported 6-10 meals per week, and 5.3% reported 11+ meals per week.

Participation and Adherence

Participants randomized to the treatment group attended a mean ± SD of 3.77 ± 1.73 sessions (75.32 ± 34.69 percent of sessions). Of the 47 participants randomized to this group, 42 attended at least one treatment session. For these 42 participants, mean ± SD attendance was 4.19 ± 1.17 (out of 5 potential sessions, equaling an average percent of 84.29 ± 24.01 sessions attended), and these participants completed an average of 14.57 ± 10.86 food records (range: 0 - 28).

Primary Aim

A mixed model with an autoregressive correlation structure provided the best fit for the weight change data. There were no significant main effects for treatment group or time on change in weight, *ps* = .364 and .535, respectively. The hypothesized interaction between treatment group and time was further not significant, $p = .393$. See Table 3-1 for means and standard error estimates for treatment and control group participants at baseline, post-test, and follow-up.

Although there was not a significant interaction, we explored group differences at each time, and change over time by group, as an exploratory analysis to better understand trends in the data and to make suggestions for future studies. There were

no significant differences in weight by treatment group at either post-test or follow-up, *ps* = .155 and .443, respectively. From baseline to post-test, participants in the treatment group experienced a non-significant mean (± SE) change of -2.07 ± 2.52 kg, *p* = .412. From post-test to follow-up, participants in the treatment group further experienced a non-significant mean change of 1.05 ± 2.42, *p* = .668, for a total non-significant change from baseline to follow-up of -1.02 ± 2.61, *p* = .697. Participants in the control group experienced a non-significant change of 0.47 ± 2.50, *p* = .849, from baseline to post-test, and -0.61 ± 2.40, *p* = .803, from post-test to follow-up, for a total of -0.14 ± 2.48, *p* = .952 from baseline to follow-up. Figure 3-2 demonstrates change in weight by group over the course of the intervention and follow-up period. A sensitivity-analysis was run using only the 42 participants in the treatment group who attended at least one treatment session; however, the pattern of results from this analysis was identical to the pattern demonstrated in the above analysis including all 47 treatment group participants.

Secondary Aims

For the secondary aims, two mixed models were run to assess the effect of treatment on differences in a) caloric intake and b) physical activity at post-test and follow-up.

Caloric Intake

A mixed model with an autoregressive covariance structure provided the best fit for caloric activity data. There were no significant main effects for time or treatment group, *ps* = .625 and .636, respectively. Further, the hypothesized time by treatment interaction was not significant, *p* = .763. As an exploratory measure, we investigated group differences in caloric intake by time and changes in caloric intake over time by

group. There was not a significant difference between participants in the treatment group and the control group in terms of caloric intake at post-test, mean ± SE difference in change = -89.05 ± 43.58 kcal, p = .111, or at follow-up, mean ± SE difference in change = 2.89 ± 75.50, p = .971. See Figure 3-3 for changes over time by group in caloric intake, and Table 3-1 for mean and standard error estimates by group and time point.

Physical Activity

A mixed model with an autoregressive covariance structure provided the best fit to the physical activity data (as measured by the IPAQ). Due to positive skew, the outcome for total physical activity (measured by weekly METs) was transformed using the square root transformation.

There was not a significant main effect for treatment group, p = .733, and the hypothesized interaction for treatment group and time was further not significant, p = .259. There was a significant main effect for time, however, such that participants experienced a general decrease in physical activity over time, $F(2,253) = -3.38$, p = .036. See Table 3-1 for means and standard error estimates for treatment and control group participants at baseline, post-test, and follow-up.

Despite not finding the hypothesized interaction, we examined change in physical activity between groups and over time by group on an exploratory basis to help further understand the data. There were no significant differences between the treatment group and control group at post-test or follow-up, *ps* = .917 and .456, respectively (see Figure 3-4). Participants in the treatment group did not experience significant changes in physical activity from baseline to follow-up, mean ± SE change = -19.29 ± 39.45 MET minutes/week, p = .485. Participants in the control group, however, experienced a

significant decrease in physical activity from baseline to follow-up, mean ± SE change = -334.21 ± 37.02, *p* = .003.

Since the focus of physical activity for the current intervention was increasing minutes spent in moderate-intensity activity, particularly focused on walking, an additional mixed model using weekly METs from walking was run on an exploratory basis. Again, the variable for weekly METs from walking was transformed using a square-root transformation due to positive skew. For weekly METs from walking, a similar pattern emerged such that participants in the treatment group did not experience a significant change in weekly MET minutes from walking from baseline to follow-up, mean ± SE change = -13.38 ± 19.45, *p* = .408, while participants in the control group again experienced a significant decrease during this time, mean ± SE = -190.97 ± 18.24, *p* = .001.

Although the changes from baseline to post-test were not significant for either group for total METs or walking METs, Figure 3-4 demonstrates that the trend was for participants in the intervention group to maintain their baseline levels of total activity though post-test, and then experience a slight decrease from post-test to follow-up. Participants in the control group meanwhile experienced a seemingly linear decrease from baseline to follow-up.

Tertiary Aim

For the tertiary aim, we investigated the treatment by time interaction within participants who were overweight or obese at baseline (baseline BMI ≥ 25). There were no significant main effects for treatment group or time, *ps* = .873 and .227, and the treatment by time interaction was further not significant, *p* = .400. As demonstrated in Figure 3-5, participants in the intervention group experienced a non-significant mean ±

SE change of -4.22 ± 2.53 kg from baseline to post-test, and a non-significant change of 0.17 ± 2.75 kg from post-test to follow-up, leading to an overall non-significant change of -4.05 ± 3.16 kg from baseline to follow-up. Participants in the control group, meanwhile, experienced a non-significant change of 0.29 ± 1.92 kg from baseline to post-test, -0.37 ± 1.75 kg from post-test to follow-up, and overall experienced a non-significant change of -0.08 ± 1.94 kg from baseline to follow-up.

Exploratory Aims

Clinically Significant Weight Change

Participants were dichotomized by weight change, such that proportion of participants who achieved ≥ 1.5 kg weight loss from baseline to post-test could be compared by treatment group. There was no significant differences between the treatment and control group in this proportion, $p = .844$.

Clinically Significant Decrease in Calories

Participants were dichotomized by change in caloric intake, such that the proportion of participants who decreased their calories by ≥ 200 kcal/day could be compared by group. Significantly more participants in the treatment group (47.0%) decreased their daily calories by at least 200 kcal compared to the control group (31.7%), $z = 1.96$, $p = .050$.

Increased or Maintained Levels of Physical Activity

Participants were dichotomized by change in physical activity from baseline to post-test, such that the proportion of participants who increased or maintained their physical activity could be compared by treatment group. There was no significant difference between the proportion of participants in the treatment (46.8%) and control

group (39.6%) who increased or maintained their physical activity from baseline to post-test, $p = .477$.

Disordered Eating

An additional exploratory aim included assessing change in disordered eating (using the EAT total score) over time, by treatment group. Due to positive skew, the total EAT score was transformed by logarithmic transformation prior to analysis. A mixed model with an autoregressive covariance structure found no main effects for treatment group or time, *ps* = .432 and .414, respectively, or for the treatment group by time interaction, $p = .320$, suggesting that there were no significant differences in disordered eating over time by treatment groups. Mean change and standard error estimates for EAT scores over time are available in Table 3-2.

Eating Habits

Next, using data from the Three Factor Eating Questionnaire, we found no main effects for treatment group or time on restraint, *ps* = .268 and .334, respectively. Further, the group by time interaction was not significant, $p = .318$.

In terms of disinhibition, there were no significant main effects for treatment group or time, *ps* = .080 and .346, respectively, and there was not a significant treatment group by time interaction, $p = .194$. In terms of hunger, there were no significant main effects for treatment group or time, *ps* = .616 and .586, and the interaction between treatment group and time was not significant, $p = .983$.

Post-hoc exploratory analyses demonstrated that participants in the treatment group reported significantly lower disinhibition at post-test compared to the control group, $t(242) = 2.02$, $p = .044$; likely resulting from a non-significant trend for individuals in the treatment group to experience decreases in disinhibition from baseline to post-

test, $t(242) = 1.78$, $p = .076$. Further, there was a non-significant trend for participants in the treatment group to experience decreases in disinhibition from baseline to follow-up, $t(242) = 1.86$, $p = .065$. There were no significant changes from baseline to post-test or baseline to follow-up in disinhibition for participants in the control group, *ps* = .500 and .424, respectively.

Problem-Solving Skills

While there was a significant group effect for total problem solving skills by treatment group (using total SPSI standardized scores), $F(1,178) = 7.65$, $p = .006$, such that participants in the control group had significantly lower problem solving scores than those in the intervention group, there was not a significant main effect for time, $p = .458$, and the hypothesized group by time interaction was not significant, $p = .833$.

Weight Loss Self-Efficacy

There was a trend for weight loss self-efficacy, measured by scores on the WEL, to improve over time across all participants, $F(2,160) = 2.82$, $p = .063$; however, there was not a significant main effect for treatment group, $p = .135$, and the interaction between treatment group and time was not significant, $p = .474$. Mean scores (± SE) for total weight loss efficacy by treatment group at each time point are available in Table 3-2.

Nutrition Knowledge

Finally, we investigated change in nutrition knowledge (as measured by the Nutrition Knowledge Questionnaire) by treatment group over the course of the intervention and follow-up. There were no significant main effects for time or group, *ps* = .642 and .934, respectively, and the group by time interaction was not significant, $p = .921$.

Table 3-1. Mean ± SE* for weight, BMI, caloric intake, and physical activity at baseline, post-test, and follow-up, by treatment group.

	Treatment		Control	
Outcome	M	SE	M	SE
Weight (kg)				
Baseline	68.89	1.84	69.92	1.82
Post-test	66.81	1.70	70.39	1.72
Follow-up	67.86	1.85	69.78	1.68
BMI (kg/m^2)				
Baseline	26.93	0.95	26.67	0.94
Post-test	26.20	0.95	26.86	0.94
Follow-up	26.66	1.01	26.65	0.96
Caloric Intake (kcal)				
Baseline	1558.51	74.22	1587.24	63.87
Post-test	1473.54	70.46	1562.59	66.81
Follow-up	1537.62	83.67	1534.73	81.33
Physical Activity (MET minute/week)				
Baseline	4100.71	17.58	5348.17	17.47
Post-test	4146.96	19.02	4064.60	19.02
Follow-up	3557.55	21.61	3008.52	19.55

** SE used as standard deviations for each mean were not available*

Table 3-2. Mean ± SE at baseline, post-test and follow-up for exploratory outcomes.

	Treatment		Control	
	M	SE	M	SE
Disordered Eating				
Baseline	2.34	0.10	2.53	0.09
Post-test	2.38	0.10	2.39	0.10
Follow-up	2.41	0.10	2.49	0.10
Problem Solving				
Baseline	114.07	2.07	109.65	2.10
Post-test	113.38	2.90	105.89	3.05
Follow-up	111.78	2.35	106.74	2.39
Weight Loss Efficacy				
Baseline	132.21	4.16	127.52	4.12
Post-test	131.61	4.4	120.32	4.30
Follow-up	136.28	4.58	132.07	4.37
Restraint				
Baseline	11.39	0.65	11.70	0.64
Post-test	12.89	0.73	11.15	0.69
Follow-up	11.18	0.76	10.72	0.70
Disinhibition				
Baseline	6.98	0.50	6.71	0.49
Post-test	5.67	0.54	7.20[a]	0.53
Follow-up	5.57	0.57	6.59	0.54
Hunger				
Baseline	5.79	0.51	6.11	0.51
Post-test	5.83	0.54	6.05	0.54
Follow-up	5.39	0.82	5.51	0.54

[a] $p < .05$ between groups

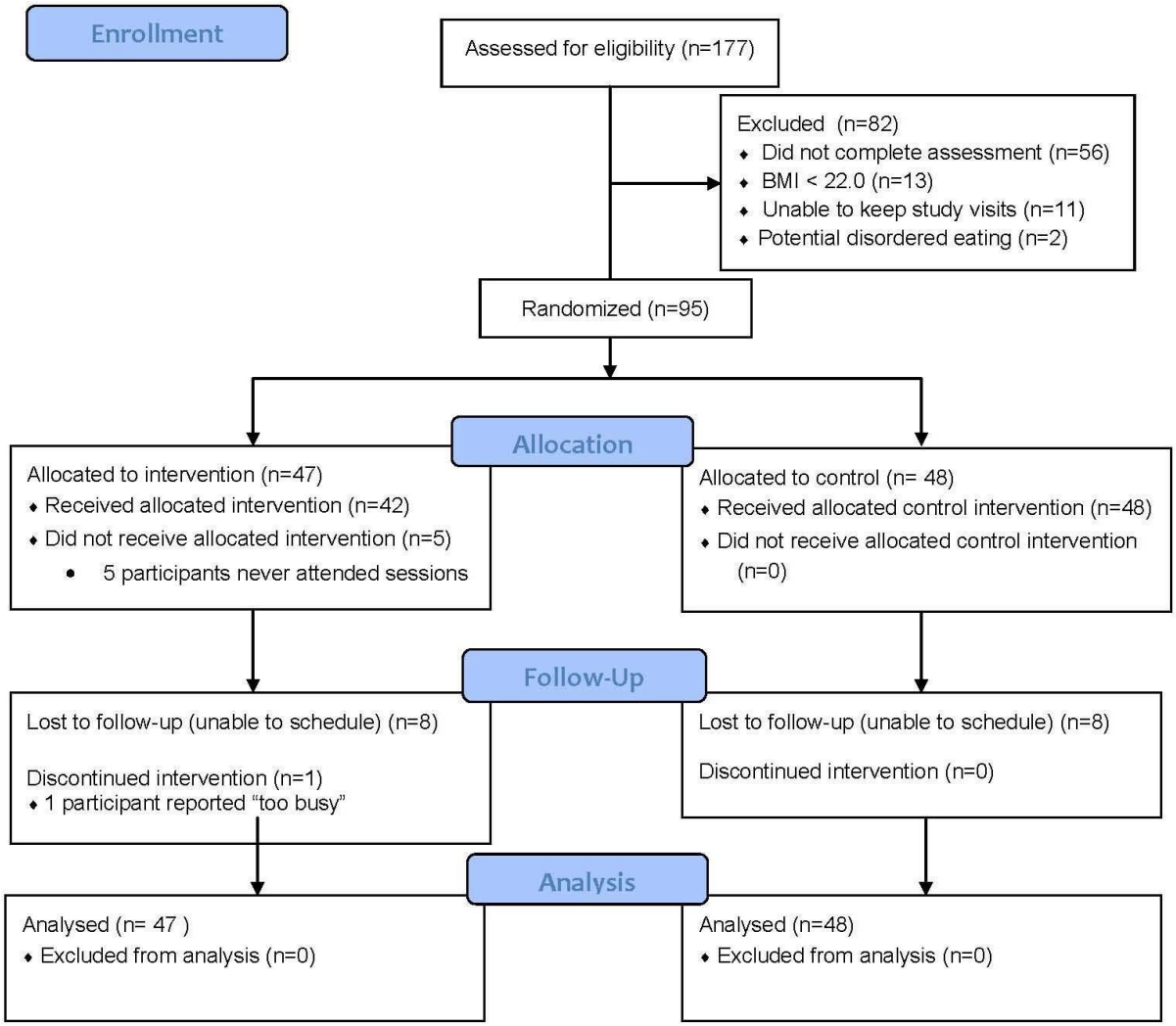

Figure 3-1. CONSORT flow diagram.

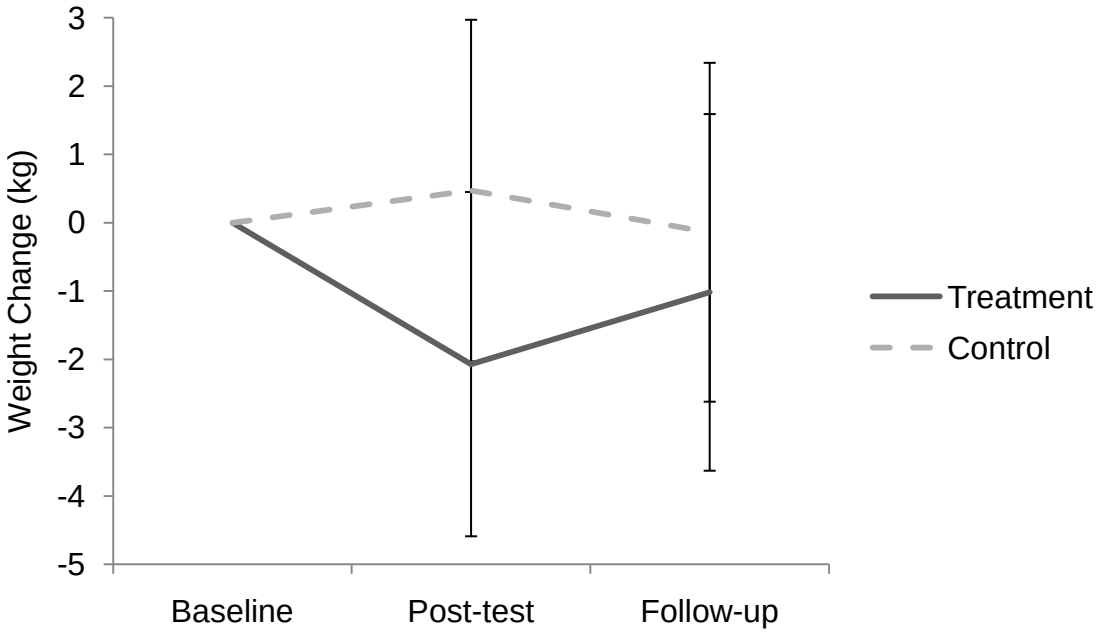

Figure 3-2. Mean ± SE change in weight by treatment group from baseline to post-test and follow-up.

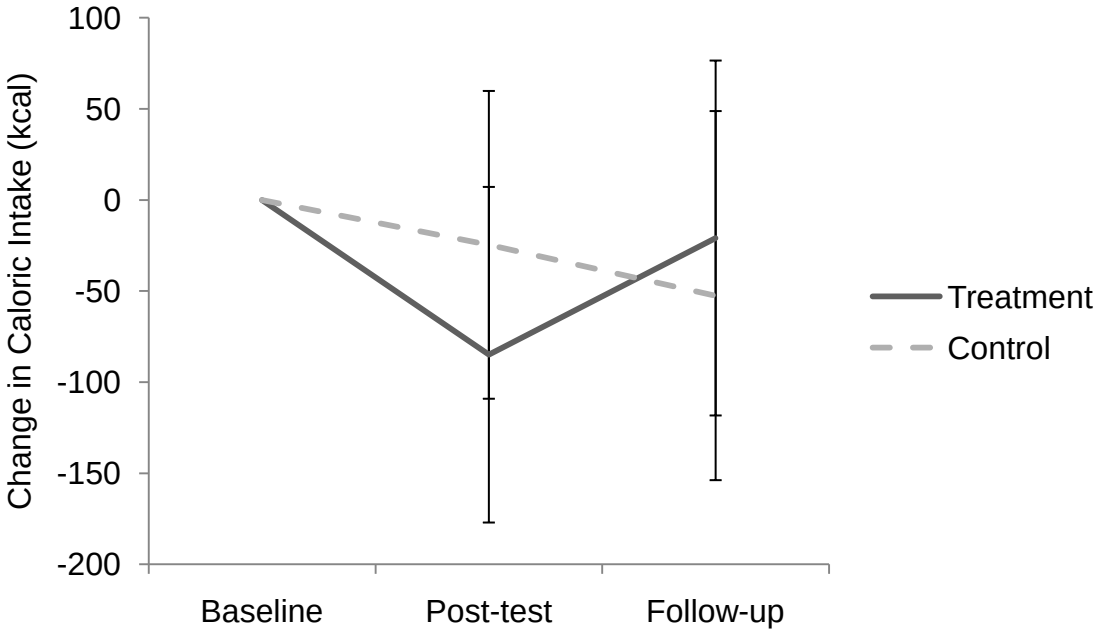

Figure 3-3. Mean ± SE change in caloric intake by treatment group, from baseline to post-test and follow-up.

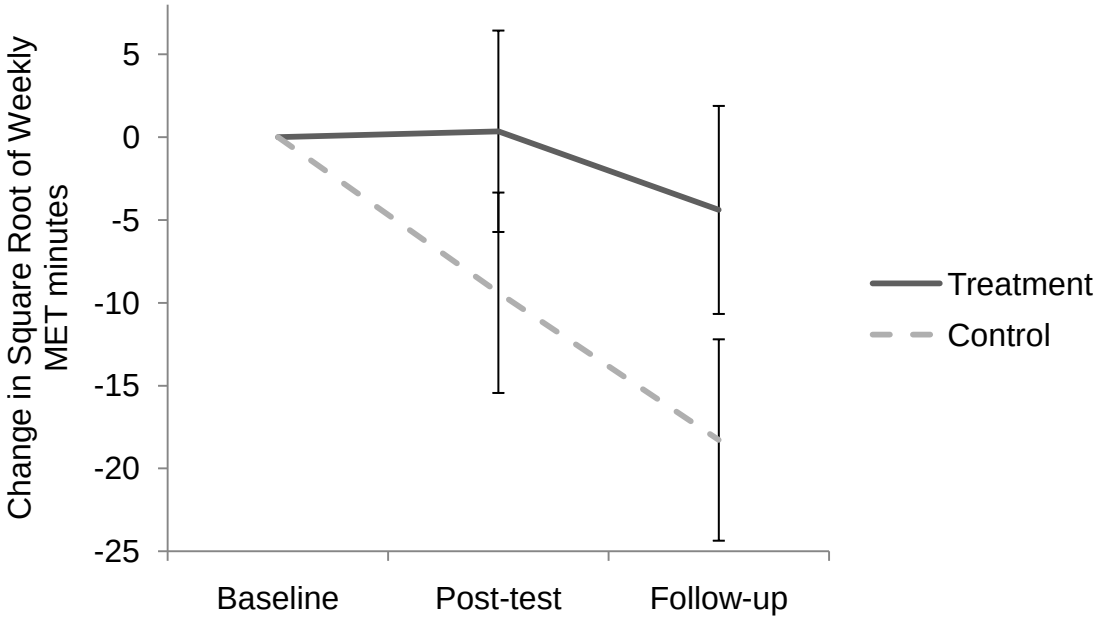

Figure 3-4. Mean ± SE change in physical activity (square root transformed) by treatment group, from baseline to post-test and follow-up.

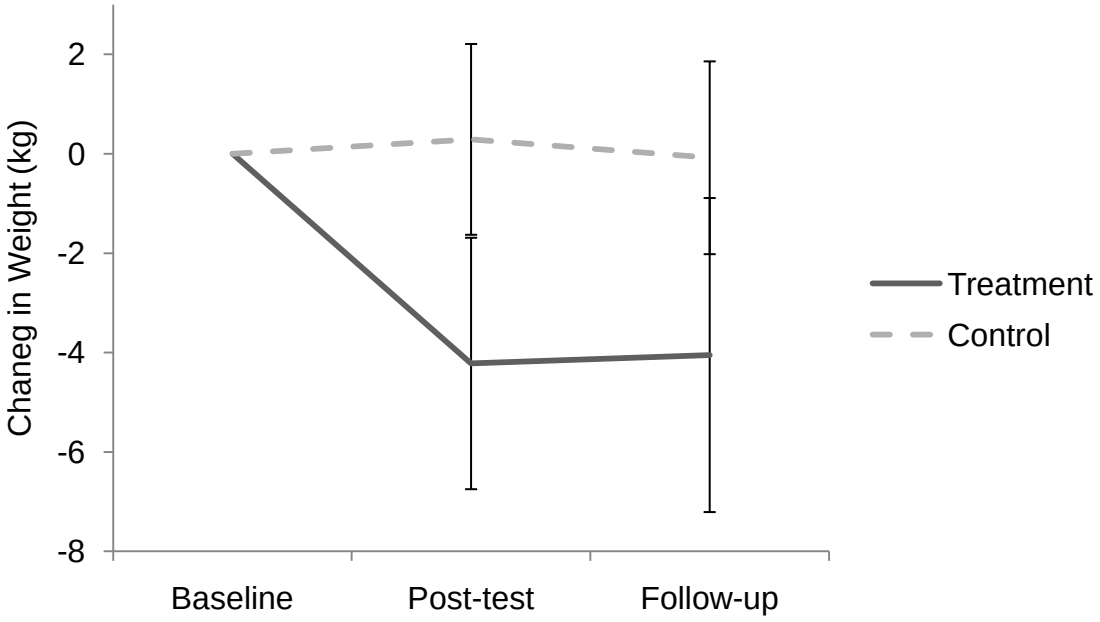

Figure 3-5. Within participants with BMI ≥ 25 at baseline, mean ± SE change in weight by treatment group from baseline to post-test and follow-up.

CHAPTER 4
DISCUSSION

The current study was a randomized trial of an innovative, brief lifestyle intervention for prevention of weight gain during the first semester of freshman year of college. Ninety-five freshman college students were successfully recruited and randomized to either treatment or wait-list control. The recruited sample of participants was racially and ethnically diverse, and both normal weight and overweight participants (categorized by BMI) were well represented. Participants in the treatment group had relatively good attendance and adherence to the program (measured by number of food records completed weekly).

Primary Aim

No significant difference was found between the treatment and wait-list control group at post-test or follow-up. Nonetheless, the trends represented in Figure 3-2 demonstrate that while the control group appeared to maintain baseline weight over time, participants in the intervention group lost some weight from baseline to post-test but regained most of that weight from post-test to follow-up. This pattern of findings suggests two things.

First, the current study may have been underpowered, as the power analysis conducted prior to recruitment was based on the assumption that participants in the control group would gain weight over the course of their first semester of college. Previous research consistently documents a trend for college students to gain weight during their year of college (Anderson et al., 2003; Butler et al., 2004; Hajhosseini et al., 2006; Hovell et al., 1985; Levitsky et al., 2004; Lloyd-Richardson et al., 2009; Racette et al., 2005), which was not observed in the enrolled control participants.

The lack of weight gain in the control group may have been associated with the short follow-up time (perhaps weight gain would have been seen if randomization continued until the end of the freshman year) or recruitment techniques. Specifically, recruitment for the current study centered around advertisements that focused on the prevention of weight gain during the freshman year (e.g., the posters displayed around campus and handbills placed in student mailboxes contained the phrase “Want to potentially avoid the Freshman 15? We are recruiting research participants for a study aiming to improve the eating and exercise habits of freshman college students”). This manner of recruitment may have led to a sample of participants for both the treatment and control group who were more interested in maintaining body weight or improving eating and exercise habits compared to the average freshman college student. Thus, while the average UF college student may have experienced weight gain during this first semester at college, the students recruited for this study may have represented a group that would have been successful at weight management without intervention.

This recruitment method also dictated a January start-date for the wait-list control participants, as we were advertising a “freshman year” program; extending the wait-list treatment groups into the sophomore year of college may have led to diminished initial recruitment, larger drop-out in the control group, and feelings of frustration or knowledge of being in a “control group” (the consent form for the current study was able to highlight the fact that all participants would be able to receive the intervention during their freshman year, but half would attend groups in the fall and half in the spring). Future studies should focus on broader recruitment, for example focusing on recruiting students for a “healthy student” program versus freshman weight-gain prevention, or

using other broad terms to describe the study. Further, these studies should investigate weight gain over the course of the entire first year of college, rather than just the first semester.

The second key finding was that the intervention, taking place over only four weeks, may have been too short to observe significant changes in behavior and body weight. Indeed, participants in the treatment group lost on average, 0.52 kg per week, which is a reasonable weight loss goal given the starting weight of participants. Participants who were overweight or obese in the treatment group experienced an even larger weekly change of -1.05 kg per week. If this program were to be extended, perhaps over two months or over a full college semester (August-December), the treatment effect observed may have been much larger, and a significant treatment by group effect might then be observed. This increase would be particularly likely to improve outcomes given previous research demonstrating that increasing the length of lifestyle weight loss programs significantly improves efficacy and total weight loss (Perri, Nezu, Patti, & McCann, 1989).

Secondary Aims

Caloric Intake

Similar to the primary results for body weight, there was not a significant difference between the treatment and control group in terms of caloric intake at post-test and follow-up. The patterns of change demonstrated in Figure 3-3, however, demonstrated that while the control participants experienced a slight decrease in caloric intake from baseline to post-test and again to follow-up, participants in the treatment group experienced a larger (albeit non-significant) decrease in caloric intake from baseline to post-test, but then experienced an increase in caloric intake from post-test to follow-up

such that changes from baseline to post-test were washed out. Some success in clinically significant caloric change by group was observed, as significantly more participants in the treatment group demonstrated success at decreasing caloric intake by 200 kcal/day from baseline to post-test compared to the control group. This suggests that more participants in the treatment group were successful at decreasing overall caloric intake compared to participants in the control group. Further, these results suggest that participants were responding well to treatment, and given a longer intervention (e.g., weekly groups over the course of the semester rather than over four weeks), this change may have led to a greater difference in overall calories and weight for the treatment group compared to the control group.

Participants in the treatment group were given caloric intake goals of 1,200 kcal/day during the intervention. Despite this recommendation representing a decrease in caloric intake of approximately 350 kcal/day from baseline, on average, participants in the treatment decreased caloric intake from baseline to post-test by about 85 kcal/day (representing a reduction from a baseline mean of 1,559 kcal/day to a post-test mean of 1,474 kcal/day). This smaller decrease may be a result of lack of sensitivity of the dietary recalls to change, or a result of participants failing to meet their caloric intake goals. While 3 dietary recalls were used to help assess “average” intake at each assessment time point, these recalls may not accurately represent overall intake. For example, the final assessment time point corresponded with final exams and the holiday season; thus, participants may have consumed more during the week of assessment than typically consumed due to environmental influences and psychological stressors. Further, an important factor for caloric intake in college students that may not have been

captured using the recalls was alcohol intake. Research has demonstrated that freshman typically report an increase in alcohol intake, and that this intake is associated with weight gain (Anding et al., 2001; Butler et al., 2004). In the current study, however, very few participants reported alcohol intake. Considering all 3 time points (baseline, post-test, and follow-up), only 3.98% of records included an alcoholic drink. This demonstrates that participants were likely not reporting or underreporting alcoholic intake due. This may be due to fears of legal repercussion, as students in the current study were not of legal drinking age. Future work, however, should focus on accurately capturing participants' alcoholic drink intake in addition to other foods and drinks consumed.

Physical Activity

There were no significant differences between treatment groups in physical activity (total METs/week) at post-test or follow-up. Further, there was no significant difference in the proportion of participants maintaining or increasing physical activity between the treatment or control groups from baseline to post-test.

While participants in the treatment group did not experience significant changes in physical activity from post-test to follow-up, participants in the control group experienced significant decreases in total weekly METs and weekly METs from walking from baseline to follow-up. This demonstrates that the intervention may have been successful in helping treatment participants maintain their baseline physical activity. Participants in the control group, however, appeared to have decreased their participation in physical activity, consistent with previous research that demonstrated that freshman students typically decrease their participation in physical activity during the transition to college (Butler et al., 2004). After the end of intervention, however,

participants in the treatment group demonstrated a trend toward decreasing activity, suggesting that maintenance of treatment effects may be an issue longer-term.

Tertiary Aim

Using only participants who were overweight or obese at baseline, a similar pattern of results to those found in the primary aim was observed. Specifically, participants in the intervention group experienced non-significant weight change from baseline to post-test, a small non-significant increase from post-test to follow-up, for a net non-significant weight loss from baseline to post-test, while participants in the control group did not experience changes from baseline to post-test and follow-up. One important finding, however, is that the weight change experienced by overweight and obese participants in the treatment group was much larger than the magnitude of all participants (-4.22 kg for overweight and obese participants compared to -2.07 kg for all participants in the treatment group). Unfortunately, this sub-group analysis was underpowered and despite large clinical changes in weight loss there were no statistically significant changes in weight by group or between groups at any time point. These findings indicate, however, that this intervention may be particularly effective in overweight and obese participants compared to normal weight participants. As discussed earlier, this effect has potential clinical significance, and would likely have an even bigger impact if the current intervention was lengthened past four weeks.

Exploratory Aims

Disordered Eating Behaviors

There were no significant changes in disordered eating behaviors (operationalized as total EAT scores) amongst either intervention group from baseline to follow-up. This finding supports previous literature suggesting that weight management interventions do

not lead to disordered eating (Jeffery & French, 1999; Klem et al., 1997; National Task Force on the Prevention and Treatment of Obesity, 2000).

Eating Habits

Scores on the Three Factor Eating Questionnaire demonstrated that, even though there was not a significant group by time interaction, participants in the treatment group had significantly lower scores on the disinhibition subscale at post-test compared to control, likely following from non-significant trends for participants in the treatment group to experience decreases in disinhibition from baseline to post-test. These results, along with trends for participants in the treatment group to experience non-significant weight losses from baseline to post-test, follow previous research suggesting that for obese individuals, decreased disinhibition was associated with improved weight-loss outcomes (Bryant et al., 2012).

Problem-Solving Skills

There was a significant group effect such that participants in the control group demonstrated lower problem solving skills than participants in the treatment group, but the hypothesized group by time interaction was not significant. While low scores for the control group may have been an artifact of non-stratified randomization, this finding suggests that despite program focus on increasing problem-solving skills, participants did not report significantly improved problem-solving skills. Due to the program length, the focus on problem solving skills may not have been sufficient to significantly improve skills such that changes were observed on the SPSI; thus, if this study were to be repeated, and conducted on a longer-term basis (i.e., groups longer than four weeks), increased time should be spent on structured problem-solving skills training.

Weight Loss Self-Efficacy

Although there were no significant differences between the treatment and control groups in terms of weight loss efficacy at post-test or follow-up, there was a trend for weight loss efficacy to improve over time. This effect of time may be partly due to the finding that control participants did not gain weight over time; thus, the expected improvement in weight self-efficacy in the treatment group was also observed in the control group, who were also overall successful with weight maintenance.

Nutrition Knowledge

No significant differences were found by group for change in nutritional knowledge, as measured by the Nutritional Knowledge Questionnaire. This may suggest that individuals did not improve their nutrition knowledge during the four-week intervention. It may also indicate that the NKQ was not an appropriate measure of nutrition knowledge in this population. Upon further review of individual items on the NKQ, many did not assess information that was presented during groups. Although the NKQ was the only validated measure of nutritional knowledge that was available at the time of study start, it may have been beneficial to additionally include a measure of knowledge addressed during the intervention, even if unvalidated, to function as a manipulation check. Further, future research should focus on developing a US-based measure of nutritional knowledge that reflects current guidelines and recommendations.

Limitations

Limitations to the current study include sample size, potential recruitment bias, and generalizability. First, as discussed previously, the study may have been underpowered due to the lack of weight gain in participants randomized to the control group. As power analyses were based on the expectation of weight gain in the control group, the study

was likely inadequately powered without this weight gain. Second, participants recruited for this study may have represented individuals who were more likely to be interested in healthy eating and exercise behaviors than the general freshman college student population. Finally, because only female freshman college students were recruited for the current study, the results may not be generalizable to other populations (e.g., males or students past their first year of college).

Strengths

Despite the above limitations, the current study has several strengths. First, this study represents the first randomized trial of lifestyle intervention for weight gain prevention in freshman college students. Previous studies have focused on education-only (Matvienko et al., 2001) interventions, using only self-monitoring (Levitsky et al., 2006), or alternate populations, including first and second-year medical students (Hivert et al., 2007) and young-adults aged 18-35 (Gokee LaRose et al., 2010). This study demonstrated the feasibility of recruitment and intervention in female freshman college students, which has not yet been documented within the literature. At study start, a primary concern was that students would not be interested in the intervention, or that the burden of attending sessions and completing food and activity records may be too high to be acceptable. Instead, participants qualitatively reported being excited during recruitment and later reported enjoying the group format and material.

Future Directions

Despite initial concerns that students would not attend a longer-term program, several students commented at the end of groups that they wished the groups had lasted longer than four weeks. Specifically, they reported that despite initial difficulty fitting the groups into their schedule with first-year classes and activities, once the time

was set aside it would have been easier to continue throughout the semester, akin to an additional college course. Future interventions should consider working within the college course framework to offer lifestyle interventions; e.g., offering a semester or quarter-long program that could potentially count for elective credit for participating students. The longer-term impact of the current intervention is also unknown. As participants were taught weight management skills and made plans for weight gains that exceeded “maintenance” levels, over the long-term participants may have more time to implement these skills to prevent later weight gain. Further, control participants may have experienced weight gain in comparison to the treatment group if longer-term follow-up were included. Thus, future studies should focus on the long-term impact of intervention in addition to measuring short-term, semester-long changes.

Conclusion

The current study demonstrated feasibility of recruitment and lifestyle intervention in female freshman college students. No significant differences were found between treatment and control participants at post-test or follow-up; however, trends suggest that the intervention may have led to some success in weight loss, decreases in caloric intake, and maintenance of physical activity for participants in the control group, but these changes were not maintained from post-test to follow-up, suggesting limited maintenance. The long-term impact of these behavioral changes, however, is unknown. Given additional time in groups (i.e., if the intervention was lengthened from four weeks), additional time should be spent on assisting participants to develop plans for maintaining their beneficial behavior changes following the end of groups. Further, a tapered plan for group sessions (e.g., going from weekly groups to biweekly and then monthly) may help give individuals the chance to practice maintenance behaviors

independently while still meeting occasionally to problem solve any barriers met for maintaining these behaviors. Overall, targeting freshman college students for weight gain prevention demonstrates promise, however future interventions should focus on lengthening the initial intervention, broadening participant recruitment, and including longer-term follow-up assessment visits.

APPENDIX A
A: PLAN OF SESSIONS

Session 1: Introduction to the Intervention & Self Monitoring

- What is weight maintenance?
- Impact of environment on weight
- Calories in vs. calories out: setting a calorie goal
- Introduction to self-monitoring

Session 2: Problem Solving & Taking Control of Eating Patterns

- What happens when your plans don't work out?
- Setting realistic goals
- Overcoming barriers
- Eating patterns & Eating regularly

Session 3: Becoming Active & Understanding Fad Diets

- Learn national recommendations for physical activity
- Find activity that's fun for you!
- What are fad diets? Are they effective?

Session 4: Improving Nutrition & Body Image

- Introduction to the Stoplight Diet
- Media impact on body image: what is ideal?
- Improving body image!

Session 5: Eating Out, Planning for Holidays & Special Events, & Long Term Success!

- Eating out without eating too much
- Controlling portion sizes
- Planning ahead for special events
- Strategies for long-term success

APPENDIX B
B: MEASURES

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?

☐ ***Yes***

☐ No → ***Skip to PART 2: TRANSPORTATION***

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.

_____ **days per week**

☐ No vigorous job-related physical activity → ***Skip to question 4***

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

_____ **hours per day**
_____ **minutes per day**

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

_____ **days per week**

☐ No moderate job-related physical activity → ***Skip to question 6***

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?

_____ **hours per day**
_____ **minutes per day**

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.

_____ **days per week**

☐ No job-related walking → ***Skip to PART 2: TRANSPORTATION***

7. How much time did you usually spend on one of those days **walking** as part of your work?

_____ **hours per day**
_____ **minutes per day**

PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?

_____ **days per week**

☐ No traveling in a motor vehicle → ***Skip to question 10***

9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?

_____ **hours per day**
_____ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?

_____ **days per week**

☐ No bicycling from place to place → ***Skip to question 12***

11. How much time did you usually spend on one of those days to **bicycle** from place to place?

_____ **hours per day**
_____ **minutes per day**

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?

_____ **days per week**

☐ No walking from place to place → ***Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY***

13. How much time did you usually spend on one of those days **walking** from place to place?

_____ **hours per day**
_____ **minutes per day**

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY

This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**?

_____ **days per week**

☐ No vigorous activity in garden or yard → ***Skip to question 16***

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?

_____ **hours per day**
_____ **minutes per day**

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?

_____ **days per week**

☐ No moderate activity in garden or yard → ***Skip to question 18***

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?

_____ **hours per day**
_____ **minutes per day**

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?

_____ **days per week**

☐ No moderate activity inside home → ***Skip to PART 4: RECREATION, SPORT AND LEISURE-TIME PHYSICAL ACTIVITY***

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?

_____ **hours per day**
_____ **minutes per day**

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

_____ **days per week**

☐ No walking in leisure time → ***Skip to question 22***

21. How much time did you usually spend on one of those days **walking** in your leisure time?

_____ **hours per day**
_____ **minutes per day**

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

_____ **days per week**

☐ No vigorous activity in leisure time → ***Skip to question 24***

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

_____ **hours per day**
_____ **minutes per day**

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

_____ **days per week**

☐ No moderate activity in leisure time → ***Skip to PART 5: TIME SPENT SITTING***

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
_____ **hours per day**
_____ **minutes per day**

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

_____ **hours per day**
_____ **minutes per day**

27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?

_____ **hours per day**

_____ **minutes per day**

This is the end of the questionnaire, thank you for participating.

Eating Attitudes Test (EAT-26)

Current Weight: _____ Highest weight (excluding pregnancy): _____
Sex: _____
Height: _____ Lowest Adult Weight: _____ Ideal Weight: _____

✓ **Please choose one response by marking a check to the right for each of the following statements:**	Always	Usually	Often	Some times	Rarely	Never	Score
1. Am terrified about being overweight.	_	_	_	_	_	_	
2. Avoid eating when I am hungry.	_	_	_	_	_	_	
3. Find myself preoccupied with food.	_	_	_	_	_	_	
4. Have gone on eating binges where I feel that I may not be able to stop.	_	_	_	_	_	_	
5. Cut my food into small pieces.	_	_	_	_	_	_	
6. Aware of the calorie content of foods that I eat.	_	_	_	_	_	_	
7. Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)	_	_	_	_	_	_	
8. Feel that others would prefer if I ate more.	_	_	_	_	_	_	
9. Vomit after I have eaten.	_	_	_	_	_	_	
10. Feel extremely guilty after eating.	_	_	_	_	_	_	
11. Am preoccupied with a desire to be thinner.	_	_	_	_	_	_	
12. Think about burning up calories when I exercise.	_	_	_	_	_	_	
13. Other people think that I am too thin.	_	_	_	_	_	_	
14. Am preoccupied with the thought of having fat on my body.	_	_	_	_	_	_	
15. Take longer than others to eat my meals.	_	_	_	_	_	_	
16. Avoid foods with sugar in them.	_	_	_	_	_	_	
17. Eat diet foods.	_	_	_	_	_	_	
18. Feel that food controls my life.	_	_	_	_	_	_	
19. Display self-control around food.	_	_	_	_	_	_	
20. Feel that others pressure me to eat.	_	_	_	_	_	_	
21. Give too much time and thought to food.	_	_	_	_	_	_	
22. Feel uncomfortable after eating sweets.	_	_	_	_	_	_	
23. Engage in dieting behavior.	_	_	_	_	_	_	
24. Like my stomach to be empty.	_	_	_	_	_	_	
25. Have the impulse to vomit after meals.	_	_	_	_	_	_	
26. Enjoy trying new rich foods.	_	_	_	_	_	_	
					Total Score =		

Behavioral Questions: In the past 6 months have you:	**Yes**	**No**
A. Gone on eating binges where you feel that you may not be able to stop? (Eating much more than most people would eat under the same circumstances) If you answered yes, how often during the worst week: _____		
B. Ever made yourself sick (vomited) to control your weight or shape? If you answered yes, how often during the worst week: _____		
C. Ever used laxatives, diet pills or diuretics (water pills) to control your weight or shape? If you answered yes, how often during the worst week? _____		
D. Ever been treated for an eating disorder? When: _____		

EATING INVENTORY (THREE FACTOR EATING QUESTIONNAIRE)

For questions 1-36, answer “TRUE” if you agree with the statement, or feel it is true as applied to you. Answer “FALSE” if you disagree with the statement, or feel that it is false as applied to you.

	TRUE	FALSE
1. 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 have just finished a meal.	☐	☐
2. I usually eat too much at social occasions, like parties and picnics.	☐	☐
3. I am usually so hungry that I eat more than three times a day.	☐	☐
4. When I have eaten my quota of calories, I am usually good about not eating anymore.	☐	☐
5. Dieting is so hard for me because I just get too hungry.	☐	☐
6. I deliberately take small helpings as a means of controlling my weight.	☐	☐
7. Sometimes things just taste so good that I keep on eating even when I am no longer hungry.	☐	☐
8. Since I am often hungry, I sometimes wish that while I am eating, an expert would tell me that I have had enough or that I can have something more to eat.	☐	☐
9. When I feel anxious, I find myself eating.	☐	☐
10. Life is too short to worry about dieting.	☐	☐
11. Since my weight goes up and down, I have gone on reducing diets more than once.	☐	☐
12. I often feel so hungry that I just have to eat something	☐	☐
13. When I am with someone who is overeating, I usually overeat too.	☐	☐
14. I have a pretty good idea of the number of calories in common foods.	☐	☐

	TRUE	FALSE
15. Sometimes when I start eating, I just can't seem to stop.	☐	☐
16. It is not difficult for me to leave something on my plate.	☐	☐
17. At certain times of the day, I get hungry because I have gotten used to eating then.	☐	☐
18. While on a diet, if I eat food that is not allowed, I consciously eat less for a period of time to make up for it.	☐	☐
19. Being with someone who is eating often makes me hungry enough to eat also.	☐	☐
20. When I feel blue, I often overeat.	☐	☐
21. I enjoy eating too much to spoil it by counting calories or watching my weight.	☐	☐
22. When I see a real delicacy, I often get so hungry that I have to eat right away.	☐	☐
23. I often stop eating when I am not really full as a conscious means of limiting the amount that I eat.	☐	☐
24. I get so hungry that my stomach often seems like a bottomless pit.	☐	☐
25. My weight has hardly changed at all in the last ten years.	☐	☐
26. I am always hungry so it is hard for me to stop eating before I finish the food on my plate.	☐	☐
27. When I feel lonely, I console myself by eating.	☐	☐
28. I consciously hold back at meals in order not to gain weight.	☐	☐
29. I sometimes get very hungry late in the evening or at night.	☐	☐
30. I eat anything I want, any time I want.	☐	☐
31. Without even thinking about it, I take a long time to eat.	☐	☐

	TRUE	FALSE
32. I count calories as a conscious means of controlling my weight.	☐	☐
33. I do not eat some foods because they make me fat.	☐	☐
34. I am always hungry enough to eat at any time.	☐	☐
35. I pay a great deal of attention to changes in my figure.	☐	☐
36. While on a diet, if I eat a food that is not allowed, I often then splurge and eat other high calorie foods.	☐	☐

Please answer the following questions by filling in the circle corresponding to the letter of the response that is appropriate to you.

37. How often are you dieting in a conscious effort to control your weight?

☐	☐	☐	☐
rarely	sometimes	usually	always

38. Would a weight fluctuation of 5 lbs affect the way you live your life?

☐	☐	☐	☐
not at all	slightly	moderately	very much

39. How often do you feel hungry?

☐	☐	☐	☐
only at meal times	sometimes between meals	often between meals	almost always

40. Do your feelings of guilt about overeating help you to control your food intake?

☐	☐	☐	☐
never	rarely	often	always

41. How difficult would it be for you to stop eating halfway through dinner and not eat for the next four hours?

☐	☐	☐	☐

easy	slightly difficult	moderately difficult	very difficult

42. How conscious are you of what you are eating?

☐	☐	☐	☐
not at all	slightly	moderately	Extremely

43. How frequently do you *avoid* “stocking up” on tempting foods?

☐	☐	☐	☐
almost never	seldom	usually	almost always

44. How likely are you to shop for low calorie foods?

☐	☐	☐	☐
unlikely	slightly likely	moderately likely	very likely

45. Do you eat sensibly in front of others and splurge alone?

☐	☐	☐	☐
never	rarely	often	Always

46. How likely are you to consciously eat slowly in order to cut down on how much you eat?

☐	☐	☐	☐
unlikely	slightly likely	moderately likely	very likely

47. How frequently do you skip dessert because you are no longer hungry?

☐	☐	☐	☐
almost never	seldom	at least once a week	almost every day

48. How likely are you to consciously eat less than you want?

☐	☐	☐	☐
unlikely	slightly likely	moderately likely	very likely

49. Do you go on eating binges even though you are not hungry?

☐	☐	☐	☐
never	rarely	sometimes	at least once a week

50. To what extent does this statement describe your eating behavior?
"I start dieting in the morning, but because of any number of things that happen during the day, by evening I have given up and eat what I want, promising myself to start dieting again tomorrow."

☐	☐	☐	☐
not like me	little like me	pretty good description of me	describes me perfectly

51. On a scale of 1 to 6, where 1 means no restraint in eating (eat whatever you want, whenever you want it) and 6 means total restraint (constantly limiting food intake and never "giving in"), what number would you give yourself?

☐	☐	☐	☐	☐	☐
1	2	3	4	5	6

SPSI-R

ID# ☐☐ ☐☐ ☐☐☐☐ Date ☐☐ / ☐☐ / ☐☐

Instructions: Below are some ways that you might think, feel, and act when faced with PROBLEMS in everyday living. We are not talking about the common hassles and pressures that you handle successfully every day. In this questionnaire, a problem is something important in your life that bothers you a lot but you don't know immediately how to make it better or stop it from bothering you so much. The problem could be something about yourself (such as your thoughts, feelings, behavior, health, or appearance), your relationships with other people (such as your family, friends, teachers, or boss), or your environment and the things that you own (such as your house, car, property, money).

Please read each statement carefully and choose one of the numbers below that best shows how much the statement is true of you. See yourself as you **usually** think, feel, and act when you are faced with important problems in your life **these days. Fill in the bubble completely.**

	Not at all true of me (0)	Slightly true of me (1)	Moderately true of me (2)	Very true of me (3)	Extremely true of me (4)
1. I spend too much time worrying about my problems instead of trying to solve them.	○ 0	○ 1	○ 2	○ 3	○ 4
2. I feel threatened and afraid when I have an important problem to solve.	○ 0	○ 1	○ 2	○ 3	○ 4
3. When making decisions, I do **not** evaluate all my options carefully enough.	○ 0	○ 1	○ 2	○ 3	○ 4
4. When I have a decision to make, I fail to consider the effects that each option is likely to have on the well-being of other people.	○ 0	○ 1	○ 2	○ 3	○ 4
5. When I am trying to solve a problem, I often think of different solutions and then try to combine some of them to make a better solution.	○ 0	○ 1	○ 2	○ 3	○ 4
6. I feel nervous and unsure of myself when I have an important decision to make.	○ 0	○ 1	○ 2	○ 3	○ 4
7. When my first efforts to solve a problem fail, I know if I persist and do not give up too easily, I will be able to eventually find a good solution.	○ 0	○ 1	○ 2	○ 3	○ 4
8. When I am attempting to solve a problem, I act on the first idea that occurs to me.	○ 0	○ 1	○ 2	○ 3	○ 4

SPSI-R

ID# ☐☐ – ☐☐ – ☐☐☐☐

	Not at all true of me (0)	Slightly true of me (1)	Moderately true of me (2)	Very true of me (3)	Extremely true of me (4)
9. Whenever I have a problem, I believe that it can be solved.	○ 0	○ 1	○ 2	○ 3	○ 4
10. I wait to see if a problem will resolve itself first, before trying to solve it myself.	○ 0	○ 1	○ 2	○ 3	○ 4
11. When I have a problem to solve, one of the things I do is analyze the situation and try to identify what obstacles are keeping me from getting what I want.	○ 0	○ 1	○ 2	○ 3	○ 4
12. When my first efforts to solve a problem fail, I get very frustrated.	○ 0	○ 1	○ 2	○ 3	○ 4
13. When I am faced with a difficult problem, I doubt that I will be able to solve it on my own no matter how hard I try.	○ 0	○ 1	○ 2	○ 3	○ 4
14. When a problem occurs in my life, I put off trying to solve it for as long as possible.	○ 0	○ 1	○ 2	○ 3	○ 4
15. After carrying out a solution to a problem, I do **not** take the time to evaluate all of the results carefully.	○ 0	○ 1	○ 2	○ 3	○ 4
16. I go out of my way to avoid having to deal with problems in my life.	○ 0	○ 1	○ 2	○ 3	○ 4
17. Difficult problems make me very upset.	○ 0	○ 1	○ 2	○ 3	○ 4
18. When I have a decision to make, I try to predict the positive and negative consequences of each option.	○ 0	○ 1	○ 2	○ 3	○ 4
19. When problems occur in my life, I like to deal with them as soon as possible.	○ 0	○ 1	○ 2	○ 3	○ 4
20. When I am attempting to solve a problem, I try to be creative and think of new or original solutions.	○ 0	○ 1	○ 2	○ 3	○ 4

SPSI-R

ID# ☐☐ – ☐☐ – ☐☐☐☐

	Not at all true of me (0)	Slightly true of me (1)	Moderately true of me (2)	Very true of me (3)	Extremely true of me (4)
21. When I am trying to solve a problem, I go with the first good idea that comes to mind.	○ 0	○ 1	○ 2	○ 3	○ 4
22. When I try to think of different possible solutions to a problem, I **cannot** come up with many ideas.	○ 0	○ 1	○ 2	○ 3	○ 4
23. I prefer to avoid thinking about the problems in my life instead of trying to solve them.	○ 0	○ 1	○ 2	○ 3	○ 4
24. When making decisions, I consider both the immediate consequences and the long-term consequences of each option.	○ 0	○ 1	○ 2	○ 3	○ 4
25. After carrying out my solution to a problem, I analyze what went right and what went wrong.	○ 0	○ 1	○ 2	○ 3	○ 4
26. After carrying out my solution to a problem, I examine my feelings and evaluate how much they have changed for the better.	○ 0	○ 1	○ 2	○ 3	○ 4
27. Before carrying out my solution to a problem, I practice the solution in order to increase my chances of success.	○ 0	○ 1	○ 2	○ 3	○ 4
28. When I am faced with a difficult problem, I believe I will be able to solve it on my own if I try hard enough.	○ 0	○ 1	○ 2	○ 3	○ 4
29. When I have a problem to solve, one of the first things I do is try to get as many facts about the problem as possible.	○ 0	○ 1	○ 2	○ 3	○ 4
30. I put off trying to solve problems until it is too late to do anything about them.	○ 0	○ 1	○ 2	○ 3	○ 4
31. I spend more time avoiding my problems than solving them.	○ 0	○ 1	○ 2	○ 3	○ 4
32. When I am trying to solve a problem, I get so upset that I cannot think clearly.	○ 0	○ 1	○ 2	○ 3	○ 4

SPSI-R

ID# ☐☐ – ☐☐ – ☐☐☐☐

	Not at all true of me (0)	Slightly true of me (1)	Moderately true of me (2)	Very true of me (3)	Extremely true of me (4)
33. Before I try to solve a problem, I set a specific goal so that I know exactly what I want to accomplish.	○ 0	○ 1	○ 2	○ 3	○ 4
34. When I have a decision to make, I do **not** take the time to consider the pros and cons of each option.	○ 0	○ 1	○ 2	○ 3	○ 4
35. When the outcome of a solution to a problem is not satisfactory, I try to find out what went wrong and then I try again.	○ 0	○ 1	○ 2	○ 3	○ 4
36. I hate trying to solve the problems that occur in my life.	○ 0	○ 1	○ 2	○ 3	○ 4
37. After carrying out a solution to a problem, I try to evaluate as carefully as possible how much the situation has changed for the better.	○ 0	○ 1	○ 2	○ 3	○ 4
38. When I have a problem, I try to see it as a challenge, or opportunity to benefit in some positive way from having a problem.	○ 0	○ 1	○ 2	○ 3	○ 4
39. When I am trying to solve a problem, I think of as many options as possible until I cannot come up with any more ideas.	○ 0	○ 1	○ 2	○ 3	○ 4
40. When I have a decision to make, I weigh the consequences of each option and compare them against each other.	○ 0	○ 1	○ 2	○ 3	○ 4
41. I become depressed and immobilized when I have an important problem to solve.	○ 0	○ 1	○ 2	○ 3	○ 4
42. When I am faced with a difficult problem, I go to someone else for help in solving it.	○ 0	○ 1	○ 2	○ 3	○ 4
43. When I have a decision to make, I consider the effects that each option is likely to have on my personal feelings.	○ 0	○ 1	○ 2	○ 3	○ 4

SPSI-R

ID# ☐☐ – ☐☐ – ☐☐☐☐

	Not at all true of me (0)	Slightly true of me (1)	Moderately true of me (2)	Very true of me (3)	Extremely true of me (4)
44. When I have a problem to solve, I examine what factors or circumstances in my environment might be contributing to the problem.	○ 0	○ 1	○ 2	○ 3	○ 4
45. When making decisions, I go with my "gut-feeling" without thinking too much about the consequences of each option.	○ 0	○ 1	○ 2	○ 3	○ 4
46. When making decisions, I use a systematic method for judging and comparing alternatives.	○ 0	○ 1	○ 2	○ 3	○ 4
47. When I am trying to solve a problem, I keep in mind what my goal is at all times.	○ 0	○ 1	○ 2	○ 3	○ 4
48. When I am attempting to solve a problem, I approach it from as many different angles as possible.	○ 0	○ 1	○ 2	○ 3	○ 4
49. When I am having trouble understanding a problem, I try to get more specific and concrete information about the problem to help clarify it.	○ 0	○ 1	○ 2	○ 3	○ 4
50. When my first efforts to solve a problem fail, I get discouraged and depressed.	○ 0	○ 1	○ 2	○ 3	○ 4
51. When a solution that I have carried out does not solve my problem satisfactorily, I do **not** take the time to examine carefully why it did not work.	○ 0	○ 1	○ 2	○ 3	○ 4
52. I am too impulsive when it comes to making decisions.	○ 0	○ 1	○ 2	○ 3	○ 4

Please make sure that you answered every question.
Thank You

WEL

ID# ☐☐ ☐☐ ☐☐☐☐ Date ☐☐ / ☐☐ / ☐☐

This form describes some typical eating situations. Everyone has situations which make it very hard for them to keep their weight down. The following pages contain a number of situations relating to eating patterns and attitudes. This form will help you to identify the eating situations which you find are the hardest to manage.

Now read each situation listed below and decide how confident (or certain) you are that you will be able to resist eating in each of the difficult situations. In other words, pretend that you are in the eating situation **right now**. On a scale from **0** (not confident) to **9** (very confident), choose ONE number that reflects how confident you feel now about being able to successfully resist the desire to eat. Write this number down next to each item under the column "CONFIDENCE NUMBER."

Not confident at all that I can resist the desire to eat. ↓ **0 1 2 3 4 5 6 7 8 9** ↓ **Very confident that I can resist the desire to eat.**

Examples: **CONFIDENCE NUMBER**

I am confident that:

1. I can resist eating on holidays..... 8
2. I can say "no" to snacks..... 6

I AM CONFIDENT THAT: **CONFIDENCE NUMBER**

1. I can resist eating when I am anxious (or nervous)..... ☐
2. I can control my eating on the weekends..... ☐
3. I can resist eating even when I have to say "no" to others..... ☐
4. I can resist eating when I feel physically run down..... ☐
5. I can resist eating when I am watching TV..... ☐
6. I can resist eating when I am depressed (or down)..... ☐
7. I can resist eating when there are many different kinds of food available..... ☐

WEL

ID# ☐☐ – ☐☐ – ☐☐☐☐

Not confident at all that I can resist the desire to eat. ↓									Very confident that I can resist the desire to eat. ↓
0	1	2	3	4	5	6	7	8	9

I AM CONFIDENT THAT:	CONFIDENCE NUMBER
8. I can resist eating even when I feel it's impolite to refuse a second helping.....	☐
9. I can resist eating even when I have a headache.....	☐
10. I can resist eating when I am reading.....	☐
11. I can resist eating when I am angry (or irritable).....	☐
12. I can resist eating even when I am at a party.....	☐
13. I can resist eating even when others are pressuring me to eat.....	☐
14. I can resist eating when I am in pain.....	☐
15. I can resist eating just before going to bed.....	☐
16. I can resist eating when I have experienced failure.....	☐
17. I can resist eating even when high-calorie foods are available.....	☐
18. I can resist eating even when I think others will be upset if I don't eat.....	☐
19. I can resist eating when I feel uncomfortable.....	☐
20. I can resist eating when I am happy.....	☐

Nutrition survey

This is a survey, *not* a test. Your answers will help identify which dietary advice people find confusing.

If you do not know the answer, mark 'not sure' rather than guess.

The first few items are about what advice you think experts are giving us

1 Do you think health experts recommend that people should be eating more, the same amount, or less of these foods? *(tick one box per food)*

	More	Same	Less	Not sure
Vegetables	☐	☐	☐	☐
Sugary foods	☐	☐	☐	☐
Meat	☐	☐	☐	☐
Starchy foods	☐	☐	☐	☐
Fatty foods	☐	☐	☐	☐
High fibre foods	☐	☐	☐	☐
Fruit	☐	☐	☐	☐
Salty foods	☐	☐	☐	☐

2 How many servings of fruit and vegetables a day do you think experts are advising people to eat? (One serving could be, for example, an apple or a handful of chopped carrots)

. . . . . .

3 Which fat do experts say is most important for people to cut down on? *(tick one)*

(a) monounsaturated fat ☐
(b) polyunsaturated fat ☐
(c) saturated fat ☐
(d) not sure ☐

4 What version of dairy foods do experts say people should eat? *(tick one)*

(a) full fat ☐
(b) lower fat ☐
(c) mixture of full fat and lower fat ☐
(d) neither, dairy foods should be cut out ☐
(e) not sure ☐

Experts classify foods into groups. We are interested to see whether people are aware of what foods are in these groups

1 Do you think these are *high or low in added sugar*? *(tick one box per food)*

	High	Low	Not sure
Bananas	☐	☐	☐
Unflavoured yoghurt	☐	☐	☐
Ice-cream	☐	☐	☐
Orange squash	☐	☐	☐
Tomato ketchup	☐	☐	☐
Tinned fruit in natural juice	☐	☐	☐

2 Do you think these are *high or low in fat*? *(tick one box per food)*

	High	Low	Not sure
Pasta (without sauce)	☐	☐	☐
Low fat spread	☐	☐	☐
Baked beans	☐	☐	☐
Luncheon meat	☐	☐	☐
Honey	☐	☐	☐
Scotch egg	☐	☐	☐
Nuts	☐	☐	☐
Bread	☐	☐	☐
Cottage cheese	☐	☐	☐
Polyunsaturated margarine	☐	☐	☐

3 Do you think experts put these in the *starchy foods* group? *(tick one box per food)*

	Yes	No	Not sure
Cheese	☐	☐	☐
Pasta	☐	☐	☐
Butter	☐	☐	☐
Nuts	☐	☐	☐
Rice	☐	☐	☐
Porridge	☐	☐	☐

4 Do you think these are *high or low in salt*? *(tick one box per food)*

	High	Low	Not sure
Sausages	☐	☐	☐
Pasta	☐	☐	☐
Kippers	☐	☐	☐
Red meat	☐	☐	☐
Frozen vegetables	☐	☐	☐
Cheese	☐	☐	☐

5 Do you think these are *high or low in protein*? *(tick one box per food)*

	High	Low	Not sure
Chicken	☐	☐	☐
Cheese	☐	☐	☐
Fruit	☐	☐	☐
Baked beans	☐	☐	☐
Butter	☐	☐	☐
Cream	☐	☐	☐

6 Do you think these are *high or low in fibre/roughage*? *(tick one box per food)*

	High	Low	Not sure
Cornflakes	☐	☐	☐
Bananas	☐	☐	☐
Eggs	☐	☐	☐
Red Meat	☐	☐	☐
Broccoli	☐	☐	☐
Nuts	☐	☐	☐
Fish	☐	☐	☐
Baked potatoes with skins	☐	☐	☐
Chicken	☐	☐	☐
Baked beans	☐	☐	☐

7 Do you think these fatty foods are *high or low in saturated fat*? *(tick one box per food)*

	High	Low	Not sure
Mackerel	☐	☐	☐
Whole milk	☐	☐	☐
Olive oil	☐	☐	☐
Red meat	☐	☐	☐
Sunflower margarine	☐	☐	☐
Chocolate	☐	☐	☐

8 Some foods contain a lot of fat but no cholesterol.

(a) agree ☐
(b) disagree ☐
(c) not sure ☐

9 Do you think experts call these *a healthy alternative to red meat*? *(tick one box per food)*

	Yes	No	Not sure
Liver pate	☐	☐	☐
Luncheon meat	☐	☐	☐
Baked beans	☐	☐	☐
Nuts	☐	☐	☐
Low fat cheese	☐	☐	☐
Quiche	☐	☐	☐

10 A glass of unsweetened fruit juice counts as a helping of fruit.

(a) agree ☐
(b) disagree ☐
(c) not sure ☐

11 Saturated fats are mainly found in:*(tick one)*

(a) vegetable oils ☐
(b) dairy products ☐
(c) both (a) and (b) ☐
(d) not sure ☐

12 Brown sugar is a healthy alternative to white sugar.

(a) agree ☐
(b) disagree ☐
(c) not sure ☐

13 There is more protein in a glass of whole milk than in a glass of skimmed milk.

(a) agree ☐
(b) disagree ☐
(c) not sure ☐

14 Polyunsaturated margarine contains less fat than butter.

(a) agree ☐
(b) disagree ☐
(c) not sure ☐

15 Which of these breads contain the most vitamins and minerals? *(tick one)*

(a) white ☐
(b) brown ☐
(c) wholegrain ☐
(d) not sure ☐

16 Which do you think is higher in calories: butter or regular margarine? *(tick one)*

(a) butter ☐
(b) regular margarine ☐
(c) both the same ☐
(d) not sure ☐

17 A type of oil which contains mostly monounsaturated fat is: *(tick one)*

(a) coconut oil ☐
(b) sunflower oil ☐
(c) olive oil ☐
(d) palm oil ☐
(e) not sure ☐

18 There is more calcium in a glass of whole milk than a glass of skimmed milk.

(a) agree ☐
(b) disagree ☐
(c) not sure ☐

19 Which *one* of the following has the most calories for the same weight? *(tick one)*

(a) sugar ☐
(b) starchy foods ☐
(c) fibre/roughage ☐
(d) fat ☐
(e) not sure ☐

20 Harder fats contain more: *(tick one)*

(a) monounsaturates ☐
(b) polyunsaturates ☐
(c) saturates ☐
(d) not sure ☐

21 Polyunsaturated fats are mainly found in: *(tick one)*

(a) vegetable oils ☐
(b) dairy products ☐
(c) both (a) and (b) ☐
(d) not sure ☐

The next few items are about choosing foods

Please answer what is being asked and not whether you like or dislike the food!

For example, suppose you were asked. . . . . .

'If a person wanted to cut down on fat, which cheese would be best to eat?'

(a) cheddar cheese
(b) camembert
(c) cream cheese
(d) cottage cheese

If you didn't *like* cottage cheese, but knew it was the right answer, you would still tick cottage cheese.

1 Which would be the best choice for a low fat, high fibre snack? *(tick one)*

(a) diet strawberry yoghurt ☐
(b) raisins ☐
(c) muesli bar ☐
(d) wholemeal crackers and cheddar cheese ☐

2 Which would be the best choice for a low fat, high fibre light meal? *(tick one)*

(a) grilled chicken ☐
(b) cheese on wholemeal toast ☐
(c) beans on wholemeal toast ☐
(d) quiche ☐

3 Which kind of sandwich do you think is healthier? *(tick one)*

(a) two *thick* slices of bread with a *thin* slice of cheddar cheese filling ☐
(b) two *thin* slices of bread with a *thick* slice of cheddar cheese filling ☐

4 Many people eat spaghetti bolognese (pasta with a tomato and meat sauce). Which do you think is healthier? *(tick one)*

(a) a *large amount* of pasta with a *little* sauce on top ☐
(b) a *small amount* of pasta with a *lot* of sauce on top ☐

5 If a person wanted to reduce the amount of fat in their diet, which would be the best choice? *(tick one)*

(a) steak, grilled ☐
(b) sausages, grilled ☐
(c) turkey, grilled ☐
(d) pork chop, grilled ☐

6 If a person wanted to reduce the amount of fat in their diet, but didn't want to give up chips, which one would be the best choice? *(tick one)*

(a) thick cut chips ☐
(b) thin cut chips ☐
(c) crinkle cut chips ☐

7 If a person felt like something sweet, but was trying to cut down on sugar, which would be the best choice? *(tick one)*

(a) honey on toast ☐
(b) a cereal snack bar ☐
(c) plain Digestive biscuit ☐
(d) banana with plain yoghurt ☐

8 Which of these would be the healthiest snack? *(tick one)*

(a) baked apple ☐
(b) strawberry yoghurt ☐
(c) wholemeal crackers and cheddar cheese ☐
(d) carrot cake with cream cheese topping ☐

REFERENCE LIST

Adams, T., & Rini, A. (2007). Predicting 1-year change in body mass index among college students. *Journal of American College Health, 55,* 361-366. doi:10.3200/JACH.55.6.361-366

Anderson, D. A., Shapiro, J. R., & Lundgren, J. D. (2003). The freshman year of college as a critical period for weight gain: An initial evaluation. *Eating Behaviors, 4,* 363-367. doi:10.1016/S1471-0153(03)00030-8

Anding, J., Suminski, R., & Boss, L. (2001). Dietary intake, body mass index, exercise, and alcohol: are college women following the dietary guidelines for Americans? *Journal of American College Health, 49,* 167-171. doi:10.1080/07448480109596299

Bandura, A. (1985). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall.

Booth, M. (2000). Assessment of physical activity: an international perspective. *Research Quarterly for Exercise and Sport, 71,* S114.

Bouchard, C., & Perusse, L. (1993). Genetics of obesity. *Annual Review of Nutrition, 13,* 337-354. doi:10.1146/annurev.nu.13.070193.002005

Boutelle, K., Neumark-Sztainer, D., Story, M., & Resnick, M. (2002). Weight control behaviors among obese, overweight, and nonoverweight adolescents. *Journal of Pediatric Psychology, 27,* 531-540. doi:10.1093/jpepsy/27.6.531

Bowman, S. A., & Vinyard, B. T. (2004). Fast food consumption of U.S. Adults: Impact on energy and nutrient intakes and overweight status. *Journal of American College Nutrition, 23,* 163-168.

Bryant, E. J., Cauldwell, P., Hopkins, M.E., King, N. A., & Blundell, J. E. (2012). Psycho-markers of weight loss. The roles of TFEQ Disinhibition and Restraint in exercise-induced weight management. *Appetite, 58,* 234-241. doi:10.1016/j.appet.2011.09.006

Butler, S., Black, D., Blue, C., & Gretebeck, R. (2004). Change in diet, physical activity, and body weight in female college freshman. *American Journal of Health Behaviour, 28,* 24-32. doi:10.5993/AJHB.28.1.3

Calfas, K. J., Sallis, J. F., Nichols, J. F., Sarkin, J. A., Johnson, M. F., Caparosa, S., et al. (2000). Project GRAD: Two-year outcomes of a randomized controlled physical activity intervention among young adults. *American Journal of Preventive Medicine, 18,* 28-37. doi:10.1016/S0749-3797(99)00117-8

Clark, M. M. Abrams, D. B., Niaura, R. S., Eaton, C. A., & Rossi, J. S. (1991). Self-efficacy in weight management. *Journal of Consulting and Clinical Psychology, 59,* 739-744. doi:10.1037/0022-006X.59.5.739

Contento, I., Balch, G., Bronner, Y., Lytle, L., Maloney, S., Olson, C., et al. (1995). The effectiveness of nutrition education and implications for nutrition education policy, programs, and research: a review of research. *Journal of Nutrition Education, 27,* 277-418.

Craig, C., Marshall, A. Sjöström, M., Bauman, A., Booth, M., Ainsworth, B., et al. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise, 35,* 1381-1395. doi:10.1249/01.MSS.0000078924.61453.FB

D'Zurilla T. J., Nezu, A. M., & Maydeu-Olivares, A. (2002). *Manual for the Social Problem-Solving Inventory-Revised (SPSI-R).* North Tonawanda, NY: Multi-Health Systems, Inc.

Donnelly, J. E., Blair, S. N., Jakicic, J. M., Manore, M. M., Rankin, J. W., & Smith, B. K. (2009). Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults*. Medicine & Science in Sports & Exercise, 41, 459-471.* doi:10.1249/MSS.0b013e3181949333

Donnelly, J. E., Hill, J. O., Jacobsen, D. J., Potteiger, J., Sullivan, D. K., Johnson, S. L., et al. (2003). Effects of a 16-month randomized controlled exercise trial on body weight and composition in young, overweight men and women: The Midwest exercise trial. *Archives of Internal Medicine, 163,* 1343-1350. doi:10.1001/archinte.163.11.1343

Elfhag, K., Rössner, S., Barkeling, B., Rooth, P. (2005). Sibutramine treatment in obesity: Initial eating behaviour in relation to weight loss results and changes in mood. *Pharmacological Research, 51,* 159-163. doi: 10.1016/j.phrs.2004.07.005

Epstein, L. H., & Squires, S. (1988). *Stoplight diet for children: An eight-week program for parents and children.* Boston, MA: Little Brown and Company.

Flegal, K. M., Carroll, M. D., Kit, B. K., Ogden, C. L. (2012). Prevalence of obesity and trends in the distribution of body mass index Among US adults, 1999-2010. Journal of the American Medical Association, 307, 491-497. doi:10.1001/jama.2012.39

Fontaine, K. R., & Cheskin, L. J. (1997). Self-efficacy, attendance, and weight loss in obesity treatment. *Addictive Behaviors, 22,* 567-570. doi:10.1016/S0306-4603(96)00068-8

Forster, J., Jeffery, R., Schmid, T., & Kramer, F. (1988). Preventing weight gain in adults: A pound of prevention. *Health Psychology, 7,* 515-525. doi:10.1037/0278-6133.7.6.515

Garn, S., Clark, D., Lowe, C., Forbes, G., Garn, S., Owen, G., et al. (1976). Trends in fatness and the origins of obesity. *Pediatrics, 57,* 443-456.

Garner, D. M., & Garfinkel, P. E. (1979). The Eating Attitudes Test: An index of the symptoms of anorexia nervosa. *Psychological Medicine, 9,* 273-279. doi:10.1017/S0033291700030762

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes Test: Psychometric features and clinical correlates. *Psychological Medicine, 12,* 871-878. doi:10.1017/S0033291700049163

Gokee LaRose, J., Tate, D. F., Gorin, A. A., & Wing, R. A. (2010). Preventing weight gain in young adults: A randomized controlled pilot study. *American Journal of Preventive Medicine, 39,* 63-68. doi:10.1016/S0306-4603(96)00068-8

Gordon-Larsen, P., Adair, L. S., Nelson, M. C., & Popkin, B. M. (2004). Five-year obesity incidence in the transition period between adolescence and adulthood: the National Longitudinal Study of Adolescent Health. *American Journal of Clinical Nutrition, 80,* 569-575.

Gordon-Larsen, P., Nelson, M. C., & Popkin, B. M. (2004). Longitudinal physical activity and sedentary behavior trends: Adolescence to adulthood. *American Journal of Preventive Medicine, 27,* 277-283. doi:10.1016/S0749-3797(04)00183-7

Gorman, B.S., & Allison, D.B. (1995). Measures of restrained eating. In D.B. Allison (Ed.), *Handbook of assessment for eating behaviors and weight-related problems.* (pp. 149-184). Thousand Oaks, CA: Sage Publishing, Inc.

Graham, M., & Jones, A. (2002). Freshman 15: Valid theory or harmful myth? *Journal of American College Health, 50,* 171-173. doi:10.1080/07448480209596023

Hagströmer, M., Oja, P., & Sjöström, M. (2007). The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity. *Public Health Nutrition, 9,* 755-762. doi:10.1079/PHN2005898

Hajhosseini, L., Holmes, T., Mohamadi, P., Goudarzi, V., McProud, L., & Hollenbeck, C. B. (2006). Changes in body weight, body composition and resting metabolic rate (RMR) in first-year university freshmen students. *Journal of American College Nutrition, 25,* 123-127.

Haslam, D. W., & James, W. P. T. (2005). Obesity. *The Lancet, 366,* 1197-1209. doi:10.1016/S0140-6736(05)67483-1

Hill, J. O., & Peters, J. C. (1998). Environmental contributions to the obesity epidemic. *Science, 280,* 1371-1374. doi:10.1126/science.280.5368.1371

Hill, J. O., Wyatt, H. R., Reed, G. W., & Peters, J. C. (2003). Obesity and the environment: Where do we go from here? *Science, 299*, 853-855. doi:10.1126/science.1079857

Hivert, M., Langlois, M., Berard, P., Cuerrier, J., & Carpentier, A. (2007). Prevention of weight gain in young adults through a seminar-based intervention program. *International Journal of Obesity, 31,* 1262-1269. doi:10.1038/sj.ijo.0803572

Hoffman, D., Policastro, P., Quick, V., & Lee, S. (2006). Changes in body weight and fat mass of men and women in the first year of College: A study of the "freshman 15". *Journal of American College Health, 55,* 41-46. doi:10.3200/JACH.55.1.41-46

Hovell, M. F., Mewborn, C. R., Randle, Y., & Fowler-Johnson, S. (1985). Risk of excess weight gain in university women: A three-year community controlled analysis. *Addictive Behaviors, 10,* 15-28. doi:10.1016/0306-4603(85)90049-8

Huang, T., Harris, K., Lee, R., Nazir, N., Born, W., & Kaur, H. (2003). Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American College Health, 52,* 83-86. doi:10.1080/07448480309595728

Institute of Medicine. (1995). *Weighing the options: criteria for evaluating weight-management programs.* Washington, DC: National Academies Press.

Jakicic, J. M., & Otto, A. D. (2005). Physical activity considerations for the treatment and prevention of obesity. *American Journal of Clinical Nutrition, 82,* 226S-229S.

Jeffery, R., & French, S. (1997). Preventing weight gain in adults: design, methods and one year results from the Pound of Prevention study. *International Journal of Obesity and Related Metabolic Disorders, 21,* 457. doi:10.1038/sj.ijo.0800431

Jeffery, R. W., Epstein, L. H., Wilson, G. T., Drewnowski, A., Stunkard, A. J., & Wing, R. R. (2000). Long-term maintenance of weight loss: Current status. *Health Psychology, 19,* 5-16. doi:10.1037/0278-6133.19.Suppl1.5

Jeffery, R. W., & French, S. A. (1998). Epidemic obesity in the United States: Are fast foods and television viewing contributing? *American Journal of Public Health, 88,* 277-280. doi:10.2105/AJPH.88.2.277

Jeffery, R. W., & French, S. A. (1999). Preventing weight gain in adults: The Pound of Prevention study. *American Journal of Public Health, 89,* 747-751. doi:10.2105/AJPH.89.5.747

Jia, H., & Lubetkin, E. I. (2010). Trends in quality-adjusted life-years lost contributed by smoking and obesity. *American Journal of Preventive Medicine, 38,* 138-144. doi:10.1016/j.amepre.2009.09.043

Klem, M., Wing, R., McGuire, M., Seagle, H., & Hill, J. (1997). A descriptive study of individuals successful at long-term maintenance of substantial weight loss. *American Journal of Clinical Nutrition, 66,* 239-246.

Klem, M. L., Wing, R. R., Simkin-Silverman, L., & Kuller, L. H. (1997). The psychological consequences of weight gain prevention in healthy, premenopausal women. International *Journal of Eating Disorders, 21,* 167-174. doi:10.1002/(SICI)1098-108X(199703)21:2<167::AID-EAT7>3.0.CO;2-J

Kral, T. V., Roe, L. S., & Rolls, B. J. (2004). Combined effects of energy density and portion size on energy intake in women. *American Journal of Clinical Nutrition, 79,* 962-968.

Kral, T. V. E., & Rolls, B. J. (2004). Energy density and portion size: their independent and combined effects on energy intake. *Physiology & Behavior, 82,* 131-138. doi:10.1016/j.physbeh.2004.04.063

Levitsky, D. A., Garay, J., Nausbaum, M., Neighbors, L., & DellaValle, D. M. (2006). Monitoring weight daily blocks the freshman weight gain: a model for combating the epidemic of obesity. *International Journal of Obesity, 30,* 1003-1010. doi:10.1038/sj.ijo.0803221

Levitsky, D. A., Halbmaier, C. A., & Mrdjenovic, G. (2004). The freshman weight gain: a model for the study of the epidemic of obesity. *International Journal of Obesity and Related Metabolic Disorders, 28,* 1435-1442. doi:10.1038/sj.ijo.0802776

Lewis, C. E., Jacobs, D. R., Jr., McCreath, H., Kiefe, C. I., Schreiner, P. J., Smith, D. E., et al. (2000). Weight gain continues in the 1990s: 10-year trends in weight and overweight from the CARDIA study. *American Journal of Epidemiology, 151,* 1172-1181.

Lloyd-Richardson, E., Bailey, S., Fava, J., & Wing, R. (2009). A prospective study of weight gain during the college freshman and sophomore years. *Preventive Medicine, 48, 256-261.* doi:10.1016/j.ypmed.2008.12.009

Lowry, R., Galuska, D. A., Fulton, J. E., Wechsler, H., Kann, L., & Collins, J. L. (2000). Physical activity, food choice, and weight management goals and practices among U.S. college students. *American Journal of Preventive Medicine, 18,* 18-27. doi:10.1016/S0749-3797(99)00107-5

Lutes, L. D., Winett, R. A., Barger, S. D., Wojcik, J. R., Herbert, W. G., Nickols-Richardson, S. M., & Anderson, E. S. (2008). Small changes in nutrition and physical activity promote weight loss and maintenance: 3-month evidence from the ASPIRE randomized trial. *Annals of Behavioral Medicine, 35,* 351-357. doi:10.1016/j.appet.2006.03.160

Matvienko, O., Lewis, D. S., & Schafer, E. (2001). A college nutrition science course as an intervention to prevent weight gain in female college freshmen. *Journal of Nutrition Education, 33,* 95-101. doi:10.1016/S1499-4046(06)60172-3

Megel, M. (1994). Health promotion, self-esteem, and weight among female college freshmen. *Health Values: The Journal of Health Behavior, Education, & Promotion, 18,* 10-19.

Molenberghs, G., & Kenward, M. (2007). *Missing Data in Clinical Studies.* Indianapolis, IN: Wiley.

Must, A., Gortmaker, S. L., & Dietz, W. H. (1994). Risk factors for obesity in young adults: Hispanics, African Americans and Whites in the transition years, age 16-28 years. *Biomedicine & Pharmacotherapy, 48*, 143-156. doi:10.1016/0753-3322(94)90103-1

National Heart, Lung, and Blood Institute (1998). *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults* (No. 98-4083). Washington, D.C.: National Institutes of Health.

National Task Force on the Prevention and Treatment of Obesity. (2000). Dieting and the Development of Eating Disorders in Overweight and Obese Adults. *Archives of Internal Medicine, 160,* 2581-2589. doi:10.1001/archinte.160.17.2581

Nezu, A. M., Nezu, C. M., Friedman, S. H., Faddis, S., & Houts, P. S. (1998). *Coping with cancer: A problem solving approach.* Washington, DC: American Psychological Association. doi:10.1037/10283-000

Nielsen, S. J., & Popkin, B. M. (2003). Patterns and Trends in Food Portion Sizes, 1977-1998. *Journal of the American Medical Association, 289, 450*-453. doi:10.1001/jama.289.4.450

Niemeier, H. M., Raynor, H. A., Lloyd-Richardson, E. E., Rogers, M. L., & Wing, R. R. (2006). Fast food consumption and breakfast skipping: Predictors of weight gain from adolescence to adulthood in a nationally representative sample*. Journal of Adolescent Health, 39,* 842-849. doi:10.1016/j.jadohealth.2006.07.001

Parmenter, K., & Wardle, J. (1999). Development of a general nutrition knowledge questionnaire for adults. *European Journal of Clinical Nutrition, 53,* 298-308. doi:10.1038/sj.ejcn.1600726

Perri, M. G., & Corsica, J. (2002). Improving the maintenance of weight lost in behavioral treatment of obesity. In T. Wadden & A. Stunkard (Eds.), *Handbook of Obesity Treatment* (pp. 357-379). New York: Guilford Press.

Perri, M. G., & Nezu, A. (1993). Preventing relapse following treatment for obesity. In A. Stunkard & T. Wadden (Eds.), *Obesity: Theory and Therapy* (pp. 287-299). New York: Raven Press.

Perri, M.G., Nezu, A. M., Patti, E.T., & McCann, K. L. (1989). Effect of length of treatment on weight loss. *Journal of Consulting and Clinical Psychology, 57,* 450-452. doi:10.1037//0022-006X.57.3.450

Perri, M. G., Nezu, A. M., & Viegener, B. J. (1992). *Improving the long-term management of obesity: Theory, research, and clinical guidelines.* New York: John Wiley & Sons.

Perri, M. G. (1998). The Maintenance of treatment effects in the long-term management of obesity. Clinical Psychology: *Science and Practice, 5,* 526-543. doi:10.1111/j.1468-2850.1998.tb00172.x

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers, 36,* 717-731.

Racette, S., Deusinger, S., Strube, M., Highstein, G., & Deusinger, R. (2005). Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. *Journal of American College Health, 53,* 245-251. doi:10.3200/JACH.53.6.245-251

Rolls, B. J., Morris, E. L., & Roe, L. S. (2002). Portion size of food affects energy intake in normal-weight and overweight men and women. *American Journal of Clinical Nutrition, 76,* 1207-1213.

Rubin, D. (1976). Inference and missing data. *Biometrika, 63,* 581-592. doi:10.1093/biomet/63.3.581

SAS Institute, Inc. (2008). *SAS Version 9.1.3.* Cary, NC: SAS Institute, Inc.

Schafer, J., & Graham, J. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7,* 147-177. doi:10.1037/1082-989X.7.2.147

Schmidt, M., Affenito, S. G., Striegel-Moore, R., Khoury, P. R., Barton, B., Crawford, P., et al. (2005). Fast-food intake and diet quality in Black and White girls: The National Heart, Lung, and Blood Institute Growth and Health Study. *Archives of Pediatric Adolescent Medicine, 159,* 626-631. doi:10.1001/archpedi.159.7.626

Schwartz, N. (1975). Nutritional knowledge, attitudes, and practices of high school graduates. *Journal of the American Dietetic Association, 66,* 28-31.

Searles, R., Terry, R., & Amos, R. (1986). Nutrition knowledge and body-image satisfaction of female adolescents. *Journal of Nutrition Education, 18,* 123-127.

Serdula, M. K., Collins, M. E., Williamson, D. F., Anda, R. F., Pamuk, E., & Byers, T. E. (1993). Weight control practices of U.S. adolescents and adults. *Annals of Internal Medicine, 119,* 667-671.

Sheehan, T. J., DuBrava, S., DeChello, L. M., & Fang, Z. (2003). Rates of weight change for black and white Americans over a twenty year period. *International Journal of Obesity and Related Metabolic Disorders, 27,* 498-504. doi:10.1038/sj.ijo.0802263

Simkin-Silverman, L., Wing, R., Boraz, M., & Kuller, L. (2003). Lifestyle intervention can prevent weight gain during menopause: results from a 5-year randomized clinical trial. *Annals of Behavioral Medicine, 26,* 212-220. doi:10.1207/S15324796ABM2603_06

Simkin-Silverman, L., Wing, R. R., Hansen, D. H., Klem, M. L., Pasagian-Macaulay, A., Meilahn, E. N., et al. (1995). Prevention of cardiovascular risk factor elevations in healthy premenopausal women*. Preventive Medicine, 24,* 509-517. doi:10.1006/pmed.1995.1081

Stunkard, A. J., & Messick, S. (1985). The three-factor eating questionnaire to measure dietary restraint, disinhibition and hunger. *Journal of Psychosomatic Research, 29,* 71-83. doi:10.1016/0022-3999(85)90010-8

Subar, A. F., Thompson, F. E., Potischman, N., Forsyth, B. H., Buday, R., Richards, D., et al. (2007). Formative research of a quick list for an automated self-administered 24-hour dietary recall. *Journal of the American Dietetic Association, 107,* 1002-1007. doi:10.1016/j.jada.2007.03.007

Tang, L., Song, J., Belin, T. R., & Unützer, J. (2005). A comparison of imputation methods in a longitudinal randomized clinical trial. *Statistics in Medicine, 24,* 2111-2128. doi:10.1002/sim.2099

U.S. Department of Labor. (2001). *Average Annual Expenditures and Characteristics of All Consumer Units, Consumer Expenditure Survey.* Washington, D.C.: U.S. Department of Labor.

U.S. Department of Labor. (2008). *Average Annual Expenditures and Characteristics of All Consumer Units, Consumer Expenditure Survey.* Washington, D.C.: U.S. Department of Labor.

World Health Organization (1995). *Physical status: The use and interpretation of anthropometry.* Geneva: World Health Organization.

Wing, R., Matthews, K., Kuller, L., Meilahn, E., & Plantinga, P. (1991). Weight gain at the time of menopause. *Archives of Internal Medicine, 151,* 97-102. doi:10.1001/archinte.151.1.97

Zimmerman, T. P., Hull, S. G., McNutt, S., Mittl, B., Islam, N., Guenther, P. M., et al. (2009). Challenges in converting an interviewer-administered food probe database to self-administration in the National Cancer Institute automated self-administered 24-hour recall (ASA24). *Journal of Food Composition and Analysis, 22,* S48-S51. doi:10.1016/j.jfca.2009.02.003

BIOGRAPHICAL SKETCH

Kathryn Ross Middleton graduated from Virginia Commonwealth University in 2006 with a B.S. in psychology. At VCU, she worked as a research assistant in the lab of Suzanne E. Mazzeo, Ph.D., working on studies investigating eating disorders and body image. Kathryn's undergraduate thesis focused on the danger of etiological ambiguity for judgments made regarding obese individuals. Kathryn worked as a statistical analyst for the Virginia Department of Health, Division of WIC and Family Services, from spring 2005 until summer 2007, when she moved to Gainesville, Florida for graduate school. In graduate school, Kathryn worked with Michael G. Perri, Ph.D., focusing on behavioral obesity intervention and weight management programs. Kathryn graduated with her M.S. in psychology in spring 2009, with her thesis focusing on the impact of weight loss and physical activity on health-related quality of life. In April 2012, Kathryn received her M.P.H. with a concentration in biostatistics from the University of Florida.

To fulfill the final requirements of her Ph.D. program, Kathryn completed her internship in clinical psychology at the Alpert Medical School of Brown University in Providence, Rhode Island. Kathryn's research interests focus on the treatment and prevention obesity, particularly in the translation of effective behavioral weight management treatment into public health level programs.