The Effectiveness of Summer Weight Loss Camp in Decreasing Body Mass Index and Increasing Self-Efficacy for Eating and Exercise

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This thesis titled
The Effectiveness of Summer Weight Loss Camp in Decreasing Body Mass Index and
Increasing Self-Efficacy for Eating and Exercise

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ABSTRACT

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Adolescent obesity is an increasingly alarming issue in the United States and abroad. This study attempted to evaluate the short- and long-term effectiveness of a summer weight loss camp for children and adolescents. Subjects were administered eating and exercise self-efficacy questionnaires before and after camp, and again four months later. In addition to self-efficacy, Body Mass Index (BMI) and girth measurements were used to gauge changes in body size and shape. Three subject groups were compared to assess the impact of the length of stay (3, 6, or 9 weeks) at camp on success. It was hypothesized that summer weight loss camp would alter the self-efficacy and body mass of subjects and that a longer length of stay at camp would lead to greater changes. The 9-week group showed the most improvement in BMI and both measures of self-efficacy when they left camp. Contradictory to the hypothesis, the 3-week group showed the most consistent improvement in BMI and self-efficacy measures at the 4-month follow-up.

Approved: _____________________________________________________________

Bruce Martin

Assistant Professor of Recreation and Sport Sciences
For Mom and Dad
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CHAPTER 1: INTRODUCTION

Obesity is an increasingly problematic issue in the United States and around the world. Currently 68.3% of adults (Flegal, Carroll, Ogden, & Curtin, 2010) and 31.7% of children (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010) in the United States are overweight or obese and world-wide there are more than 1 billion overweight adults, 300 million of whom are obese (World Health Organization, 2010). This study will assess the short- and long-term outcomes of a commercial weight loss camp on adolescent boys and girls including an investigation of the relationship between the length of stay at the camp and the amount of success achieved. Success will be defined in physiological and psychosocial terms using the Self-Efficacy Theory (SET; Bandura, 1977) as the framework for the psychosocial portions of the study. Few studies have been done with this population or this treatment.

Purpose

The purpose of this study was to evaluate the effectiveness of an existing summer camp weight loss program for adolescent boys and girls. A secondary goal was to determine if a relationship exists between the amount of time spent in the program and the degree of success experienced by the subjects. Success was defined by weight loss and improvements in self-efficacy for eating and exercise. A larger, tertiary purpose of this study was to use existing theoretical models to advance the interconnectedness of weight loss research with existing research in the social sciences.
Significance

The general body of research on exercise, physical activity, and weight loss is largely atheoretical. Although usable and reliable results still follow, the lack of a broader base for understanding the concepts and theories limits the applicability of the results to other areas of interest. The need for theory-driven investigations in the field of weight loss and management has been suggested (King et al., 1992) to advance the field and to apply findings to other social sciences. Therefore, the present study used SET as the theoretical framework.

Furthermore, this study addressed several voids in the existing literature on weight loss by focusing on a population and environment that has not previously been evaluated. The consequences of obesity in the adult population are well documented as is the fact that a large percentage of overweight adolescents become overweight and obese adults. Combating adolescent overweight and obesity is essential to ameliorate the obesity epidemic across the world. An increasingly popular method of weight control for the adolescent population is participation in weight loss summer camps. Anecdotal success stories abound on the various camp websites, but a controlled study has not been done to assess the effectiveness of this environment.

Test Site and Sample

Data collection was performed at Camp Shane, a sleep-away summer weight loss camp. Camp Shane operates like most traditional camps with activity periods for sports, arts and crafts, and free time, combined with an added focus on weight loss and behavior
change. In addition to traditional camp activities, campers participate in nutrition education classes, aerobics or gym periods, and psychological counseling sessions.

The study participants were 13-17 year-old male and female campers who experienced the same daily activities and diet throughout the summer. Throughout the summer, campers at Camp Shane are kept on a strict 1800 calorie-a-day diet and participate in at least 4 hours of physical activity. This leads to a negative daily caloric balance that induces rapid weight loss during their camp stay.

One of the major goals of camp is to increase positive perceptions about physical activity as well as to educate the campers about health and nutrition in the hope that campers will be able to continue their newly acquired healthy behaviors once they return home. Anecdotally, there is little consistency between weight loss, maintenance, and gain among campers once they have left camp.

Limitations

One major limitation of this study is that the weight loss treatment is independent of the research. Treatment variables will not be altered and subject participation in camp activities will vary slightly. Although this limitation may influence the data, it also makes the study more realistic; the test population and environment are actual people in an actual weight loss program. The researcher is only there as an outside observer.

To effectively assess long-term change, participants must be contacted several months after the treatment period has ended. Participant response to the follow-up evaluation was low; only 19% of the subject pool completed the follow-up evaluation. Previous studies that have attempted post-treatment or follow-up evaluation also cite a
lack of response as a limitation to their studies. In other studies, this lack of response has been attributed to an inability to contact participants (Ball & Crawford, 2006) and attrition from the weight loss program (Teixeira, Going, Sardinha, & Lohman, 2005) among other things.

The lack of a control group limits the applicability of this study. It was not possible to identify a population in a real-world setting that would have been similar enough to the subject population to draw useful comparisons. Several other studies evaluating treatment programs were also performed without a control group for this or similar reasons (Gallagher, Jakicic, Napolitano, & Marcus, 2006; Tiexeira, Going, Houtkooper, & Cussler, 2006). In a highly controlled, laboratory setting a control group would have been possible but, because the study was performed using an existing treatment program, a control group was not feasible.

Assumptions

Both of the self-efficacy scales used in this study are barrier self-efficacy scales. In using them, one assumption is that participants struggle with barriers to exercise and healthy eating habits. Furthermore it is assumed that this struggle may be lessened with a form of cognitive behavioral therapy and education, similar to the summer camp experience.

Hypothesis

It is hypothesized that weight loss summer camp elicits positive short- and long-term success as measured by physiological evaluations of fitness, anthropometric measurements, and increased self-efficacy for exercise and healthy eating. Secondly, the
length of time spent in the weight loss program is hypothesized to positively correlate with the amount of success experienced in both the short- and long-term assessments.

Definitions

Body Mass Index (BMI): BMI is an indirect measure of overweight and obesity. It is equal to an individual’s mass in kilograms divided by their height in meters, squared. (BMI = kg/m²) BMI is limited in that it does not distinguish between fat mass and lean mass. It is also unable to assess body fat distribution. However, BMI is a widely used and adequate measure of risk and body fatness in the general population.

Obesity: A disease characterized by excess body fat to the extent that health is impaired (World Health Organization, as cited in Boardley & Pobocik, 2009).

Self-Efficacy: The belief that one has the ability to succeed in a given task or produce a given result.
CHAPTER 2: LITERATURE REVIEW

In response to the rising rates of obesity in adolescents, the scientific community has conducted a great deal of research documenting the prevalence, consequences, and treatment options for the disease in this population. The SET (Bandura, 1977) has shown promise in guiding the treatment of this population by increasing confidence for exercise and eating habits. It has also been suggested that self-efficacy could be a powerful predictor of weight loss maintenance. The Self-Determination Theory (SDT) has also been examined in the context of a summer camp environment. The goals of increased autonomy, efficacy, and self-determination that are the foundations of the SDT are also the goals of summer camps that aim to modify behavior and encourage personal growth in adolescents. This chapter will review the body of literature related to adolescent obesity, weight loss, weight maintenance, eating and exercise behaviors, and their relationships to the SET.

Overweight and Obesity Defined

In adults, overweight is defined as having a Body Mass Index (BMI) higher than 25 kg/m². Obesity is defined by the Center for Disease Control and Prevention (CDC) and the World Health Organization (WHO) as having a BMI of greater than 30 kg/m². The National Heart, Lung, and Blood Institute (NHLBI) additionally defines central abdominal obesity as a waist circumference of 40 inches in men and 35 inches in women.

For adolescents, the definition of obesity is more complex. This is because BMI changes during normal development throughout the early and adolescent years. The CDC defines childhood and adolescent obesity according to percentile rank for age and
gender. Individuals with a BMI greater than or equal to the 95th percentile are considered obese and those with a BMI less than the 95th percentile but greater than or equal to the 85th percentile are considered overweight. Growth charts from the CDC indicating these percentiles by age for gender can be found in Appendix A.

Adolescent Obesity and Overweight

Prevalence

It has been well documented that the prevalence of obesity and overweight has been increasing in the adolescent population. The CDC reports that for children aged 12-19 years, the prevalence of obesity increased from 5% to 17.6% from 1980 to 2006 (CDC, 2010). Childhood and adolescent obesity is a complicated problem with several influencing factors. Race and socioeconomic status are two factors that correlate to obesity in both adult and adolescent populations. However, as the rates of obesity continue to rise, the effect of socioeconomic status is diminishing (Zhang & Wang, 2006), and younger adolescents (12-14 years) seem to be less affected than older adolescents (Miech et al., 2006).

Eating and exercise habits are two of the primary behaviors that control weight gain, loss, and maintenance. Low meal frequency, consumption of high caloric beverages, and skipping breakfast are all nutritional factors that have been shown to correlate with obesity. Research has also shown that recently there has been an increase in these behaviors in adolescents (Moreno et al., 2010). Cross-sectional studies have found that physical activity, an important combatant of weight gain and obesity, declines significantly between the ages of 10 and 16 (Strauss, Rodzilsky, Burack, & Colin, 2001).
Consequences

Perhaps the most dangerous consequence of being overweight at a young age is that the affected children and adolescents are more likely to become obese adults. A study cited by the CDC found that 80% of children who were overweight at age 10-15 were obese at age 25. Another found that if overweight begins before age 8, obesity in later life will probably be more severe (CDC, 2010). This generation of children, which is experiencing the highest rates of overweight and obesity, is not only suffering the consequences of childhood obesity but is being set up to endure obesity and all its comorbidities throughout their lifespans. The current childhood obesity epidemic is like a line of dominos. In the future, when they fall, the costs to individuals, society, and the health care system will be tremendous.

Obesity places an incredible amount of stress on the physiological systems of the body. As a result of this stress, the negative consequences of obesity manifest in several different organ systems throughout the body. In adults, research has revealed a positive correlation between weight and risk factors for coronary heart disease, type II diabetes, certain cancers, hypertension, dyslipidemia, stroke, liver and gallbladder disease, sleep apnea and respiratory problems, osteoarthritis, gynecological problems (CDC, 2009). Overweight and obese children are predisposed to all of these comorbidities as they age. Furthermore, this age group presents with unique complications in development and health. Obese children and adolescents are more likely to develop risk factors for certain diseases than are their peers. The development of risk factors associated with cardiovascular disease in children and young adults has raised particular alarm in the
scientific community. Overweight children have been found to exhibit a significantly higher prevalence of dyslipidemia, high fasting blood glucose levels, high glycohemoglobin levels, high systolic blood pressure, and other risk factors when compared to their healthy-weight counterparts (Skinner, Mayer, Flower, & Weinberger, 2008). These factors play an important role in the development of chronic diseases such as type II diabetes and heart disease. A positive association has also been observed between asthma and obesity in adolescents aged 13-17 years (Ahmad et al., 2009). In adolescents, the consequences of overweight and obesity are just starting to be understood because the excessive prevalence of this disease has developed much more recently in the adolescent population than in the adult population.

Entire books and literature reviews have been dedicated to summarizing and exploring the connection between obesity and its multiple comorbidities in adults. As with adolescents, the consequences are wide ranging and the great amount of physiological stress on the body causes the disease to manifest in multiple body systems. The following paragraphs summarize some of the main health concerns that overweight individuals have to manage.

Obesity is the strongest independent risk factor for the development of diabetes (Weinstein, Sesso, & Lee et al., as cited in Koopman, Swofford, Beard & Meadows, 2009). Excessive free fatty acid in the blood stream, which is often caused by excess adipose tissue, leads to insulin resistance which is a precursor to type II diabetes. It is important to note that while obesity is a major risk factor for the development of diabetes, obesity does not always result in diabetes. Instead of a direct cause and effect
relationship between obesity and diabetes, the process is mediated by several other factors. A study by Sinha et al. (2002) found that 21% of obese adolescents exhibited impaired glucose tolerance and 4% presented with type II diabetes. This may not seem like a huge crisis except that type II diabetes has previously been seen as a disease afflicting only the adult population. The fact that adolescents are experiencing these symptoms earlier in life is shocking. Because this is a relatively new phenomena, it is unknown what the consequences of adolescent diabetes will be much later in life.

Obesity has been shown to negatively impact the heart and cardiovascular systems through hyperglycemia, artherosclerosis, hypertension, dyslipidemia, excessive strain on the heart and abnormalities within the cardiac structure and function. Additionally, abdominal obesity is an independent risk factor for the development of cardiovascular disease. Some of these various factors also contribute to the development of metabolic syndrome X, which is a conglomeration of risk factors that alone do not raise alarm but together have serious implications for cardiovascular disease (Koopman et al., 2009; Schelbert, 2009). Overweight and obese adolescents also have a higher risk of hypertension and hyperlipidema which may lead to severe cardiovascular problems in later life. Because metabolic syndrome X has a negative impact on cardiovascular health and the atherosclerotic process is known to start in young children, research has begun to identify the risk that adolescent obesity poses for the development of metabolic syndrome X (Bradford, 2009). Of the obese adolescents, 28.7% meet the definition for metabolic syndrome X (Cook, Weitzman, & Auinger, as cited in Bradford, 2009), and data from the National Health and Nutrition Examination Survey (NHANES) has revealed an positive
association between the prevalence of metabolic syndrome X and BMI in children and adolescents (Weiss, Dziura, & Burgert, as cited in Bradford, 2009).

Obesity is also associated with obstructive sleep apnea, asthma, acid reflux disease, nonalcoholic fatty liver disease, and gallstone disease. While these conditions are not necessarily fatal, each contributes to the lowered quality of life of an obese individual and many can result in death if not properly treated. Disorders of the musculoskeletal system are also common among obese individuals. Osteoarthritis, plantar fasciitis, and other disabilities of the musculoskeletal system limit mobility and the potential for engaging in physical activity. Several kinds of cancers have an association with obesity as well. The malignancies correlated with obesity include but are not limited to: breast, endometrial, colon, rectal, prostate, and kidney cancers (CDC, 2009).

The effect of these associated comorbidities reaches far beyond personal struggle. The financial effect in particular places a strain on families and employers, adding to the already staggering cost of health care in America. Adult obesity is estimated to result in a 36% to 37.4% higher annual medical cost when compared to normal weight adults (Boardley & Pobocik, 2009). The medical costs of childhood obesity are not as well understood. Some studies report that there is no difference between the medical care costs of overweight and normal weight children (Skinner et al., 2008). Other studies report that overweight children have significantly more medical visits, use more mental health resources, and have significantly higher medical laboratory expenditures than their normal weight counterparts (Boardley & Pobocik, 2009).
In addition to the physiological consequences of overweight and obesity, many young people also face the damaging psychological effects of the disease. The CDC states that overweight children can be the targets of early, systematic social discrimination that can result in stigmatization, leaving the individual with low-self-esteem that affects academic and social life, often lasting into adulthood (CDC, 2010). There is also a correlation between overweight and peer relationship problems in children as young as preschool. A German study of peer relationship problems found overweight, obesity, and female gender to be significantly associated with “abnormal” peer relationships in very young children that could not be explained by confounding (Boneberger et al., 2009).

Several studies disagree that increased weight causes increased psychological stress in children. Body-image satisfaction has been shown to be lower in overweight children and adolescents, but the dissatisfaction was not significantly higher. Because of this, body-image dissatisfaction cannot be labeled as a specific marker of obesity in this population (Talen & Mann, 2009). Similarly self-esteem has been reported in normal ranges for overweight children and global-self-worth seems to be unaffected by body weight (Young-Hyman, Schlundt, Herman-Wenderoth, & Bozylinski, 2003). Talen & Mann (2009) reported that low self-concept actually seem to be a risk factor for becoming overweight, not the other way around as commonly assumed. Similarly, depression in childhood may be a risk factor for developing obesity later in life, challenging the idea that being obese causes depression.
Treatment

The biggest key to combating childhood obesity is to enact early prevention strategies. Some research has examined the effects of the pre- and peri-natal periods, finding some evidence of a connection. It is recommended that expectant mothers and new mothers carefully monitor blood sugar during pregnancy, pay attention to factors influencing placental sufficiency, and control weight before contraception and during the pregnancy to try to circumvent risk factors for child obesity (Guo, Wu, Chumela, & Roche, 2002). Several months of breastfeeding has shown a small but significant effect on preventing obesity (Arenz et al., and Bogen et al., as cited in Bradford, 2002).

As children get older, prevention strategies tend to involve the entire family for success. Family based behavioral therapy has proven to lead to weight loss in children, suggesting that inclusion of the parents in a child’s therapy is invaluable (Epstein et al., as cited in Bradford, 2002). Diet and physical activity are approached at this age from the family perspective. For instance, a poor diet in children is often addressed by examining family eating behaviors and parental control over the children’s diets. Parents are often held responsible for the children not eating breakfast or for making poor nutrition choices. Similarly, instead of addressing physical activity of the individual child, sedentary behaviors of the entire family are assessed. In particular, TV viewing is one of the best studied factors influencing childhood obesity (Neumark-Sztainer & Story, as cited in Bradford, 2009). Plans and tips to prevent and combat childhood obesity can be found through various government organizations, community initiatives, and the scientific community.
Treating overweight and obesity in adolescents and adults comes down to one simple but difficult concept: negative caloric balance. The individual must expend more calories than they consume to create a negative caloric balance which will result in weight loss. Although the idea is relatively simple, successfully and consistently creating a negative caloric balance is incredibly difficult, and success is inconsistent at best. This is especially true for the obese population of individuals who often have psychological factors affecting their diet and exercise habits that are not easily explained or consistent throughout the population. Currently, “limited knowledge exists on the dynamic relationships between mental health and obesity” (Talen & Mann, 2009, p. 287), so it can be difficult to tailor treatment to the psychological needs of an individual. Regardless of the psychological issues at work, anyone can create a negative caloric balance to induce weight loss using two simple tools: diet and exercise.

Obesity treatment for older adolescents and adults should consist of both nutrition therapy and a sound physical activity program. Nutritionally, obese individuals should be counseled and educated on nutritional topics such as portion control, macronutrient balance, food labels, food marketing gimmicks, and how to make healthy nutritional choices every day. A pre-treatment dietary assessment is a valuable tool for doctors and dietitians to create a nutritional plan that will be sensible and meet each individual’s needs. Calorie restriction rather than content restriction tends to be a widely endorsed nutrition strategy for obese individuals. This ensures that a balance of protein, fats, and carbohydrates are being consumed to ensure healthy physiological function. It is important to stress the need for nutritional counseling so that people on calorie-restricted
diets understand what an appropriate portion of food is, and so that the person doesn’t feel deprived and immediately give up (Shewmake & Huntington, 2009).

Although strict limitation of caloric intake is effective for losing weight, most health professionals recommend a more moderate approach. A good baseline is to ask the individual to decrease their daily caloric intake by 500-1000 kcal/day. This will lead to a weight loss of ½ pound to 2 pounds a week. Weight management programs based on a more moderate approach seem to have better long-term success (Strychar, 2006). In addition to increased success, a more moderate approach is safer for the individual particularly when the negative caloric balance comes from drastically cutting caloric intake. When caloric intake is below 1000 kcal/day, macronutrient deficiency and cardiac arrhythmias become a major concern (Shewmake & Huntington, 2009).

Exercise is the second essential component to reaching and maintaining the negative caloric balance that is essential for weight loss. Research has demonstrated in men that weight loss is more easily maintained by exercise than by diet alone (King, Frey-Hewitt, Dreon, & Wood, 1989). Research has demonstrated that weight loss can be achieved through caloric restriction alone, exercise alone, or a combination of exercise and caloric restriction with no significant differences between the weight loss treatments (Shalitin et al., 2009).

It is important to remember that in order for long-term weight maintenance, education is an important factor of any treatment program. Education should be a primary concern for adolescents because they will not change their dietary or physical activity habits if they don’t really understand it to begin with. Additionally, increasing an
individual’s knowledge about eating and exercise should give them confidence to control these factors, a concept known as self-efficacy.

Self-Efficacy Theory

Originally developed by Bandura (1977), the SET attributes behavior change largely to cognitive processes. This theory allows for both the environment and psychology to play a role in behavior by examining the effects of cognition on behavior as well as the effects of behavior, feedback and the environment on cognition. SET “maintains that all processes of psychological and behavioral change operate through the alteration of the individual’s sense of personal mastery or self-efficacy” (Maddux, 1995, p. 7). Self-efficacy is not only concerned with the skills a person perceives they possess but also with their confidence to use those skills. According to Bandura (1977), “people process, weigh, and integrate diverse sources of information concerning their capability, and they regulate their choice behavior and effort expenditure accordingly” (p. 212). By this process an individual’s expectations affect the process that determines goals, actions, and effort. Therefore, the expectations for a behavior can play a large role in determining the outcome for that behavior.

The SET is often considered a sub-theory and one of the most critical components of the social cognitive theory (Weingberg & Gould, 2003). The social-cognitive theory suggests that personal, behavioral, and environmental factors interact to influence the process of behavioral change. Each of these factors affects and is affected by each of the others in a continually active process (Bandura, 1986). The greatest strength of social-cognitive theory is that it offers connections between the major subfields of psychology
and allows for interpretation by other disciplines as well (Maddux, 1995). This adds support to the theory from several different contexts and allows for it to be embraced by the scientific community as a general way of understanding the factors that affect decision making and behavioral change in a variety of settings. Several studies on the relationship between psychosocial variables, physical activity, and weight loss address the issue from a social-cognitive perspective (Gallagher et al., 2006; Hardcastle & Taylor, 2001; Sallis et al., 1987).

Similar to the social cognitive theory, self-efficacy is a dynamic concept that changes with environmental factors and behavior-related feedback. The accepted determinants of self-efficacy are: performance, vicarious and imaginable experiences, verbal persuasion, as well as physiological and emotional states (Maddux, 1995). It is also important to remember that the determinants of self-efficacy come from a wide variety of sources including an individual’s cognitions, their social network, and their surrounding environment.

A primary weakness of the SET is that it focuses on the cognitive aspects of behavioral change rather than the more affective aspects such as needs, motives, values, or feelings. These ancillary factors undoubtedly have an impact on behavior that must not be forgotten when discussing self-efficacy. In fact, these external factors can often times act as extrinsic motivation until internal factors (such as self-efficacy) can develop into intrinsic motivation. Despite the narrowness of its construction, self-efficacy has been determined to have strong correlations to many health-related behaviors including physical activity participation and dietary habits.
Self-Efficacy Theory and Weight Loss

Recent research has revealed some interesting connections between self-efficacy and weight loss in the overweight and obese population. Several instruments exist to measure self-efficacy as it pertains to weight loss. Two popular scales are the Eating Self-Efficacy Scale (ESES) or the Weight Efficacy Life-Style Questionnaire (WEL) (Teixtera et al., 2005). Although there are several different variables of self-efficacy that may pertain to weight loss, commonly used scales measure the participant’s efficacy for overcoming obstacles having to do with dietary behavior, physical activity, or living a healthy lifestyle. This kind of self-efficacy is termed barrier self-efficacy.

Studies have reported that obesity treatment programs based on the social cognitive theory, the umbrella theory to self-efficacy, have achieved decreased BMI (Annesi & Whitaker, 2009) and have resulted in weight loss maintenance over time (Kruger, Blanck, & Gillespie, 2008). The specific effects of self-efficacy, including the process by which it has positive effects, are still not well understood. One study found that some elements of self-efficacy (preventing weight gain, regular exercise, eating healthy) had a significant association with current BMI while a slightly different combination (preventing weight gain, eating healthy) were significantly associated weight gain over the previous 2 years (Ball & Crawford, 2006). It has been suggested that self-efficacy may not be the sole contributor to weight loss on its own but that it may interact with other psychosocial variables as an important component of successful weight loss treatment. The same study found that increases in specific task self-efficacy were associated with positive changes in the more global but related elements of self-
efficacy: mood and body satisfaction. These findings support the SET and help to
develop understanding of both specific task self-efficacy and the positive effects it can
have on an individual’s overall attitude (Annesi & Whitaker, 2009).

Some studies that measure self-efficacy deal with global self-efficacy or self-
worth while others deal with specific task self-efficacy (i.e., a person’s confidence they
can complete a given task) or the aforementioned barrier self-efficacy (i.e., a person’s
confidence that they can complete a task despite commonly cited barriers to that task). It
is important that these global, specific, and barrier measures of self-efficacy not be
confused. Although they do interact and have an effect on each other, they do not
measure the same thing.

A great deal of research has been done to attempt to identify predictors of weight
loss success. Although there is still inconsistency in the available data, it appears that
self-efficacy best predicts weight loss success when the changes in self-efficacy are
considered rather than baseline self-efficacy (Gallagher et al., 2006). This disparity can
be explained by considering the amount of participant education that goes into a
successful weight management program. Beginners often come in knowing very little
about what exercise really feels like, what it really takes to control eating habits or how to
control either of these factors. These things are learned as the participant begins a weight
loss program. The learning that takes place during the onset stages of weight loss
treatment suggests that baseline self-efficacy may be a weak predictor of exercise and
dietary adherence and success (Teixtera et al., 2005).
It is noteworthy that “changes in both eating and exercise self-efficacy during treatment are consistently associated with weight reduction” (Teixtera et al., 2005). Each variable has been shown to independently have an effect on weight loss behaviors (Baranowski, Webber, Cullen, & Baranowski, 1999; Trost, Owen, Bauman, Sallis, & Brown, 2002). However, it remains unclear how eating and exercise self-efficacy interact to influence weight loss. It has been suggested that improvements in the self-efficacy for persisting in an exercise program may also have an effect on the persistence to maintain dietary behavior, therefore having an additive effect on weight loss (Spence et al., 2006). Few studies have attempted to further explore the interaction between eating and exercise self-efficacy.

**Self-Efficacy Theory and Exercise Behavior**

The SET has been widely used in the realm of physical activity and health (Maddux, 1995; Marcus et al., 1992, 1994). SET has been modified to examine the adoption or maintenance of physical activity. Because physical activity and exercise are major components to many weight loss programs, findings dealing with self-efficacy for physical activity or exercise are of great significance to the broader study of weight loss or maintenance. Every individual has certain beliefs about their abilities to participate in physical activity and these beliefs are thought to have an effect on the decisions people make regarding their exercise behavior. Depending on their level of self-efficacy for physical activity, a person will be more or less motivated to engage in the activity and, if forced to engage in physical activity, a person will contribute more or less effort depending on their self-efficacy for exercise. By this process a person’s physical activity
self-efficacy plays a dominant role in determining their overall level of physical activity and as a result, their overall health.

In an attempt to guide clinical treatment of overweight and obesity, some research has focused on self-efficacy as a pre-treatment predictor of weight loss success. A study that assessed the role of psychosocial factors with exercise prescription adherence found that self-efficacy was positively correlated with physiological health at base line but that baseline self-efficacy was not significantly different for completers or drop outs (Jones, Harris, Waller, & Coggins, 2005). As with weight loss self-efficacy, the change in self-efficacy from baseline may be a stronger predictor of success than the baseline self-efficacy alone because of all the education that takes place to increase the self-efficacy.

As mentioned in the previous section, the change in exercise self-efficacy over time seems to be an important factor in exercise adherence. A gym-based study in the United Kingdom (Jones et al., 2005) found that baseline exercise self-efficacy did not distinguish between participants who successfully completed a 12-week physical activity program and those who dropped out. However, the participants who completed the program experienced a positive shift in exercise self-efficacy while those who did not complete the program experienced a negative shift in exercise self-efficacy. Annesi and Whitaker (2009) found that even small changes in self-efficacy, in addition to other psychosocial factors, explained a significant proportion of exercise session attendance. The same study went on to suggest that increases in specific task self-efficacy were associated with positive changes in mood and body satisfaction. This supports self-
efficacy theory in both specific situations and in the idea that increasing self-efficacy in one aspect of life can have positive effects on an individual’s overall attitude.

Other studies suggest that self-efficacy at the end of an exercise intervention rather than the change in self-efficacy from baseline is a suitable predictor of long-term success (Blanchard et al., 2007). Also differentiating between short- and long-term success, one study using specific measures of task self-efficacy and barrier self-efficacy found that the association between exercise adherence and barrier self-efficacy lasted during and after treatment while the association with task self-efficacy was weakened over time (Blanchard et al., 2007). This suggests that while a participant is in the intervention phase, both task and barrier self-efficacy are important to adherence but after the intervention is complete, barrier self-efficacy becomes more important than task self-efficacy.

A good deal of research has been done using the self-efficacy theory to better understand the trend of child and adolescent inactivity. Cross-sectional studies have included a variety of results when dealing with self-efficacy and physical activity in children and adolescents. For instance, obese children report significantly lower physical activity self-efficacy (Trost, Kerr, Ward, & Pate, 2001); barrier self-efficacy was reported to positively correlate with self-reported physical activity as well as moderate and vigorous physical activity (Motl et al., 2007; Motl et al., 2005); and for pre-teen and teenage girls self-efficacy scores correlated with time spent in high level activity but not moderate level activity (Strauss et al., 2001). Although the research on self-efficacy and
physical activity in adolescents is in the beginning stages, self-efficacy appears to be a promising theory to guide future research.

While some longitudinal research has been done linking self-efficacy to exercise or physical activity adoption, the majority of this research in children and adolescents is cross-sectional. Given the success of relating change in self-efficacy and post-treatment self-efficacy to exercise adherence in the adult population, longitudinal studies could provide valuable information on the successful treatment of childhood and adolescent obesity and should be pursued in the future course of research.

**Self-Efficacy Theory and Dietary Behavior**

In addition to the adoption of a consistent exercise program, regulation of dietary behavior is an important component of maintaining a neutral or negative caloric balance to produce weight maintenance or loss. The relationship between eating self-efficacy and dietary behavior has been assessed almost exclusively in the adult population with promising results. Additionally, most of this research focuses on dietary behavior for health benefits and disease prevention or treatment rather than for weight loss or maintenance.

One study that focused on nutrition for weight loss found that eating self-efficacy was significantly related to fiber intake, fruit intake, and vegetable intake but not fat intake in a sample of overweight and obese middle-aged men (Hagler et al., 2007). One study was performed with college students enrolled in a class to curb overeating based on cognitive behavioral therapy as subjects. While not statistically significant, the gains in
eating self-efficacy for this group also translated into weight loss (Irwin & Guyton, 1997).

In general the research on eating self-efficacy is not as evolved as the research for exercise self-efficacy. There is a need for longitudinal studies examining the role of pre-treatment eating self-efficacy and change in eating self-efficacy in aiding long-term dietary control as well as weight loss and management. Other populations could also benefit from more targeted study of eating self-efficacy including the overweight/obese population and the adolescent population. Eating self-efficacy is an important factor for the overweight population because it seems to play an important role in eating behavior regulation with does have an effect on weight management. Eating self-efficacy may be an important factor for a young population to improve because they are in a time of development where life-long habits and skills are forming.

Short-Term and Long-Term Results of Weight Loss Therapies

The length of time of the treatment or intervention program may play an important role in short- and long-term success. Currently there is little consistency among intervention program length when treating overweight and obesity. Cognitive behavioral therapy based interventions have been studied using treatment lengths of six months (Gallager, Jakicic, Napolitano, & Marcus, 2006). Because of this varied research, recommendations cannot be made about the best length of treatment. Similarly, the relationship between treatment time and short- and long-term success is not well understood.
Short-Term Results

A recent study by Gallagher et al. (2006) attempted to further the research of psychosocial variables and weight loss by testing a treatment program that was specifically designed to modify eating and physical activity behaviors. They also defined success by weight loss category and physical activity category, the latter of which had yet to be considered. The intervention program lasted for 6 months and consisted of weekly group sessions focusing on social cognitive theory and strategies to alter energy balance through diet and physical activity lifestyle modifications. All prescribed exercise was home based with brisk walking reported as the most used exercise modality.

This study supported previous research by affirming that self-efficacy is one of several statistically significant factors determining the level of success in a behavioral based weight loss program. Gallagher et al. (2006) also found that while most behavioral processes measured seemed to play an important role, cognitive processes seemed to be less important. The most significant correlates of weight loss in this study were shown to be self-efficacy, decisional balance, all barriers to physical activity (time, effort, and obstacle), and enlisting social support (a behavioral process technique). A greater difference in psychosocial variables was seen when comparing levels of physical activity as opposed to levels of weight loss. The behavioral variables that showed significance when analyzed by activity level were: average behavioral process scores, substituting behaviors, committing oneself, and reminding oneself. This suggests that behavioral processes, which are the target of lifestyle change programs, appear to affect physical activity more than weight loss. This division might not be as prevalent in long-term
results however as it is widely assumed that increased, prolonged physical activity will lead to weight loss. This study concluded that a particular psychological makeup is not required to successfully lose weight and that interventions should address barriers to physical activity rather than increasing the knowledge of participants (Gallagher et al., 2006).

The study done by Gallagher et al. (2006) assessed the subjects before and after treatment only. A follow-up assessment would have also been very helpful in determining if the changes made in activity level affected by psychosocial variables eventually lead to weight loss or weight maintenance over a longer period of time. Also, it cannot be assumed that the changes in activity level were sustained.

A study done by Teixeira, Going, Houtkooper, and Cussler (2006) evaluated how the changes in psychosocial variables correlate with success in a weight management program. As discussed earlier, it seems that assessing changes in self-efficacy may be a better predictor of success than self-efficacy at baseline. Their subjects underwent four months of weekly behavioral modification sessions in addition to unsupervised physical activity. Subjects’ psychosocial variables were tested at baseline, 4 months (post-treatment), and 16 months (one year after treatment completion). Several changes in psychosocial variables during treatment were found to significantly and independently predict short-term weight loss. Increases in cognitive eating restraint and exercise self-efficacy and reductions in perceived barriers were all associated with short-term weight loss. The long-term results (weight maintenance results) and are discussed in the following section.
Foster, Wadden, Swain, and Stunkard (1998) also found that several psychosocial factors related to eating affected weight loss. Similarly to Teixeira et al. (2006), they found that while initial scores on an inventory were not predictive of success, the amount of change a subject experienced on some of the subscales correlated with their level of success over the 5 to 6 month treatment course. Particularly they saw that the greater increases in eating restraint were associated with the greatest amount of weight loss. Foster et al. (1998) also examined the relationship between baseline Eating Inventory scores and initial anthropometric data, finding a strong relationship between the two.

**Long-Term Results**

For most people the struggle to lose weight is quickly followed by the struggle to maintain weight loss. Across a variety of populations, about 50% of individuals who begin a physical activity program will drop out within 3 to 6 months (Dishman, 1988). For this reason, information on the long-term success or failure of physical activity programs is essential to identifying weaknesses in physical activity facilitation and weight loss intervention. Research done comparing psychosocial variables to long-term weight loss and maintenance have focused on the following goals: using baseline psychosocial variables as a predictor of attrition or success, and assessing changes in psychosocial variables over the course of a weight reduction program including their association with weight loss.

The study performed by Teixeira et al. (2006) focused on the change in psychosocial variables that occurred over the time of treatment and the associations of these changes with short- and long-term weight loss. The short-term results of this study
were discussed in the previous section; the long-term, or weight maintenance, results are discussed here.

Teixera et al. (2006) found that exercise related variables (e.g., self-efficacy, perceived barriers, and intrinsic motivation) were the strongest correlates to overall 16-month weight change. Exercise motivation was found to best predictor of success during the weight maintenance phase but other exercise related variables were also statistically significant. They were also able to determine that “a significant part of the association between exercise motivation and 16 month outcomes is due to processes taking place exclusively after treatment, before and after controlling for weight change during the initial treatment.” (Teixeira et al., 2006, p. 185)

The results support the idea that change in self-efficacy over a treatment period seems to play an important role in success, particularly after a treatment program has ended. This suggests that behavioral and cognitive modification that takes place over a relatively short treatment period can have lasting effects on weight loss and maintenance. The study supports lifestyle modification and behavioral change as an appropriate, effective means of treating and preventing overweight and obesity. This suggests that practitioners should focus on attempting to improve psychosocial correlates of weight loss for continued success in weight maintenance. Teixeira et al. (2006) concluded that the “associations [between changes in psychosocial variables and weight loss and maintenance success] are due primarily to processes taking place while treatment is ongoing, as no additional relationship could be detected between … variables and changes in body weight after treatment was completed” (p. 185).
The long-term effects of changes in self-efficacy and other social cognitive factors have not been as well documented as the short-term effects. It is still unclear what factors play a role in the long-term success or failure of a weight management program. This void in the research presents a particularly important aspect that can be studied to improve the quality of weight loss intervention programs and equip them to elicit long-term success.

Connection to the Current Study

Adolescent overweight and obesity is a growing problem in both its prevalence and its severity. The implications for future generations are immense. It is imperative that (a) we begin to understand the complex relationship between the psycho-social factors influencing weight gain, loss, and maintenance so that we can address this disease in the future, and (b) we begin to prevent the early onset of this disease and equip weight loss practitioners to treat it once it arises as effectively as possible. It is important to know not only the short-term success of a program but also the long-term success.

Therefore, the present study was developed to identify the influence that the length of stay at camp plays on the short- and long-term changes in anthropometric measurement, physical fitness, and self-efficacy for eating and exercise. Pre, post, and follow-up assessments were done to assess campers’ weight, behaviors, and self-efficacy for eating and exercise. The results were then compared between groups of campers who stayed at camp for 3, 6, or 9 weeks.

It was hypothesized that participating in the activities and dietary regimen of a summer weight loss camp would elicit positive effects in terms of weight, physical
health, and self-efficacy for eating and exercise. Secondarily, it was hypothesized that the longer a participant stays at camp, the more change he or she will experience in both the short- and long-term.
CHAPTER 3: METHODS

Site

Camp Shane is a weight loss summer camp situated in the Catskill Mountains in upstate New York. Founded in 1968, Camp Shane is the oldest weight loss camp in existence and continues to set standards of success for similar summer camps. Boys from age 7 to 17 and girls from age 7 to 23 are eligible to attend Camp Shane.

Although it is a weight loss camp, weight loss is not the only goal at Camp Shane. Camps Shane strives to create a friendly, supportive and nonthreatening environment where campers can grow and have fun while achieving their goals of physical health and weight loss. Various sports, creative activities, special events, and nonstructured leisure time accompany more traditional modes of exercise such as aerobics or gym time. This physical activity is combined with an 1,800 calorie a day diet to elicit weight loss and health gains. Despite the numerous testimonials of Camp Shane’s success, no empirical study has been done to verify its effectiveness.

Sample

The population used for this study is a group of 94 male and female campers at Camp Shane from 13-17 years old. Selection was based on camp divisions; three female and two male camp divisions were chosen to participate in the study. A division is a group of cabins housing campers of similar ages that participate in the same weekly activities. Subjects in this study ranged in BMI upon arrival at camp from 22.55 to 51.41. The average BMI for subjects was 35.15 ± 6.22.
Instruments and Assessments

For the purposes of this study it was necessary to measure physiologic variables, physical activity and dietary habits, and barrier self-efficacy for eating and exercise. Assessment of these variables at baseline, post-treatment, and 4 months post-treatment identified the effectiveness of the program for weight loss, health benefits, behavioral change, and psychological change related to behavior maintenance.

Physiologic Assessment

*Height and Weight*

Height and weight measurements can be useful in tracking changes over time. Although not perfect for gauging obesity or health risks, height and weight measurements are the simplest measurements to obtain and they can provide useful information. In addition, height and weight data are commonly collected by numerous agencies concerned with overweight and obesity throughout the life span. Because of this, even without ideal validity, height and weight measurements provide a realistic and practical assessment that relates to health and success in an applied setting.

Height and weight measurements can also be combined to determine an individual’s BMI. Height was measured using a stationary tape measure mounted to the wall and weight was assessed using digital scales that were calibrated weekly. Since BMI is a height to weight ratio, it does not take into account a person’s relative amount of fat mass and lean body mass making it an inaccurate and not entirely valid measure of obesity. BMI is strongly correlated with body fat in the general population but introduces large amounts of uncertainty when used alone due to its indirect assessment of body
fatness (St. Jeor, 1997). Although BMI is an indirect measure of overweight and obesity, it is commonly used in the real world by insurance companies and hospitals as a measure of overall health. An improvement in BMI could have a large, positive impact in a person’s life even though it reports a measure body mass and height rather than actual adiposity.

BMI is defined as weight in kilograms divided by height in meters squared. A BMI of 18.5-24.9 is considered the ‘normal weight’ classification; a BMI of 25.0 or higher is considered overweight; and, a BMI of 30.0 or higher is considered obese for both male and female adults. Morbid or sever obesity is defined as having a BMI over 40.0 (Baechle & Earle, 2008). Classifications of BMI for children and adolescents (ages 2-19) are based on percentile ranking that is age and sex specific instead of a set number. Children in the 85th to 95th percentile for their age and sex are classified as overweight. Those who are above the 95th percentile are classified as obese with those who are above the 99th percentile classified as morbidly obese (CDC, 2010). Body weight and age charts with percentiles from the CDC may be found in the appendix.

Girth Measurements

Girth measurements are another kind of anthropometric measurement that is noninvasive and relatively easy to obtain. Girth measurements can provide valuable information about shifting body proportions as the body loses fat mass. Commonly measured sites for weight loss programs are the: neck, upper arm, chest or bust, waist, hip, thigh, and calf.
Waist circumference is a commonly used girth measurement that is used as an indicator of abdominal obesity. The visceral adipose tissue that is associated with central adiposity is highly correlated with hypertension, coronary heart disease, type II diabetes, and increased mortality risk. The measurement of waist circumference is complicated by a lack of agreement among the scientific community regarding test sites and techniques. There are four commonly used sites for waist circumference measurements used throughout the literature. Waist circumference measurements measured at different sites are not interchangeable, and so, are not comparable (Wang et al., 2003). However, there is no uniformly accepted approach to increase accuracy and consistency. For the purposes of this study, waist circumference was measured at the top of the naval when the subjects’ arms were resting at their sides. The measuring tape was held perpendicular to the long axis of the body and parallel to the floor and tightened until it conformed to the body’s shape.

The waist-to-hip ratio is derivative from two girth measurements. This measurement is considered to be an indicator of health risk or risk of developing health risk because it measures how fat is stored in the body. There are two primary patterns of fat storage in the overweight and obese population: android and gynoid. The android pattern is characterized by storing fat mainly around the abdomen causing the waist girth measurement to be larger than the hip measurement. The gynoid pattern is characterized by storing fat mainly below the waist around the hips and thighs. The android body type is correlated with higher rates of obesity related diseases such as cardiovascular disease, hypertension, and type II diabetes to name a few (Azizi, Esmaillzadeh, Marmiran, &
Ainy, 2005; DeLemos, 2006; Qiao & Nyamdorj, 2010). As an approximation, women with waist-to-hip ratios of more than 0.8 and men with ratios of more than 1.0 are at increased risk for disease because of their body fat distribution.

The chronic diseases presaged by the waist-to-hip ratio are typically observed in the adult population. However, this test is important in younger populations as well because of the rising prevalence of these severe diseases, such as diabetes, in the adolescent and youth population. A decrease in waist-to-hip ratio at a younger age could have a huge impact on disease prevention and so is considered to be extremely practical and important to the success of a weight loss program for health benefits.

Camp Shane Exercise Testing

*Physical Fitness Tests*

In addition to the physiologic variable described above, data on physical health will be collected using Camp Shane’s pre- and postcamp exercise tests. These tests include sit-up, push-up, sit and reach, and shuttle run components. They are intended to measure the health-related fitness components of cardiovascular endurance, muscular endurance, and flexibility. Unfortunately, Camp Shane does not adhere to rigorous standards for physical health assessment so the findings from these variables cannot be related to other studies, baseline data, or even be assumed to be reliable or valid. However, this data may provide insight into the changes in physical fitness that occur throughout the summer and will hopefully obtain results that prompt further, more precise research into the physical changes that result from attending a weight loss camp.
Behavioral Assessment

The following behavioral assessments attempt to generally understand a person’s habits regarding physical activity and diet. These assessments were done before treatment and during a follow-up examination, to provide valuable information on behavioral changes initiated by the treatment as well as the long-term success or relapse from program.

Seven-Day Physical Activity Recall

The Seven-Day Physical Activity Recall (Sallis et al., 1985) has been used in numerous epidemiological studies assessing physical activity and its relationship to other health related factors. It was first published in 1984 for use in the Stanford Five-City Project (Sallis et al., 1985). Since this time, several studies assessing the reliability and validity of the Seven Day Physical Activity Recall have been conducted, with slightly mixed results.

One such study conducted by Washburn, Jacobsen, Sonko, Hill, and Donnelly (2003) assessed the validity of this instrument in young adults (age 17-35) using doubly labeled water as the “gold standard” measure of energy expenditure. They found that there were no significant differences in total daily energy expenditure between doubly labeled water and the seven day physical activity recall for the total sample, for men, or for women. However, they noted that energy expenditure estimates on an individual basis were subject to error. They concluded that the Seven-Day Physical Activity Recall can reasonably estimate the activity level of a group but that a high level of individual variability limits the use of this instrument on an individual basis (Washburn et al., 2003).
The Food Habits Questionnaire

The Food Habits Questionnaire is an assessment of dietary quality. This questionnaire is qualitative in nature, looking for estimations rather than exact intake of a variety of foods. This instrument is very practical in comparison to other methods of assessing dietary quality. It is relatively short, easy to administer, and noninvasive. It is also more familiar or meaningful to study participants because it deals with “the general types of foods eaten and methods of preparation [rather] than with food or nutrient consumption patterns” (Silverstein, Scott, & Zahart, 1997, p. 282). The Food Habits Questionnaire was developed and tested for use in the RENO diet-heart study with the goal of assessing global aspects of dietary quality and food habits related to cardiovascular disease and cancer (St. Jeor, 1997).

The Food Habits Questionnaire consists of 49 questions asking about food consumption and habits within the last month. Responses are charted on a 5-point Likert scale ranging from “I don’t use this food” to “usually or always: 3 to 7 times/week.” Questions are phrased so that behaviors resulting in better nutritional quality are scored higher. A frequent intake of grains, vegetables, fruits, low-fat and fat-reduced foods, results in a higher score. For high-fat foods and foods in the “other” group, less frequent intake results in a higher score.

Self-Efficacy Theory Based Assessments

For both the eating and exercise self-efficacy assessments, barrier self-efficacy instruments were selected to remain consistent with the contemporary research (Gallagher et al., 2006; Motl, Dishman, Saunders, Dowda, & Pate, 2007; Motl et al.,
2005; Teixeira et al., 2005) and because some research has shown barrier self-efficacy to be a better correlate of behavior than task self-efficacy (Blanchard et al., 2007). A copy of the Eating Self-Efficacy Scale and the Self-Efficacy for Exercise Questionnaire are included in Appendix B.

*The Eating Self-Efficacy Scale*

The Eating Self-Efficacy Scale, developed by Glynn & Ruderman (1986), is a 25-item barrier self-efficacy scale. That is, the Eating Self-Efficacy Scale measures how confident a subject is that they can overcome barriers to control their overeating. The Eating Self-Efficacy Scale was chosen for this study because of its prior use in similar research (Irwin & Guyton, 1997) and because it is a barrier self-efficacy measure. The scale consists of 15 items assessing eating in negative affect situations (i.e., feeling upset, annoyed, angry, etc.) and 10 items assessing eating during socially acceptable circumstances (i.e., holidays, parties, when hungry, etc.). Responses are recorded on a 7-point likert scale ranging where a low score is associated with no difficulty controlling eating and a high score is associated with the most difficulty controlling eating. The item scores are summed and, as a result, total scores for the Eating Self-Efficacy Scale range from 25-175 with low total scores signifying more eating self-efficacy and high scores signifying less eating self-efficacy.

Construct validity of the Eating Self-Efficacy Scale was assessed using a principal components factor analysis that revealed two reliable factors: eating because of negative affect and eating during socially acceptable circumstances. The Eating Self-Efficacy
Scale demonstrated predictive validity, adequate internal consistency (Cronbach alpha = 0.92), and test-retest reliability (r+0.70, p<0.001) (Glynn & Ruderman, 1986).

The Self-Efficacy for Exercise Questionnaire

The Self-Efficacy for Exercise Questionnaire is a 14-item instrument that has been used in a few studies on exercise adherence and health. The questionnaire items were developed for a study comparing the ability of two theoretical models, self-motivation and self-efficacy, in predicting long-term adherence to aerobic exercise (Garcia & King, 1991). For this study, the questionnaire was developed at Stanford University, following the guidelines set by Bandura in 1977 (Wilcox, Sharpe, Hutto, & Granner, 2005). The questionnaire asks subjects to rate their confidence to exercise in a variety of situations that have previously been shown to be major barriers to exercise.

The Self-Efficacy for Exercise Questionnaire and similar measure of barrier related self-efficacy have been administered in adult populations (Garcia & King, 1991) or in the elderly population (Resnick & Jenkins, 2000) with great success. More recently, research has focused on expanding the use of the scale into more diverse populations (Wilcox et al., 2005). Even in populations that are diverse in age, gender, weight, and education, the Self-Efficacy for Exercise Questionnaire seems to provide a reliable and valid measure of self-efficacy.

Garcia & King (1991) tested the reliability properties of the questionnaire. They found that the internal consistency of the questionnaire at baseline was high with Cronbach’s alpha = 0.90. The test-retest correlation for this study was 0.67 (p<.001).
Self-efficacy was also shown to be predictive of exercise adherence between months 1-6 and 7-12, providing support for concurrent criterion-related validity. In this comparison study, self-efficacy was found to be the superior method of predicting long-term adherence to aerobic exercise.

Wilcox et al. (2005) wanted to further assess the psychometric properties of this questionnaire in a more diverse population. They conducted a factor analysis to determine whether the scale represented one or more factors. They found that each item on the scale had a factor loading that exceeded 0.40, suggesting that all items on the questionnaire should be retained. The results were consistent across several demographic variables including age, gender, race, weight, and level of education. Wilcox et al. also found internal consistency to be high and this consistency was demonstrated across every subgroup with Cronbach’s alpha ranging from 0.90 to 0.94. Eliminating items from the scale did not increase alpha in any of the subgroups. This study also supported the Self-Efficacy for Exercise questionnaire with concurrent criterion-related and convergent validity by comparing the results to established trends in physical activity, self-efficacy, and demographic variables. They concluded that this questionnaire seems to be a valid and reliable measure for use in diverse populations.

Procedures

Parental consent forms were sent via e-mail to the parents of campers enrolled in Camp Shane before their arrival on camp by Camp Shane staff. In addition, the researcher was present during the precamp check in process to speak with parents about the study and obtain consent. The following day, campers whose parents had consented
to the study were gathered to begin the pretest. Before the questionnaire packet was
handed out, the researcher described the study in full and campers were given the option
to participate voluntarily. Camper assent forms were collected prior to handing out the
questionnaire packet.

The questionnaire packet handed out during the precamp testing session included
a page asking for contact information that was immediately disaggregated from the rest
of the data and kept locked up until the contact information was needed. The precamp
packet also included questions about demographic data, the Seven-Day Physical Activity
Recall, the Food Habits Questionnaire, the Self-Efficacy for Exercise Questionnaire, and
the Eating Self-Efficacy Scale. Data was coded using a combination of the subject’s birth
date and initials. Upon collection, contact information was disaggregated from the data
and a master key linking participants to their data code was be kept by the researcher. All
data, contact information, as well as the master key were kept locked with access limited
to the researcher. Anthropometric and physical assessment data for the precamp period
were collected from camp records.

Two days prior to departure, participating campers were gathered for the
postcamp test. The postcamp questionnaire packet contained the eating and exercise self-
efficacy assessments. Behavioral assessments were omitted from this test because all
campers have a shared experience of physical activity and eating habits on camp that is,
for the most part, out of their control. Because of this, postcamp behavioral assessments
would not reflect the freedom of choice and ability to control habits that are the important
results of these assessments. Anthropometric and physical assessment data for the postcamp period were collected from camp records.

Four months after the participant had left Camp Shane, the researcher e-mailed a follow-up questionnaire packet to them using the contact information they supplied during the pretest. The follow-up assessment included questions about current weight, the Eating Self-Efficacy Scale, and the Self-Efficacy for Exercise Questionnaire. The behavioral assessments were omitted from the follow-up assessment after analysis of the precamp data was not successfully collected. Many campers did not fill out these, lengthier, assessments or blatantly did not read each item carefully before answering (i.e., answering “2” for every item). It was concluded that omitting these items from the follow-up assessment may increase the response rate and response quality.

Analysis

Descriptive statistics were calculated for the dependent variables for each assessment period and for each group. Descriptive statistics were also performed on the entire subject pool at the pretest to analyze any differences between groups and create an understanding of what a typical camper is like.

Long-term change data was first analyzed using a 3 x 3 mixed measures ANOVA to measure the effect of length of stay at camp and time and the effect of each of these factors individually. When statistical significance was achieved with the mixed measures ANOVA, paired sample t-tests were performed. Short-term change for each variable was analyzed using one-way ANOVA and paired sample t-tests.
Correlations were performed between a variety of variables to assess the strength of the relationship between variable. Pertinent to this study are the relationships between BMI and self-efficacy for eating and exercise. These correlations are presented when they were statistically significant or practically important.

To assess the internal consistency of scales, reliability analysis was performed to determine the Cronbach’s alpha was for the Eating Self-Efficacy Scale and the Self-Efficacy for Exercise Questionnaire. The two component subscales, negative affect situations and socially acceptable situations, of the Eating Self-Efficacy Scale were also analyzed for reliability.
CHAPTER 4: RESULTS

Ninety-seven parents consented to their children participating in the study. Of these, 94 children agreed to participate and completed the precamp assessment. Seventy-three of these campers completed the posttest questionnaire. Thirty of these were in the 3-week trial group; 39, in the 6-week group; and 4, in the 9-week group. Only 20 participants completed the follow-up questionnaire; 9 of these were from the 3-week group; 8, from the 6-week group; and 3, from the 9-week group. There was a drastic difference in the number of participants who completed all three assessments and those who completed only the pre- and postassessments. Because of this, statistical analysis regarding the short-term change included all subjects who completed the pre- and posttests so that a larger subject pool could be used (n = 73). When analyzing the long-term effectiveness, only the smaller subject pool was used (n = 20). Data reported in tables includes all valid responses for each assessment and period.

Due to inconsistency in the data collection process, none of the physiologic assessments were used in determining the success of the groups. The camp staff who performed the assessments were improperly trained and did not maintain consistency between the pre- and posttests or between subjects. Because of this, the physical fitness assessments were not valid or reliable and for the purposes of this study were useless. Similarly, the behavioral assessments, the eating habits questionnaire and the physical activity assessment, were not used because many of the subjects either did not fill them out or because the responses were not unique (i.e., circling “2” for every question on an assessment). While it is unfortunate that the physiologic assessments, the eating habits
questionnaire, and the physical activity assessment were not able to be used, anthropometric measurements and both self-efficacy assessments were used and practically relevant results were achieved.

The 3-, 6-, and 9-week subject groups were similar in terms of ethnicity. The 3- and the 6-week groups had a similar proportion of male to female subjects. In the 9-week group, that proportion was nearly reversed. The 9-week subject group exhibited a very small sample size that may have influenced the significance of the statistics run for this group. The number, ethnicity, and gender proportion are listed below.

Participants in the 3-week group had a mean age of 15.1 ± 1.37 years. Of the 30 participants in this group, 20% were male and 80% were female; 77% were Caucasian, 3% were African American, 17% were Hispanic, and 3% classified themselves as “other.” For 87% of the subjects, this was their first time at a summer weight loss camp.

Participants in the 6-week group had a mean age of 14.69 ± 1.34 years. Of the participants in this group, 18% were male and 82% were female; 77% were Caucasian, 13% were African American, none were Hispanic, and 10% classified themselves as “other.” For 70% of the subjects, this was their first time at a summer weight loss camp.

Participants in the 9-week group had a mean age of 15.36 ± 1.91 years. Of the participants in this group, 75% were male and 25% were female; 50% were Caucasian, 25% were African American, none were Hispanic, and 25% classified themselves as “other.” For 50% of the subjects, this was their first time at a summer weight loss camp.
Anthropometric Measurements

*Body Mass Index*

All groups of campers experienced a decrease in BMI during their stay at camp. The average short-term change in BMI for all campers participating in this study was 

\[-3.28 \pm 1.58\] points. A summary of the average BMI for each group at each assessment and the changes in BMI for each group are presented in Table 1.

**Table 1**

*Average Values and Changes for Body Mass Index*

<table>
<thead>
<tr>
<th>Measure</th>
<th>3 weeks</th>
<th>6 weeks</th>
<th>9 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Camp</td>
<td>33.85 ± 6.46</td>
<td>34.53 ± 5.51</td>
<td>40.65 ± 3.78</td>
</tr>
<tr>
<td>Post-Camp</td>
<td>31.75 ± 5.82</td>
<td>30.77 ± 4.91</td>
<td>34.06 ± 3.32</td>
</tr>
<tr>
<td>Follow-Up</td>
<td>28.68 ± 4.19</td>
<td>31.11 ± 6.02</td>
<td>34.13 ± 1.66</td>
</tr>
<tr>
<td>Pre-Post Camp Change</td>
<td>-2.11 ± 0.94</td>
<td>-3.81 ± 1.15</td>
<td>-6.59 ± 1.22</td>
</tr>
<tr>
<td>Pre-Follow-Up Change</td>
<td>-2.74 ± 2.08</td>
<td>-3.76 ± 2.40</td>
<td>-4.83 ± 9.67</td>
</tr>
<tr>
<td>Post-Follow-Up Change</td>
<td>-0.80 ± 1.83</td>
<td>-0.25 ± 1.65</td>
<td>1.25 ± 1.72</td>
</tr>
</tbody>
</table>

Short-term change in BMI was analyzed by one way ANOVA to compare the pre-post difference between the subject groups. Subjects elicited a greater decrease in BMI the longer their duration at camp. This pre-post change was significantly different for all
subject groups (p<.001). The change in BMI from the beginning of camp and end of camp was not statistically significant between any of the subject groups (p>.05).

The pre-post change in BMI was analyzed by paired-sample t-test for each subject group. The 3-week group experienced a mean change in BMI of -2.11 ± .94 points. This decrease is statistically significant (p<.001). The 6-week group experienced a change in BMI of -3.81 ± 1.15 points. This decrease was also statistically significant (p<.001). Although the 9-week group experienced a greater quantitative decrease in BMI (-6.59 ± 1.22 points) than the 3- or 6-week groups, the reduction was not statistically significant (p>.05). This is most likely due to small sample size.

The long-term BMI changes were analyzed by 3 x 3 mixed measure ANOVA to examine the effects of the time (precamp, postcamp, and 3 months after camp) and the length of stay at camp (3, 6, or 9 weeks) on BMI. No significant interaction was present for time x length of stay. The main effect for time was significant (F(2,34) = 55.64, p<.001) while the main effect for length of stay was not significant (F(2,17) = 1.241, p > .05).

The 3-week group exhibited a statistically significant change in BMI from the pretest to the follow-up period (p<.01). The change in BMI from the posttest to the follow-up period was not statistically significant (p>.05). The 6-week group also achieved statistical significance between the pre-camp and follow-up periods (p<.01) but not the postcamp and follow-up periods (p>.05). The 9-week subject group did not achieve statistical significance when comparing the pre- or postcamp scores for BMI to the follow-up scores. For the 9-week group, this lack of significance may be due to the
small sample size. For the 3- and 6-week groups, this indicates that a significant amount of weight was lost during camp but that weight change after camp was not significant. T-tests were not performed to compare the change in BMI between groups because this measure was not shown to be statistically significant through the 3 x 3 mixed measure ANOVA.

**Girth Measurements**

All subject groups experienced a nonsignificant increase (p>.05) in waist to hip ratio during their time at camp. Despite the nonsignificant increase in waist to hip ratio, all subject groups experienced a decrease in waist girth between the pre- and postcamp periods that was significant for the 3- and the 6-week subject groups. A summary of waist to hip ratio and waist girth averages and changes for each group table 2. The 3-week group lost an average of 1.76 ± 4.07 inches from their waist girth. This change was statistically significant at the p = .05 level. The 6-week group experienced a larger decrease in waist girth of 2.69 ± 5.18 inches. The change in the 6-week group was statistically significant at the p = .01 level. The 9-week group experienced a decrease in waist girth of 2.38 ± 8.58 but statistical significance was not achieved, probably due to the small sample size.
Table 2

*Average Change (Inches) in Waist Girth and Waist to Hip Ratio*

<table>
<thead>
<tr>
<th>Measure</th>
<th>3 weeks</th>
<th>6 weeks</th>
<th>9 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Waist Girth Measurement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Camp</td>
<td>41.82 ± 6.82</td>
<td>41.26 ± 6.01</td>
<td>45.75 ± 7.90</td>
</tr>
<tr>
<td>Post-Camp</td>
<td>40.06 ± 6.20</td>
<td>38.62 ± 5.74</td>
<td>43.37 ± 2.06</td>
</tr>
<tr>
<td>Pre-Post Camp Change</td>
<td>-1.76 ± 4.07</td>
<td>-2.69 ± 5.18</td>
<td>-2.38 ± 8.58</td>
</tr>
<tr>
<td><strong>Waist to Hip Ratio</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Camp</td>
<td>0.90 ± 0.090</td>
<td>0.88 ± 0.12</td>
<td>0.91 ± 0.19</td>
</tr>
<tr>
<td>Post-Camp</td>
<td>0.92 ± 0.16</td>
<td>0.88 ± 0.07</td>
<td>0.97 ± 0.05</td>
</tr>
<tr>
<td>Pre-Post Camp Change</td>
<td>0.02 ± 0.18</td>
<td>0.00 ± 0.10</td>
<td>0.06 ± 0.17</td>
</tr>
</tbody>
</table>

Eating Self-Efficacy

The Eating Self-Efficacy Scale is a barrier self-efficacy scale; a high score on this test is indicative of the individual having a high degree of difficulty controlling their eating behavior. When interpreting scores from this scale it is important to remember that a lower score is more desirable and thus a decrease in the score represents positive change. The maximal score on this test is 175; the minimum score is 25. A summary of the averages for each collection period and the changes for each group is presented in Table 3.
Table 3

*Averages and Average Change in Eating Self-Efficacy*

<table>
<thead>
<tr>
<th>Measure</th>
<th>3 weeks</th>
<th>6 weeks</th>
<th>9 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Camp</td>
<td>83.98 ± 29.08</td>
<td>85.84 ± 31.23</td>
<td>114.5 ± 31.92</td>
</tr>
<tr>
<td>Post-Camp</td>
<td>85.31 ± 28.16</td>
<td>81.29 ± 26.54</td>
<td>97.75 ± 39.63</td>
</tr>
<tr>
<td>Follow-Up</td>
<td>64.87 ± 23.61</td>
<td>93.29 ± 23.08</td>
<td></td>
</tr>
<tr>
<td>Pre-Post Camp Change</td>
<td>-1.34 ± 18.19</td>
<td>-5.46 ± 26.53</td>
<td>-16.75 ± 51.53</td>
</tr>
<tr>
<td>Pre-Follow-Up Change</td>
<td>-19.57 ± 14.08</td>
<td>-3.33 ± 35.17</td>
<td></td>
</tr>
<tr>
<td>Post-Follow-Up Change</td>
<td>-16.21 ± 12.53</td>
<td>0.57 ± 29.17</td>
<td></td>
</tr>
</tbody>
</table>

*Reliability Analysis*

The internal consistency of the Eating Self-Efficacy Scale was analyzed using Cronbach’s Alpha. The Eating Self-Efficacy Scale was shown to be reliable for the pretest (\(\alpha = 0.951\)), posttest (\(\alpha = 0.954\)), and follow-up (\(\alpha = 0.949\)) assessments.

The negative affect situation and the socially acceptable situation subscales of the Eating Self-Efficacy Scale were also analyzed using Cronbach's Alpha for the pre, post, and follow-up assessments. The negative affect subscale was shown to be reliable for the pretest (\(\alpha = .957\)), posttest (\(\alpha = .954\)), and follow-up (\(\alpha = .959\)) assessments. The socially acceptable situation subscale of the ESES was shown to be reliable for the pretest (\(\alpha = .904\)), posttest (\(\alpha = .895\)), and follow-up (\(\alpha = .851\)) assessments.
Short-Term Changes

All groups experienced a change in eating self-efficacy during the time spent at camp. The average short-term change in Eating Self-Efficacy Scale scores was $-4.54 \pm 25.36$, indicating that, on average, campers experienced an increase in eating self-efficacy during the time they spent at camp. In other words, campers felt they would have less trouble controlling their eating at the end of camp as compared to the beginning of camp. The change in eating self-efficacy was analyzed by one way ANOVA to compare the three subject groups. The postcamp change in eating self-efficacy score decreased slightly (indicating an increase in self-efficacy) with the length of stay between all subject groups. Only the 9-week group showed statistical significance compared to the 3- and 6-week groups ($p<.05$). The magnitude of the pre-to postcamp change was $-1.35 \pm 18.19$, $-5.45 \pm 26.53$, and $-16.75 \pm 51.53$ for the 3-, 6-, and 9-week groups respectively. The short-term change in eating self-efficacy was not statistically significant for the 3-, 6-, or 9-week groups ($p>.05$).

Long-Term Changes

A 3 x 3 mixed-design ANOVA was calculated to examine the effects of the time (precamp, postcamp, and 3 months after camp) and the length of stay at camp (3, 6, or 9 weeks) on eating self-efficacy score. No significant interaction was present for time x length of stay ($F(4,22) = .523, p > .05$). The main effect for time was not significant ($F(2,22) = .825, p>.05$). The main effect for length of stay was also not significant ($F(1,11) = 3.067, p > .05$).
Correlations

A Pearson correlation coefficient was calculated for the relationship between subjects’ BMI and eating self-efficacy before camp. Pretest BMI was weakly, positively and yet significantly correlated with pretest eating self-efficacy across all groups ($r(87) = .261, p< .05$) indicating a weak but reliable relationship between the two variables before camp intervention. This indicates that before coming to camp, campers with higher BMIs were more likely to have lower eating self-efficacy.

Exercise Self-Efficacy

The Self-Efficacy for Exercise Questionnaire asks subjects to rate their confidence in overcoming common barriers to exercise. When interpreting scores from this scale it is important to remember that a higher score represents higher self-efficacy for exercise. The maximal score on this test is 100 and the minimum score is 0. The average scores and changes in exercise self-efficacy are presented in table 4.

Reliability Analysis

The internal reliability of the Self-Efficacy for Exercise Questionnaire was analyzed using Cronbach’s Alpha. The questionnaire was shown to be reliable for the pre ($\alpha = 0.911$), post ($\alpha = 0.897$), and follow-up ($\alpha = 0.935$) assessments.
Table 4

*Averages and Average Change in Exercise Self-Efficacy*

<table>
<thead>
<tr>
<th>Measure</th>
<th>3 weeks</th>
<th>6 weeks</th>
<th>9 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Camp</td>
<td>41.67 ± 19.00</td>
<td>50.22 ± 20.60</td>
<td>27.17 ± 2.33</td>
</tr>
<tr>
<td>Post-Camp</td>
<td>50.88 ± 16.64</td>
<td>61.19 ± 18.72</td>
<td>56.73 ± 24.40</td>
</tr>
<tr>
<td>Follow-Up</td>
<td>58.93 ± 24.96</td>
<td>49.87 ± 18.43</td>
<td>50.00 ± 0.00</td>
</tr>
<tr>
<td>Pre-Post Camp Change</td>
<td>9.20 ± 14.50</td>
<td>11.38 ± 14.44</td>
<td>29.57 ± 22.52</td>
</tr>
<tr>
<td>Pre-Follow-Up Change</td>
<td>15.04 ± 23.36</td>
<td>0.00 ± 15.04</td>
<td></td>
</tr>
<tr>
<td>Post-Follow-Up Change</td>
<td>2.63 ± 19.17</td>
<td>-12.47 ± 13.31</td>
<td></td>
</tr>
</tbody>
</table>

*Short-Term Changes*

All groups experienced a positive short-term change in exercise self-efficacy. The average change for all subjects was +11.572 ± 16.45 indicating an increase in self-efficacy for exercise. The average change in exercise self-efficacy score increased as the length of stay at camp increased. The average change for the 3-, 6-, and 9-week groups were +9.54 ± 14.90, +11.19 ± 16.11, and +30.43 ± 23.23 respectively. This change was statistically significant for the 3- and 6-week groups (p<.001). Despite the marked increase in exercise self-efficacy of the 9-week group, statistical significance was not achieved, most likely due to the small sample size.
The change in exercise self-efficacy was analyzed by one way ANOVA to compare the difference between subject groups. The postcamp change in exercise self-efficacy score increased with the length of stay, indicating that exercise self-efficacy increased with length of stay at camp. However, this change was only significant between the 3- and 9-week groups (p<.05). No significant difference was found between the 3- and 6-week groups or the 6- and 9-week groups.

**Long-Term Changes**

A 3 x 3 mixed-design ANOVA was calculated to examine the effects of the time (precamp, postcamp, and 3 months after camp) and the length of stay at camp (3, 6, or 9 weeks) on self-efficacy for exercise score. No significant interaction was present for time x length of stay (F(4,22) = 1.332, p > .05). The main effect for time was significant (F(2,22) = 5.187, p < .05). The main effect for length of stay was also not significant (F(1,11) = .107, p > .05).

The follow-up changes were then analyzed by paired-sample t-tests from both the pre- and postcamp test periods to the follow-up period for each subject group. None of the long-term changes in exercise self-efficacy were statistically significant, regardless of their direction. The 3-week group was the only subject group that continued to show non-significant improvements in exercise self-efficacy after camp. The follow-up score for exercise self-efficacy was not statistically significantly different from either the pre- or postcamp score in the 3- or the 6-week group (p>.05). The 9-week group was unable to be tested due to the small sample size.
**Correlations**

A Pearson correlation coefficient was calculated for the relationship between subjects’ BMI and self-efficacy for exercise before camp. Pretest BMI was weakly, negatively, and significantly correlated with pretest self-efficacy for exercise across all groups \((r(80) = -.243, p<.05)\) indicating a weak but reliable relationship between the two variables before camp intervention. This indicates that before coming to camp, campers with higher BMIs were more likely to have lower scores for self-efficacy for exercise.

Pearson correlation coefficients were also calculated to try to look at the relationship between the pre, post, and follow-up self-efficacy for exercises scores and the change in those scores. There was a significant relationship between the follow-up self-efficacy for exercise scores and the change between self-efficacy for exercise between the pre- and follow-up tests \((r(16) = .740, p<.01)\) and the post- and follow-up tests \((r(15) = .655, p<.01)\). Neither the pre- or posttest scores were significantly associated with either of the changes in self-efficacy for exercise. This indicates that self-efficacy before camp and even after camp do not have relationship with the change in self-efficacy at the follow-up period.

A significant, positive correlation \((r(15) = .631, p<.05)\) also existed between change in BMI and self-efficacy for exercise between the posttest and follow-up periods. A significant correlation did not exist between the change in BMI and eating self-efficacy \((r(15) = .161, p = .566)\), indicating that for this subject group the change in exercise self-efficacy is more related to the change in BMI than the change in eating self-efficacy.
There is also a weak but significant correlation ($r(66) = -.317, p<.01$) between the posttest scores for eating and exercise self-efficacy across groups. This indicates that self-efficacy scores at the end of camp were somewhat predictive of each other. Both measures of self-efficacy were either high or low for an individual camper at the end of camp. It cannot be determined if the increase in one measure of self-efficacy influences the other directly or if both measures are independently increased.
CHAPTER 5: DISCUSSION

Although several of the tests and questionnaires that were originally supposed to be used in the analysis were rejected, the data that were used were still able to show some insight into what is happening to campers' bodies and level of self-efficacy during and after their time at camp. The purpose of this study was to assess the effectiveness of a summer weight loss camp as a treatment option for adolescent overweight and obesity. It was hypothesized that campers would experience a positive change in BMI, girth measurements, and self-efficacy for eating and exercise. Additionally, it was hypothesized that campers who spent the longest amount of time at camp would experience the greatest amount of success in both the short- and long-term.

Anthropometric Measurements

Body Mass Index

The 3- and 6-week subject groups exhibited a statistically significant change in BMI from precamp to the follow-up study. The 9-week group, although not statistically significant, also decreased it’s BMI between the precamp and the follow-up study. This suggests that spending time at camp does elicit weight loss that persists after camp has ended. It is interesting to note that of the three subject groups, only the 3-week group continued to lose weight after camp. The 6- and 9-week groups gained a small portion of weight back, though, this weight gain was not significant.

Length of stay at camp was shown to have a stronger influence on short-term success than long-term success as indicated by BMI. This suggests that while length of stay may play a small role in the long-term behavior change of campers affecting their
weight, there are undoubtedly other factors at work after campers return home that influence long-term results. This result supports the findings of Teixeira et al. (2006) who found that much of the relationship between exercise motivation and long-term success is due to a process that takes place exclusively after the treatment period has ended.

Girth Measurements

The increase in waist to hip ratio exhibited by all subject groups was not expected. An increase in waist to hip ratio has been shown to correlate with an increased risk for chronic diseases (Azizi et al., 2005; Qiao & Nyamdorj, 2010). This increased risk is a result of a greater proportion of fat being stored in the abdomen. After weight loss, the subjects in this study did not lose weight proportionately. They lost weight from their hips at a greater rate than their abdomen, leading to a higher waist to hip ratio. This does not necessarily translate to a greater disease risk because they also lost fat from their abdomen.

Waist circumference is not measured consistently across studies because there is no uniformly accepted approach on what part of the abdomen to measure. Because of this, waist girth measurements from different studies should not be compared. Although waist circumference is a less standardized measure of disease risk, it has been shown to correlate with the risk of developing chronic diseases and a decrease, as long as it is measured consistently within a study, has implications for disease prevention. (Wang et al., 2003) On average the subjects decreased their waist circumference by $2.38 \pm 4.77$
inches. This suggests that, despite an increase in waist to hip ratio, subjects are losing abdominal fat and decreasing their risk for disease.

Follow-up measures of waist to hip ratio and hip girth were not obtained. Because follow-up assessments were sent by e-mail, accuracy and consistency in the girth measurements could not be assured.

Self-Efficacy Scales

Reliability analysis confirmed the validity of the Eating Self-Efficacy Scale and the Self-Efficacy for Exercise Questionnaire. This further establishes the reliability of these scales for future research and adds to the consistency and comparability of the current body of research.

Correlations between precamp BMI and self-efficacy for eating and exercise support the idea that an individual's beliefs about their ability to control their eating and exercise habits are in fact correlated with their level of overweight and obesity. In other words, the results support the self-efficacy theory. It is important to note that the correlation of BMI and self-efficacy does not imply a casual relationship. It cannot be determined from correlations if lower self-efficacy causes increased BMI, if higher BMI causes lower self-efficacy, or if there is another factor mediating and confounding the relationship. All that is known is that at the pre camp test, a lower self-efficacy for eating and exercise correlated with a higher BMI and vice versa.

_Eating Self-Efficacy_

Although statistical significance was not achieved, it is interesting to note that the increases in eating self-efficacy were of greater magnitude for the subject groups that
stayed at camp longer. Along with the education about making healthy nutritional choices, campers also learn what an appropriate portion size is, how much they struggle with cravings, and how difficult it can be to eat appropriately to obtain a negative caloric balance. More important than anything that they learn, campers get to experience feelings of success when it comes to food choices for possibly the first time in their lives. This feeling of success may play an important role in increasing their eating self-efficacy.

*Exercise Self-Efficacy*

The effect of length of stay at camp was much clearer for self-efficacy for exercise than for eating self-efficacy. It was interesting that neither the pre or post scores for self-efficacy for exercise were predictive of the change in self-efficacy after camp. This suggests that there are other factors at work that play a role in the retention of self-efficacy for exercise. Although it was not significant, the magnitude of the increase in self-efficacy for exercise increased with the length of stay at camp. The 9-week group, although not statistically significant, experienced the greatest increase in short-term self-efficacy change.

*Effectiveness by Length of Stay*

The present study shows that campers who attend Camp Shane for 3, 6, or 9 weeks experience a decrease in BMI that persists at least four months after camp. Camp Shane was also successful in generating short-term increases in self-efficacy for eating and exercise across all subject groups.

Short-term, the 9-week group elicited the highest decrease in BMI and increases in both self-efficacy for eating and exercise indicating that a longer stay at camp results
in the greatest short-term benefits. However, the 3-week group seems to have elicited the best long-term results. The 3-week group was the only subject group to continue to decrease BMI after the end of camp. The 3-week group was also the only group that did not experience a decrease in self-efficacy for exercise or eating during the follow-up period and in fact continued to increase self-efficacy during this period although changes were not statistically significant. This result is contradictory to the hypothesis of this study.

Because it contradicts the hypothesis, the mechanisms by which the 3-week group achieved the highest success in the long-term should be explored. It is possible that the metabolism of the 3-week group was less impacted than the 6- or 9-week groups by the rapid weight change because of the shorter time they were subjected to it. This would make it easier for their body to continue to adapt, at a slower rate, at home. Perhaps the 3-week group experienced their short time at camp while constantly remembering and preparing for the environment at home because of their shorter stay. This may have caused them to have a more realistic view of their self-efficacy postcamp that was not further decreased upon their return home. The campers who stayed for a longer period of time may have developed a dependency on the camp environment to control their exercise and eating because of the length of time they spent there. Campers who stayed for a shorter period of time may not have been able to develop these dependencies.

Limitations

One of the greatest limitations of this study is the lack of a control group. Because of this, a conclusion that the results were the effect of the weight loss camp
treatment cannot be drawn. However, similar studies have used an experimental design without a control group when a suitable control group could not be found (Gallagher, Jakicic, Napolitano & Marcus, 2006; Tiexeira et al., 2006) as in this case. Meaningful results are still found but care must be exercised when utilizing the results.

The applicability of the long-term results of this research is greatly limited by the small subject population who completed the follow-up questionnaire. With such a small sample size, statistical significance was more difficult to obtain and the full effect of the camp may not have been demonstrated in the long-term. The short-term results are more applicable but the sample size is still relatively small, particularly for the 9-week subject group. In addition to the small sample size of the follow-up population, it is important to note that the follow-up weight measurement was self-reported. This may introduce some inaccuracy to the follow-up data.

Another limitation was the small degree of influence the researcher had in camp activities and weight loss treatment. Because of this limitation, the physiologic assessments were unusable for the purposes of this study. Additionally, the researcher was unable to control any variables of day to day camp life. While inconvenient, this limitation at least provides a realistic weight loss treatment that is reproducible. With greater control over the camp treatment, more accurate investigations could determine what variables are causing changes in eating or exercise self-efficacy.

Future Directions for Research

The American College of Sports Medicine recommends a slow, steady weight loss of 1-2 pounds per week to successfully maintain a lower body weight. This is
because faster weight shedding, particularly when sustained over longer periods of time, has been hypothesized to lead to disturbances in the metabolic system that force the body into “starvation mode.” In this state, the body becomes highly efficient, expending energy only when necessary making it very difficult to lose or maintain weight. Most campers in this study exceeded the suggested 1-2 pound per week deficit. It is interesting that of the three trial groups, only the 3-week group continued to decrease the average BMI during the posttest period. In the future, researchers may want to investigate the metabolic consequences of the rapid weight shedding and how long it takes for a camper's metabolism to return to normal. This type of research may be able to determine if a weight loss camp is actually detrimental to long-term success in weight loss.

Understanding the direct effect of the fitness and nutrition education classes would be an important step to tailoring the lifestyle education program at camp. It would also be interesting to assess the quality and quantity of either education program on the camper's change in self-efficacy and long-term success with weight loss.

The effect of gender was not assessed in this study. Gender can play an important role in fat storage patterns, particularly when looking at the android and gynoid patterns of overweight and obesity, that may have influenced the data in this study. It would also be interesting to assess the differences in the ability of males and females to lose and maintain weight under these circumstances.

Implications for Professional Practice

This study suggests that short periods at a summer weight loss camp are better for creating long-term success and longer periods are better for creating short-term success.
Although future research would have to be done to understand the mechanisms behind why longer-stay campers are less successful postcamp, some practical implications can be made. When considering a treatment protocol for overweight or obese adolescents, administrators should try to increase self-efficacy for eating and exercise through education and cultivating short-term success. Exercise self-efficacy seems to play a more important role than eating self-efficacy for this age group and so should receive greater attention during the treatment period. Participants should be encouraged to develop skills that they will be able to use independently after camp. Additionally, participants should be monitored to ensure that they are not losing weight too quickly. Diet and activity level should be adjusted to keep participants in the 1-2 pounds lost per week range for the greatest chance at long-term success.

The scientific community is far from understanding the complex problem of adolescent obesity. From development to treatment to psychosocial factor that influence it, the current obesity epidemic is a multifaceted crisis. Through consistent and continued research, the many remaining questions can start to be answered and appropriate solutions may start to arise.
REFERENCES


APPENDIX A: CDC HEIGHT AND WEIGHT CHARTS

CDC Growth Charts: United States

Body mass index-for-age percentiles:
Boys, 2 to 20 years

Published May 30, 2000.
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
APPENDIX B: ASSESSMENTS

Eating Self-Efficacy Scale

For each of the situations below, rate the likelihood that you would have difficulty controlling your overeating. Circle one number for each situation using the scale below.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>No difficulty</td>
<td>Moderate difficulty</td>
<td>Most difficulty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example: If you thought you had great difficulty controlling your eating when you are at parties, you might complete the item specifying parties in this way:

Over eating at parties  
DIFFICULTY CONTROLLING EATING  
(circle one for each item)

Please complete every item  
How difficult is it to control your...

1. Overeating after work or school?  
2. Overeating when you feel restless?  
3. Overeating around the holidays  
4. Overeating when you feel upset?  
5. Overeating when tense?  
6. Overeating with friends?  
7. Overeating when preparing food?  
8. Overeating when irritable?  
9. Overeating as part of a social occasion dealing with food (like at a restaurant or dinner party)?  
10. Overeating with family or friends?
<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>21.</td>
<td>Overeating when there is a lot of food available to you (refrigerator is full)?</td>
<td>[1]</td>
<td>[2]</td>
<td>[3]</td>
<td>[4]</td>
<td>[5]</td>
</tr>
</tbody>
</table>
Self-Efficacy for Exercise Questionnaire

INSTRUCTIONS:
Many people report that it is more difficult to get themselves to exercise under some conditions than others. For the next several questions, please rate how CONFIDENT you are, from 0% to 100%, that you could exercise under each of the following conditions over the NEXT SIX MONTHS. Please write in a confidence rating for EVERY LINE. Do NOT leave any lines blank.

Confidence Scale:

<table>
<thead>
<tr>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at All confident</td>
<td>Somewhat Confident</td>
<td>Absolutely Confident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Over the next six months I could exercise:

<table>
<thead>
<tr>
<th>Confidence Rating (0-100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. when tired.</td>
</tr>
<tr>
<td>2. during or following a personal crisis.</td>
</tr>
<tr>
<td>3. when feeling depressed.</td>
</tr>
<tr>
<td>4. when feeling anxious.</td>
</tr>
<tr>
<td>5. during bad weather.</td>
</tr>
<tr>
<td>6. when slightly sore from the last time you exercised.</td>
</tr>
<tr>
<td>7. when on vacation.</td>
</tr>
<tr>
<td>8. when there are competing interests (favorite TV show).</td>
</tr>
<tr>
<td>9. when you have a lot of work to do.</td>
</tr>
<tr>
<td>10. when you haven’t reached your exercise goals.</td>
</tr>
<tr>
<td>11. when you don’t receive support from family or friends.</td>
</tr>
<tr>
<td>12. following complete recovery from an illness which has caused you to stop exercising for a week or longer.</td>
</tr>
<tr>
<td>13. when you have no one to exercise with.</td>
</tr>
<tr>
<td>14. when your schedule is hectic.</td>
</tr>
</tbody>
</table>
INSTRUCTIONS:

Please rate how CONFIDENT you are that you could participate in your assigned exercise program for the specified number of sessions per week over the NEXT SIX MONTHS.

1. Over the next six months, I could participate in my assigned exercise program FOUR times a week _____________