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Megan Light Date

The Effects of Goal Setting on Health Outcomes: An Evaluation of 2015 Camp Strong4Life

By

Megan Light
Master of Public Health

Hubert Department of Global Health
Emory University

_____

Felipe Lobelo, MD, PhD, FAHA
Committee Chair

_____

Farrah Keong, MPH
Committee Member

_____

Jean Welsh, PhD, MPH, RN
Committee Member

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By

Megan Light

Bachelor of Science
Emory University
2014

Thesis Committee Chair: Felipe Lobelo, MD, PhD, FAHA

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Abstract

The Effects of Goal Setting on Health Outcomes:
An Evaluation of 2015 Camp Strong4Life

By Megan Light

Background: 35% of children in Georgia are overweight or obese. This growing epidemic is concerning because of the health, social, and economic consequences. Evidence supports a range of obesity prevention and control interventions including school programs, policy change, and immersive programs. Camp Strong4Life, a healthy lifestyles summer camp, uses educational programming and skills building to improve the habits of campers and their families. Goal setting is used in many behavior change programs, however, its effectiveness in improving health outcomes in children has limited support. This study aims to assess the effect of goal setting on health related outcomes.

Methods: This analysis includes anthropometric, quality of life (QOL), sugar-sweetened beverage (SSB) consumption, physical activity, and goals data for youth 9 to 17 years old with a BMI greater than the 85^{th} percentile. Complete data was available for 52 youth who attended the 1-week camp in June/July 2015 and completed both baseline and follow-up over a 4-month period. T-tests were used to determine changes in health outcomes among goal achievers and non-achievers. A multivariate linear regression model was created to assess correlates of change in BMI z-score.

Results: The mean age of campers was 12.3 years; most were female (69.2%) and African American (69.2%). Physical activity goal achievers (n=31) saw significant reductions in BMI z-score, fat percent, and SSB consumption, and improvements in QOL and light physical activity ($p<0.05$). Compared to non-achievers (n=21), youth achieving physical activity goals showed significant reductions in BMI z-score and sedentary minutes per day ($p<0.05$). Nutrition goal achievers (n=35) saw significant improvements in QOL, SSB consumption, and light activity ($p<0.05$). There were no significant differences in outcomes between nutrition goal achievers and non-achievers. The multivariate model found age, registrant type, QOL, and physical activity goal progress as significant correlates of change in BMI z-score.

Discussion: This study indicates that Strong4Life campers showed significant improvements in anthropometric, QOL, nutrition, and physical activity behaviors, particularly among youth reporting to have achieved their physical activity goals, providing support for the use of goal setting in behavioral interventions. Caution must be used in generalizing these findings because of small sample size.

The Effects of Goal Setting on Health Outcomes: An Evaluation of 2015 Camp Strong4Life

By

Megan Light
B.S., Emory University, 2014

Thesis Committee Chair: Felipe Lobelo, MD, PhD, FAHA

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Chapter 1: Introduction

1.1 Childhood Obesity Epidemic

Over one third of children and adolescents in the United States are considered overweight or obese. Over the last 30 years, childhood obesity has more than doubled in children and quadrupled in adolescents (United States CDC 2015). In the state of Georgia, 35% of children between 10 and 17 years old are overweight or obese (Kaiser Family Foundation 2015).

Childhood and adolescent obesity are of significant concern because of the short and long term health effects, social consequences, and economic costs. Obese children are at a higher risk of over 20 chronic diseases including cardiovascular disease, stroke, diabetes, some cancers, and sleep apnea and are also at a high risk of remaining obese as adults (DiClemente et al. 2009; Kirschenbaum and Gierut 2013). Obesity during childhood and adolescence has a significant impact on social and psychological health. Many problems, such as self-esteem, bullying, depression, and eating disorders, can stem from obesity and its related effects (DiClemente et al. 2009). Ultimately, there is an increased risk for decreased quality of life, social challenges, and academic difficulties (Kirschenbaum and Gierut 2013). Annual healthcare costs in the U.S. are also highly influenced by the increase in obesity rates because of both high cost of treatment and lost productivity. These costs add up to $200 billion per year in the U.S., and could increase to $400 to $500 billion per year by 2030 if current trends continue (University of Georgia Obesity Initiative 2014). If childhood and adolescent obesity rates continue to increase or even maintain current rates, individuals and society will face a huge burden that will be difficult to reverse. Therefore, it is important to build programs that aim to reverse the childhood obesity epidemic and prevent cases in the future.

1.2 Strong4Life

Strong4Life is a wellness movement of Children's Healthcare of Atlanta designed to reverse the epidemic of childhood obesity in Georgia. Strong4Life uses a combination of clinical and behavioral programming to reach children and their families through a variety of means including public awareness, social media, childcare facilities, schools, healthcare providers, and community partnerships. Nearly 1 million children in Georgia are overweight or obese and Strong4Life aims to break down the multifaceted issue into manageable lifestyle changes for Georgia families (Strong4Life 2016). Strong4Life is based on a foundation of four Healthy Habits: make half your plate fruits and vegetables, be active, drink more water and limit sugary drinks, and limit screen time (Strong4Life 2016). The focus of this study is on 2015 Camp Strong4Life ("Camp"), a healthy lifestyles summer camp and clinical treatment program designed for overweight and obese children and adolescents and their families. Camp focuses on improving healthy habits of its campers and their families through education, skills building, and a unique social support system.

1.3 Overview of the Study

This study provides an evaluation of Camp Strong4Life. Specifically, this study is focused on the role of goal setting as a component of Strong4Life's behavior change programming. Goal setting is an extensively studied field, however, support for goal setting for weight-related health outcomes and specifically with children is limited. This study intends to provide support for the effect of goal setting on health related outcomes including biometric outcomes, quality of life, nutrition behaviors, and physical activity behaviors for campers at 2015 Camp Strong4Life. Further, this study will use multivariate regression to look into significant correlates of weight loss in children.

1.4 Overview of the Literature

The following sections provide an overview on current knowledge regarding interventions for childhood obesity, goal setting theory, and predictors of weight loss in children. Chapter 2 provides more specific evidence on each topic.

1.4.1 Evidence-Based Interventions

Since the onset of the obesity epidemic, a range of intervention strategies have been used in attempt to reverse the growing epidemic. Weight gain is a result of energy intake exceeding energy expenditure. Therefore, interventions are needed to address both parts of the issue. There is a large evidence base for obesity prevention techniques including community education, environmental approaches, policy changes, clinical strategies such as weight-loss surgery, school-based programs, immersion treatment, and behavior change programs (Kelly and Kirschenbaum 2010; Holub et al. 2009; Khan et al. 2009). Obesity prevention and treatment programs that are most effective are those that offer a holistic approach to creating a healthy and supportive environment (Khan et al. 2009). A review by the Department of Health and Human Services compared effectiveness of various childhood obesity prevention programs and concluded that school-based diet or physical activity interventions, especially those with a home component, have the strongest evidence base compared to childcare-based or community-based programs (2013).

Camp Strong4Life is an immersion based behavior change program; therefore, this literature review is focused on these specific strategies. Immersion treatment is the practice of providing a "therapeutic and educational environment for extended periods of time, thereby removing [the individual] from obesogenic environments" (Kelly and Kirschenbaum 2010). Behavior change treatment, also know as cognitive behavior treatment (CBT), is a goal directed

and process oriented method used to introduce small incremental changes that can be maintained in the individual's lifestyle (Foster et al. 2005). A review by Kelly and Kirschenbaum shows that immersion based camps and residential programs have been associated with significant weight loss, and at percentages higher than those in other outpatient treatment programs (2010). This review also found that the use of CBT in conjunction with these immersive programs further contributed to positive outcomes (Kelly and Kirschenbaum 2010).

Immersion Cognitive Behavior Treatment

Many behavioral interventions combine immersion treatment and CBT, providing a holistic and supportive environment for introducing these important behavioral and psychological concepts (Kirschenbaum and Gierut 2013). CBT is useful because it can move beyond knowledge acquisition and help with an individual's decision making, self-regulation, and self-monitoring (Hoelscher et al. 2002). For example, nutrition based knowledge programs can improve an individual's knowledge about important nutrition behaviors, while behavioral interventions can help promote change in these behaviors (Hoelscher et al. 2002). Health-focused behavior programs are intended to not only reduce risk factors and teach healthy behaviors, but also to introduce the motivators and techniques necessary to engage in these behaviors (Hoelscher et al. 2002). CBT can also improve emotional and psychosocial functioning (Kelly and Kirschenbaum 2010).

Behavior therapy is based on small gradual changes through objective goals that can be practically and easily used to measure progress (Foster et al. 2005; Butryn et al. 2011). There are many components of behavioral treatment programs including self-monitoring, goal setting, stimulus control, problem solving, and reward systems (Foster et al. 2005; Butryn et al. 2011).

Goal setting serves as a directive and motivating function, as described later, while self-monitoring serves as an assessment and control mechanism over individual behavior (Baron and Watters 1981). These behavior change components are rarely evaluated alone because they often are used together as a part of the larger behavior change program (Strecher et al. 1995). Therefore, there is limited evidence of the impact of any one component, including goal setting.

1.4.2 Goal Setting Theory

In the last 30 years, goal setting has emerged as an important part of motivating human behavior change. Two organizational psychologists, Edwin Locke and Gary Latham, have provided much of the basis for goal setting theory. Evidence continues to grow supporting goal setting theory, its mechanisms, and its implications in creating and sustaining change. Goals work by controlling harmful stimuli and regulating human behavior and decision-making (Locke et al. 1981).

Goals are believed to affect performance through four mechanisms (Locke and Latham 2002; White and Skinner 1988). First, goals provide a directive function, effectively directing attention and effort away from irrelevant activities and towards activities necessary to reach the desired outcome. Second, goals provide an energizing function, motivating an individual to pursue said goal. This motivation includes both psychological motivation and physical effort. Third, goals foster persistence and commitment to relevant activities until the goal is reached. This persistence is a combination of the direction and amplitude created. Lastly, goals promote the discovery, development, and utilization of relevant knowledge and strategies, which can be continued even after reaching a goal. Strategies such as creating an action plan and problem solving are key in goal setting theory (Locke and Latham 2002; White and Skinner 1988).

Goal setting positively influences behavior change through a number of intertwined components (Locke et al. 1981). As described above, goals are motivational mechanisms that work through direction, effort, persistence, and strategy development. Goal setting is supported by social cognitive theory, as discussed below. Goal setting research has developed support for goal qualities, such as participation, commitment, specificity, and difficulty, which will be discussed later. However, many common uses for goal setting, such as goal setting for health outcomes and especially goal setting with children and adolescents, lack consistent evaluation.

Social Cognitive Theory

Goal setting theory is based in Social Cognitive Theory (SCT) (Baronowski et al. 2003; Hoelscher et al. 2002; Shilts et al. 2004; Horowitz et al. 2004; Nothwehr and Yang 2007). SCT uses a reciprocal model where both internal and external factors simultaneously influence behavior and decision-making (Hoelscher et al. 2002). Both personal factors and environmental factors are believed to be key in behavior change, and SCT identifies goal setting as a key strategy in motivating these changes (Shilts et al. 2004). SCT includes many other components, such as self-efficacy, outcome expectations, and self-regulation, which are also crucial components of successful goal setting (Horowitz et al. 2004).

Self-efficacy serves an important role in both SCT and goal setting. An individual's self-efficacy is a measure of their confidence and belief in their ability to make the necessary behavior changes to successfully attain a goal, such as weight loss (Byrne et al. 2012; Ross et al. 2010). Self-efficacy changes over time and higher self-efficacy is associated with higher commitment to healthy behavior change (Byrne et al. 2012). Weight management is particularly sensitive to self-efficacy because of the already existing importance of emotional health and self-

esteem (Ross et al. 2010). Setting manageable and realistic goals are considered effective in increasing self-efficacy and facilitating healthy behavior changes (Ries et al. 2014).

1.4.3 Correlates of Weight Loss

Along with assessing goal setting, this analysis sets out to identify factors associated with weight loss among campers at 2015 Camp Strong4Life. While previous research has been done regarding predictors of weight loss, including some research of factors in children, the results are limited and methodologies have varied extensively (Teixeira et al. 2005). However, the existing studies provide a good foundation for exploring these characteristics further. SCT and other health behavior theories suggest distinguishing between direct factors, such as behavior-specific variables like parental reinforcement of healthy eating, and indirect factors, such as more general socioeconomic and quality of life (Cislak et al. 2011).

1.5 Study Purpose, Research Questions, and Public Health Significance

Programs aimed at addressing childhood obesity are often based around behavior change treatment. Strong4Life, a Children's Healthcare of Atlanta wellness movement, aims to address childhood obesity in Georgia through public awareness, school programs, provider programs, and community partnerships. Camp Strong4Life uses a behavior change model to encourage lifestyle changes in overweight and obese children and their families. However, in order to maintain and refine the program, and other similar behavior change programs, it is important to assess the impact of the various features of the program. Goal setting is a technique that dates back to the 1970s with a generally strong evidence base. However, the use of goal setting in behavior change programs, especially those including health behaviors and a child or adolescent population, is much more limited. Further, the evidence is variable regarding what factors lead to successful weight loss in children and adolescents. In looking at correlates of weight loss, this

study considers demographic variables, baseline biometrics, quality of life, nutrition and physical activity behaviors, and a measure of progress towards one's goals. This information could help target the focus of behavior change interventions at Camp.

This purpose of this paper is twofold: (1) to determine the effectiveness of goal setting as a behavior change technique in relation to change in biometric, behavior change, and quality of life outcomes and (2) to determine the correlates of weight maintenance at Camp Strong4Life. These objectives are detailed in the following research questions:

1. **Is goal progress associated with changes in health outcomes among children aged 9-17 at Camp Strong4Life?**
    a. Is self-assessed goal progress associated with change in biometric health outcomes?
    b. Is self-assessed goal progress associated with change in quality of life outcomes?
    c. Is self-assessed goal progress associated with change in sugar-sweetened beverage consumption outcomes?
    d. Is self-assessed goal progress associated with change in physical activity outcomes?
2. **What factors are associated with weight change among children age 9-17 at Camp Strong4Life?**

This paper has a number of significant applications. Goal setting, measured through self-reported goal progress, is an easy to use and inexpensive component of behavior change programs. Evidence of an association between goal progress and health related outcomes could encourage the use of goal setting and also encourage follow-up and support for campers to reach their goals and ultimately improve health related outcomes.

Chapter 2: Literature Review

This study is at the intersection of multiple public health topics including childhood obesity, behavior-based interventions, and predictors of weight loss. Literature discussed below includes evidence for each of these subjects. The studies presented below are representative of the existing literature and are the most relevant to Camp Strong4Life in terms of target population and intervention techniques. Though there is strong existing evidence about behavior based interventions for overweight and obese children, there are gaps related to evidence on short-term summer camps, goal setting for health outcomes, and goal setting for children. Further, while research on the predictors of weight loss using behavioral interventions exists, this analysis adds to the existing literature on the topic and examines the significant correlates for change in BMI z-score for campers at 2015 Camp Strong4Life.

2.1 Interventions for childhood obesity

With the growing obesity epidemic, much research has been conducted on how to reverse the trends. Reversing this epidemic will require a comprehensive systems approach to create supportive and healthy environments. This approach includes policy initiatives, environmental changes, promotion and advertising changes, community programs, and clinical strategies, among others. The CDC's Common Community Measures for Obesity Prevention Project identified a set of strategies and recommendations for combating obesity in the U.S (Khan et al. 2009). These recommendations are within six broad categories: (1) access to healthy food and beverages, (2) supporting healthy food and beverage choices, (3) encouragement of breastfeeding, (4) encouragement of increased physical activity and decreased sedentary activity, (5) creation of communities supportive of safe physical activity, and (6) community organization for change (Khan et al. 2009).

Because weight gain is caused by an imbalance between energy consumption and energy expenditure, most interventions target both physical activity behaviors and eating habits (Holub et al. 2013). Successful interventions can take place in both the public and private areas including school-based programs, clinical strategies, policy changes, community initiatives, and individual approaches (Khan et al. 2009; Holub et al. 2013).

In terms of childhood obesity policy, the American Medical Association, for example, supports policies on healthy eating through nutrition standards in schools and bans on certain media and advertising, adequate physical activity through mandatory physical education programs, comprehensive health education programs in schools, physician education, and continued research on clinical and public health interventions for obesity (American Medical Association 2016).

Another focus of obesity prevention has been community-based programs. A 2013 review found that most of these community-based programs involve multiple components, include multiple settings (home, school, primary care, child care, community centers), and are targeted at middle school aged children or younger (Bleich et al. 2013). This review indicates that about half of community-based programs show positive changes in adiposity and obesity related outcome as well as variable changes in behavioral outcomes (Bleich et al. 2013). The review does indicate, as supported above, that programs with both a school and home component are more successful (Bliech et al. 2013).

Because of the nature of Camp Strong4Life, the focus of this review is on immersion programs and behavior change treatment.

Immersion and Behavior Change Treatment

Existing evidence strongly supports the success of behavior change treatment for childhood obesity. The most effective obesity treatment method includes diet and physical activity combined with intensive behavioral therapy and a supportive environment (Hipsky and Kirk 2002). Evidence shows that this combination can lead to significant weight loss and also maintenance over time, though more research is needed to determine to what extent (Martins et al. 2011). Strategies of obesity behavior change interventions can include goal setting, strict meal planning and portion control, self-monitoring of diet and physical activity, nutrition and activity related cognitive and behavioral strategies, and the promotion of social interaction (Nothwehr and Yang 2007).

Many of these programs are based on an immersion to lifestyle method that combines immersion treatment, CBT, and lifestyle change in order to encourage biological, cognitive, behavioral, and emotional changes (Kirschenbaum 2010). The model depends on an individual's self-regulation, behaviors, and knowledge, which lead to improved self-efficacy and increased motivation and readiness to change and maintain healthy lifestyle behaviors (Kirschenbaum 2010). Immersion CBT therapies are generally defined as 10 consecutive days and nights of participation in the controlled therapeutic and educational environment and include settings such as camps, spas, inpatient clinics, and boarding schools (Kirschenbaum 2010). Advantages of immersion programs include reduced attrition, access to individuals from across the country, and an enjoyable approach to a rooted issue (Kirschenbaum 2010). However, there is limited evidence regarding the success of shorter programs, such as Camp Strong4Life, which is only one week long.

Existing literature shows many successes in behavior-based treatment for childhood and adolescent obesity (Nemet et al. 2005; Mei et al. 2016; Kamath et al. 2008; Robinson 1999, Butryn et al. 2011). Many evidence-based behavior change interventions are introduced in schools because of the wide reach to students (Story 1999). Examples of these behavior change programs in schools include the EatFit program that uses a workbook, web-based assessment, and classroom curriculum, Planet Health, a two-year curriculum based program in middle schools, and long-term physical activity based programs (Horowitz et al. 2004; Gortmaker et al. 1999; Mei et al 2016). Overall, a review of school-based programs suggests an effect on sedentary behaviors, physical activity behaviors, and nutrition behaviors (Sharma 2006). Longer programs are also believed to have a stronger effect than shorter programs (Gonzalez-Suarez et al. 2009). HealthWorks!, a Cincinnati hospital based program, is an example of a comprehensive and interdisciplinary weight management, behavior change program aimed at children and their families outside of schools (Hipsky and Kirk 2002).

Summer Camp Setting

Existing evidence also supports the use of summer camps as a behavior change intervention for overweight and obese children. Summer camps have been used since the 1920's as treatment for children with an array of conditions or disabilities with increasing popularity and use in the United States as well as internationally (Boeder 2012). Summer camps offer services for a wide range of campers for medical issues, learning disabilities, behavior problems, and mental conditions (Boeder 2012).

Summer camps are seen as a promising therapeutic environment because of the controlled environment, educational sessions, enjoyable skill-building activities, supportive staff,

and social interaction with a group of children in a similar position with similar motivations (Boeder 2012; Kelly and Kirschenbaum 2010; Gately et al. 2005). Summer camps also offer an opportunity to collaboratively set, monitor, and reach individualized goals throughout the session with the focused attention providing a chance for the evolution of goals as a response to improvements in knowledge, skills, and behaviors (Boeder 2012). The camp setting combines the control of immersion treatment with the individualized attention of CBT interventions, such as counseling, planning, goal-setting, problem solving, self-monitoring, stress management, and the involvement of family (Patrick et al. 2011). Summer camps have a "child centered approach" where there is a commitment to a positive experience, a safe and supportive environment, and the introduction to strategies and behaviors that can be maintained after the camp session (Gately et al. 2005).

Camps designed for promoting healthy habits have increased in popularity as overweight and obesity among children and adolescents has become an increasing challenge. In 2010, close to 3,000 campers attended weight loss camps in the US (Kirschenbaum 2010). Popular weight loss summer camps include Wellspring Camps, Camp Shane, Camp Pennbrook, Camp Jump Start, and New Image Camps (Wellspring Camps 2016; Camp Shane 2016; Camp Pennbrook 2016; Camp Jump Start 2016; New Image Camps 2016). These camps range from 1.5 weeks, an option at New Image Camps, to 9 weeks, an option at Camp Shane, with the majority offering options between 4-8 weeks (Kirschenbaum 2010).

Evaluations of weight loss summer camps show evidence of positive health outcomes including significant decreases in BMI and fat mass and improvements in blood pressure, aerobic fitness, and self-esteem (Gately et al. 2005; Martins et al. 2011; Walker et al. 2003). A review by Kelly and Kirschenbaum of 22 weight loss camps and residential programs in the U.S calculated

an average reduction of 23.9% overweight and average reduction of BMI of 4.5 kg/m^2 in individuals from pre- to post-immersion (2010). Additionally, this review reported an average attrition rate lower than those usually reported for outpatient treatments (6.8% vs. 19.7% respectively) (Kelly and Kirschenbaum 2010). Most of these camps and residential programs include similar components such as controlled diet and activities, nutrition education, and intensive behavior change activities (Kelly and Kirschenbaum 2010; Kirschenbaum 2010). Wellspring Camps, which consider themselves as the "first comprehensive summer treatment programs for overweight young people," is based on a very low fat diet, 10,000 steps per day, and consistent self-monitoring. Wellspring Camps average 4 pounds of weight loss per week (Patrick et al. 2011; Wellspring Camps 2016).

Length of camp appears to show a dose-response relationship where extending the length is associated with greater weight loss (Gately et al. 2005; Martins et al. 2011). Longer residential programs can range from 4 weeks to 10 months and show reductions in BMI up to 10.8 kg/m^2 (Kelly and Kirschenbaum 2010). Follow-up studies also show that reductions in weight can be maintained significantly after one year (Martins et al. 2011; Walker et al. 2003).

Summer camps can provide a number of advantages over other education based or behavior based health interventions such as those in schools or in an inpatient setting. As an immersion program, weight loss camps minimize attrition, provide access to people from across the country and even other countries, and allow the campers to have fun and experience new things. Additionally, some camps provide campers with a post-camp support network of staff and fellow campers (Kirschenbaum 2010).

While much focus of many camps and residential programs is on dietary change and weight loss, these programs have also been shown to promote positive changes in psychosocial

functioning (Patrick et al. 2011, Walker et al. 2003). Summer camps can improve campers' self-esteem, social acceptance, sense of belonging, social support, emotional functioning, and overall quality of life (Walker et al. 2003; Patrick et al. 2011; Nabors et al. 2014). Overall, weight loss and healthy behavior summer camps show positive effects on both physical health and emotional well being.

However, there are also challenges in evaluation of these weight loss summer camps. The fun, food, and fitness project (FFFP): the Baylor GEMS pilot study was a 4-week day camp followed by an 8-week at home online intervention (Baranowski et al. 2003). The FFFP, like some other summer camps and behavioral interventions, was unable to show differences between the intervention and control groups because of limited sample size and low participation (Baranowski et al. 2003). Evaluations of programs shorter than two weeks are limited. Further, because of the multifaceted nature of camp programming, it is difficult to identify which aspects of camps are most and least impactful. In evaluations of summer camps thus far, there has been little attempt to evaluate individual components of camp programming.

Though many of the aforementioned camps consider themselves "weight loss camps," Camp Strong4Life is considered a healthy lifestyles camp because of its attention not only to weight maintenance, but to all factors related to childhood obesity including physical activity behaviors, nutrition behaviors, goal setting, family support, self-esteem, and social integration.

2.2 Evaluation of goal setting

Locke and Latham were instrumental in the development of goal setting theory in the 1970s. Since its inception, there has been a large amount of evidence supporting the mechanisms of goal setting theory. There have also been numerous investigations into factors, such as goal difficulty, goal specificity, and participatory goal setting, that lead to improved task performance

(Locke at al. 1981; Alexy 1985; Dishman et al. 2009; Cullen et al. 2001; Pearson 2012; Locke et al. 1989).

Goal Setting for Health Outcomes

Some existing research does support the idea that goal setting is a key part of health programs, particularly those that target behavior change. Specifically, there are a few existing studies that suggest an association between physical activity, nutrition, or weight related goals and subsequent weight and behavior related outcomes (Nothwehr and Yang 2007; Cullen et al. 2001; Cullen et al. 2004).

Successful health goals must be age-appropriate, individualized to an individual's needs and abilities, and include activities that the individual enjoys. Enjoyable activities are especially important for children to maintain attention, direction, and motivation (Hipsky and Kirk 2002). It is also important that the goals are truly attainable. However, as discussed in section 2.3, the attainability of a goal is difficult to characterize or quantify. A goal beyond a child or family's reach can lead to discouragement, frustration, and program attrition (Byrne et al. 2012; Locke and Latham 2002). Realistic goals not only help with achieving outcomes, but also with improving confidence and self-esteem in a child and family's ability to manage the situation (Bodenheimer and Handley 2009). There is some evidence that self-determined goals and collaboratively established goals between the patient and healthcare professional may be more effective in leading to health behavior change (Bodenheimer and Handley 2009; Pearson 2012). Especially when created with the entire family, these self-inspired goals foster a sense of self-efficacy and motivation to spark behavior change, a key component of SCT (Prince 2001). Although there are studies illustrating an association between goal setting and improved weight

related behaviors, the support is limited as other studies show conflicting results with no impact of goal setting on weight related health outcomes or physical activity or nutrition behavior change (Ries et al. 2014).

Recommendations for goal setting for health behavior change can be gathered from previous studies. These suggestions include the following: a comprehensive analysis of the patient's situation, environment, self-efficacy, and readiness to change; creating action plans including sub-goals, if necessary; ensuring the goal is difficult but not unrealistic; and including a plan for monitoring and feedback (Strecher et al. 1995; Ries et al. 2014). Nutrition goals should help shape eating behaviors and choices that are known to contribute to excess energy intake including goals related to portion sizes, fruit and vegetable intake, sugar sweetened beverage intake, and water intake (Hipsky and Kirk 2002). Physical activity goals should be aimed towards increasing activity with enjoyable activities as well as reducing screen time and sedentary behaviors (Hipsky and Kirk 2002). For best health behavior change results, goal setting should be a part of a larger intervention that includes components such as skills development, barriers counseling, involvement of primary caregivers, and consistent feedback (Ross et al. 2010; Ries et al. 2014). The program must identify the importance of the patient's environment, as identified in SCT, and the fact that goal setting and attainment will be heavily influenced by the patient's family, culture, and accessibility both during and after the intervention (Ross et al. 2010).

Goal Setting in Children

It has been determined that obesity in adults is challenging to address and nearly impossible to reverse. Interventions focused on treating and preventing childhood obesity appear

to show more successful long-term outcomes. Because the consequences of obesity last well into adulthood, preventing obesity during childhood seems to be the most effective method of preventing later adult obesity as well as other chronic diseases (Story 1999; Hoelscher et al. 2002). Further, dietary interventions are believed to sustain over time and are therefore cost-effective when implemented early in life (Hoelscher et al. 2002). As exemplified by the SCT framework, treating childhood obesity necessitates a multifaceted approach addressing nutrition and physical activity as well as the family and environment (Ross et al. 2010). Addressing the environmental influences of children is especially important because children often lack control over decision-making (Hoelscher et al. 2002). Some evidence also shows that behavior may be easier to alter among children, therefore reinforcing the support for addressing and preventing obesity earlier in life (Baranowski et al. 2003;).

Evidence specifically supporting the use of goal setting in children is relatively limited. There is, however, research to support goal setting and improved performance in the classroom and in athletic performance (Sagotsky et al 1978; McCarthy et al. 2010; Weinberg 2003).

2.3 Correlates of weight loss in children

A number of baseline characteristics have been shown to be important factors in helping predict weight loss in children. Race has been believed to be associated with success in behavior change programs with Caucasian race being predictive of higher weight loss in a program focused on diabetic patients (Delahanty et al. 2013). Age is believed to be correlated with weight loss, however, with conflicting results. Younger aged has been shown be associated with weight loss with an explanation of a shorter exposure to poor eating habits and greater parental control on habits and decision-making (Shalitin et al. 2015). However, in other studies, older age was predictive of weight loss and the researchers hypothesized that weight loss and weight

management requires skills such as self-control and healthy decision making that might be easier for older children to learn (Braet 2006; Delahanty et al. 2013). Generally, higher baseline BMI is believed to be a predictor of greater weight loss (Braet 2006; Shaltilin et al. 2015). However, some studies have shown that a higher baseline BMI is actually correlated with poor weight loss outcomes (Baxter et al. 2013). Pretreatment nutrition and activity habits have also been shown to be significant: lower baseline activity levels were associated with larger increases in activity, and greater dietary restraint and low fat diet behaviors were associated with greater weight loss among diabetic patients (Delahanty et al. 2013). Pretreatment quality of life may also be a useful predictor for weight loss (Teixeira et al. 2004).

Some family characteristics have also been found to be correlated with individual weight loss. Higher maternal education has been found to be a predictor of weight loss (Shalitin et al. 2015). Socioeconomic status and some related factors, such as accessibility to healthy foods at home, are also believed to affect health and nutrition outcomes (Cislak et al. 2011). Family relations, family counseling, and parental support have also been found to significantly increase the effectiveness of obesity prevention (Cislak et al. 2011). However, other studies have found that these family based characteristics are not significantly associated with weight loss (Braet 2006).

Beyond baseline characteristics, there are certain qualities of individuals during treatment that may lead to successful health outcomes. Social support has been shown to be predictive of weight loss. Although baseline support was not significant, support during treatment has been seen to predict weight loss. This support can be from traditional sources such as family, and also from support groups, treatment staff, and peers in the treatment program (Johnston 2012). Session attendance and treatment participation has also been found to predict greater weight loss

(Byrne et al. 2012). Additionally, baseline diet and physical activity self-efficacy has been shown to be a predictor of successful weight loss (Delahanty et al. 2013; Teixeira et al. 2004). However, other studies show that it is actually changes in diet and physical activity self-efficacy during treatment, rather than baseline self-efficacy, that is a more significant correlate of weight loss (Byrne et al. 2012). Lastly, maintained use of CBT strategies in families is also associated with weight loss (Cislak et al. 2011).

Categorization of Variables

One of the challenges with evaluation of behavior change interventions, and goal setting interventions in particular, is the use of abstract and subjective variables. Unlike concrete categorical variable such as sex and race, many of the variables used to evaluate goals and other behavior change program components are difficult to categorize into meaningful and objective categories (Dishman et al. 2009). Predictors of interest, such as goal commitment, goal difficulty, and self-efficacy, do not have existing evidence-based categories or ranking systems. Thus, it is difficult to study their individual impact on goal setting and health outcomes (Dishman et al. 2009). For this study, goal progress was measured on a four-point scale based on the camper's response to a survey question.

2.4 Strong4Life

Camp Strong4Life

Camp Strong4Life is a weeklong healthy behaviors camp that targets overweight and obese children and adolescents. Camp takes place at Camp Twin Lakes in Winder, Georgia. In order to be eligible to attend Camp, campers must be between 9-14 years old and have a BMI greater than 85th percentile or be a former camper. There is also an opportunity for campers aged

15 to 17 to come to camp as Leaders in Training. The entire Camp Strong4Life experience consists of one full week of summer camp as well as a Family Welcome Retreat before camp and a Family Reunion Retreat after camp. The Welcome event occurs in the spring and allows families to learn more about camp and set goals for healthy behavior change. The goal setting process is discussed in detail below. The Reunion event occurs in the fall and allows for reinforcement of healthy habits as well as measurement, evaluation, goals check in, and the option to set a new goal.

Camp Strong4Life focuses on increased physical activity, improved healthy eating habits, and increased motivation to pursue healthy habits. At the same time, Camp Strong4Life provides campers with an overnight, outdoor camp experience, social connections and friendships, and an extensive support system. The programming at camp is based on enjoyable educational and skill building sessions. Camp Strong4Life is designed to not only improve physical health, but also the mental health, self-esteem and independence of its campers. After Camp, campers can take the knowledge, experiences, and strategies learned at Camp back to their homes where they can maintain their healthy behavior change. The healthy behaviors promoted at Camp are reinforced by family education sessions at the Welcome and Reunion events where families cover similar topics as the campers, ensuring that families and campers are receiving the same messages.

Close to 100 campers attend Camp each year and receive a curriculum carefully crafted by a team of physicians, dieticians, exercise physiologists, among other experts. Sessions during the week-long summer camp include curriculum on mindful eating, benefits of physical activity and tips for how to be active, cooking lessons, tips for eating out, and guides to a balanced plate. Activities include swimming, climbing, biking, zip line, dance, fishing, archery, and boating.

Goal Setting and Strong4Life

Goal setting is a key component of many Strong4Life initiatives, including Camp Strong4Life. At the Welcome Retreat, campers set goals collaboratively with their families and both a nutritionist and an exercise physiologist. These professionals, trained in motivational interviewing, help guide campers and families in setting goals for healthy habits. For Camp Strong4Life, campers use a goal worksheet to create both nutrition and physical activity goals in the following "fill in the blank" style method: I/We will (*What is your goal?*) by (*How will you do your goal?*) (*When and how often will you work on your goal?*) with (*Who can support you?*). At the Reunion event, these professionals check in with the campers and families regarding progress towards their original goals and any barriers they have faced, and provide an opportunity to set a new goal.

Strong4Life encourages SMART goals: goals that are specific, measureable, attainable, realistic, and timely (Wade 2009; Siegert and Taylor 2004). Specific goals address a particular behavior, such as bike riding or jumping on the trampoline, instead of overall health or weight improvement. Measureable goals identify a frequency or amount of something so that progress can be tracked. Attainable goals ensure that the camper and family physically have the resources and ability to achieve a goal. Realistic goals, however, consider things such as the environment and goal commitment, in determining the likelihood for success. Whether or not a goal is attainable and realistic contributes to goal level or goal difficulty, discussed above. Timely goals are goals that rely on a logical and realistic timeline for progress.

2.5 Gaps in the Literature

Though goal setting theory is well established, its application to behavior change and weight related health outcomes is more limited. Further, evidence on strategies for and effects of goal setting for children and adolescents is also limited. Many nutrition interventions have used goal setting as part of their program's strategy, however, there is little evaluation on the subsequent effect of goal setting on dietary behavior change or other health outcomes, especially among overweight and obese patients. Often, goal setting is one of many behavior change components in a program, making its impact difficult to discern (Ries et al. 2014). Therefore, although the strategy appears to be a commonly used component in behavior change interventions, more rigorous evaluation is needed to determine optimal goal setting methods and mechanisms, including participation, difficulty, specificity, and whether or not any change can be attributed to goal setting itself (Cullen et al. 2004; Pearson 2012; Ries et al. 2014). Part of this lack of evaluation stems from the lack of a standardized method of measuring goals, the strategies used to set them, and their impact, either direct or indirect, on health outcomes (Ries et al. 2014).

Additionally, there are many conflicting results regarding predictors of weight loss among various populations, including children. While some factors are considered to be important, evidence of the direction and relative magnitude of their effects is conflicting. This analysis aims to understand what factors are correlates of weight loss in children who attended 2015 Camp Strong4Life.

Chapter 3: Methods

3.1 Population

The sample population for this study is the participants at 2015 Camp Strong4Life. Camp primarily targets youth aged between 9 and 14 years old with a BMI greater than the 85th percentile. Children aged 15-17 with a BMI greater than the 85th percentile are also eligible to attend Camp as a Leader in Training (LIT). Campers are recruited to Camp through multiple outlets, with referral by healthcare provider being the most common. Other methods include Strong4Life's CHOA Clinic, media outlets such as TV segments or Atlanta Camp Magazine, Strong4Life/CHOA websites, and through word of mouth.

3.2 Sample

A total of 99 campers attended a welcome event and completed the baseline surveys. A total of 97 campers attended Camp in 2015. Because the nature of this analysis involves comparing baseline and follow-up data, this analysis only includes those campers with follow-up data. A total of 52 campers attended the reunion event, completed at least one follow-up survey (physical, beverage questionnaire, quality of life), and completed follow-up about at least goal (nutrition and/or physical activity). Thus, the total sample size for this analysis is 52 campers. These campers are also referred to as "completers" because they completed both the baseline and follow-up surveys and were therefore able to be included in analysis. However, the sample size for each outcome variable may vary because of missing data for that specific outcome.

3.3 Data Collection

All data for this study was collected between April 21, 2015 and August 29, 2015. Data for this study were collected through a number of different surveys (see section 3.4 for additional

information about survey instruments) at two time points. IRB determination was not necessary for this study because it is being used as program evaluation for Camp Strong4Life. All data was collected by Strong4Life staff and trained healthcare professionals.

Welcome Data

Baseline data for new campers was collected at the Camp welcome event and baseline data for returning campers was collected at camper rescreen events. Those events took place on April 21, 2015 (rescreen event), April 23, 2015 (rescreen event), and May 2, 2015 (welcome event). Data from these events were considered 2015 baseline data. At these events, demographics, biometrics (weight, height, fat percent, dry lean mass), beverage intake, quality of life, physical activity and lifestyle habits data were collected. Goal setting also took place at the welcome events. Campers and their families set goals collaboratively with an exercise physiologist and a registered dietician. Campers set one nutrition goal and one physical activity goal and also had the option to set an "other goal."

Camp

Camp Strong4Life took place from June 27, 2015 through July 3, 2015 at Camp Twin Lakes in Winder, Georgia. No data collection occurred at camp.

Reunion Data

The second time point for data collection was at the reunion event on August 29, 2015. At this event, biometrics, beverage intake, quality of life, physical activity and lifestyle data were

collected again using the same instruments and data collection methods as the welcome events. These data were considered the 2015 follow-up data.

3.4 Data Collection Instruments

Two weeks prior to each event (welcome/rescreen and reunion), each camper was sent a camper information packet containing paper copies of the surveys listed below. Campers had the option to fill out the forms before the event and to bring these completed surveys with them, or surveys were also available for completion at the events. See Appendix 1 for full copies of each data collection instrument. Each camper was assigned a camper ID and returning campers retain their ID from previous year(s). This Camper ID is used throughout all survey instruments and in analysis, therefore allowing for the deidentification of all data.

Demographics

Demographic data were collected during camper registration including age, sex, race, and parental education. Demographic information was provided by the parent.

Anthropometric Measurements

The biometric data, including height, weight, and body composition was collected at each event. Weight and body composition (percent body fat and dry lean mass) was collected using Biospace Company USA's InBody 230 Body Composition Analysis machine. This equipment is considered an effective and user-friendly mobile data collection machine for weight loss and fitness programs. The body composition analysis uses bioelectrical impedance to measure total body water, dry lean mass, weight, skeletal muscle mass, body fat mass, BMI and percentage of body fat. In order to calculate BMI, the InBody 230 uses an externally inputted height and a

weight measured by a scale within the machine (Biospace Company 2009). The InBody 230 form has been previously validated against dual X-ray absorptiometry (DXA) and determined to be an acceptable tool to measure body composition (Karelis et al. 2013).

Quality of Life

The Pediatric Quality of Life (PedsQL) form is an evidence-based survey to assess the camper's health-related quality of life (QOL). The form was created and validated by James Varni (Varni et al. 2001). The form includes a total of 23 questions regarding four domains of everyday life: health and activities, feelings, interaction with others, and school behaviors.

Beverage Questionnaire

The beverage questionnaire is a scantron-type form where campers answer questions about the frequency and volume consumed of 12 different beverages over a weeklong period in the last month. The questions measure frequency ("How often did you drink any of these?") and dose or volume ("How much did you drink each time?"). The beverages include: water, 100% fruit juice, sweetened juice/drink, whole milk, reduced fat milk, low fat/fat free milk, regular soda, diet soda, sweetened tea, tea or coffee (both with and without cream and/or sugar), and energy and sports drinks. The beverage questionnaire comes with a guide on how to fill out the form as well as a guide that visually depicts the sizes of common beverage containers for reference.

This beverage questionnaire has been used before in nutrition studies (Hedrick et al. 2010; Hedrick et al. 2012). This type of survey has been previously validated in an adult

population for validity through comparison with food intake records and for reliability through comparison of multiple beverage questionnaires at different time points (Hedrick et al. 2010).

Physical Activity

The physical activity survey is a scantron-type from the NutrionQuest's Block Dietary Data Systems in Berkeley, California. The form measures frequency ("How many days in the past 7 days?") and dose ("How much time on those days?"). The survey asks about 9 different physical activities such as walking to school, playing games with friends, and going to physical education classes in school. The survey also measures hours of TV, video game, and internet usage. The physical activity survey comes with a guide on how to properly fill out the form. NutritionQuest's Block Physical Activity Screener was developed in conjunction with Barbara Ainsworth's compendium of physical activities has been previously validated for use in a child population (NutritionQuest 2014; Ainsworth et al. 1000; Drahovzal et al. 2003).

3.5 Data Analysis

Data was collected and managed by Strong4Life staff using REDCap electronic data capture tools hosted at Children's Healthcare of Atlanta (Harris et al. 2009). All users were previously trained in REDCap. For this analysis, all data was exported from REDCap directly into SAS software 9.4 Copyright © 2002-2012 by SAS Institute Inc., Cary, NC, USA.

Data Cleaning

A total of ten individual instruments make up the data used for this study, all discussed above. These datasets are: goals, demographics, biometrics, beverage questionnaire, and PedsQL with identical baseline and follow-up versions for each. Data was exported from REDCap in its

original form and merged in SAS by Camper ID, a unique identifier. The final dataset was cleaned to contain only those with baseline data and follow-up data on at least one goal and at least one outcome variable of interest (n=52).

Demographic Variables: Registrant type, Age, Sex, Race, Parent Education, Parents' Marital Status, Household income, Household size

The demographic information was collected at the welcome event. Registrant type differentiates between returning campers, new campers, and leaders in training. Age was calculated based on the camper's date of birth and date of welcome retreat attendance. Sex, race, parent education, parents' marital status, and household income were captured through standard questions with provided responses from which to select.

Frequencies were used to assess the demographic makeup of the sample. Additionally, t-tests were used to compare demographics of those who attended the follow-up and those who did not to determine the presence of any non-response bias.

Biometric Variables: BMI Z-Score, Fat Percent, Dry Lean Mass Percent

Analysis of the biometric data was based on existing Strong4Life protocol. BMI z-score was calculated based on the CDC growth charts for a child's sex and age (found at http://www.cdc.gov/nccdphp/dnpao/growthcharts/resources/sas.htm). Thus, z-scores are calculated based on a reference population. Paired t-tests were used to examine changes in campers' height, weight, fat percentage, dry lean mass percentage, and BMI z-score. Research shows that change in BMI z-score is the best reflection of percent fat loss when compared to other common weight indicators (Hunt et al. 2007).

Goals Variable: Goal Achievers, Goal Non-Achievers, and Goal Progress

The variable used for stratification of the data was the goal progress variable. This information was collected during the goal follow-up sessions conducted by a nutritionist and exercise physiologist along with the camper and the camper's family. The goal progress question gives four levels of progress:

1. We have not started working on this goal, and do not think we will work on it
2. We have not started working on this goal but would still like to work on it
3. We have started working on this goal
4. We have already achieved this goal

This check in question was asked separately for both the camper's nutrition goal and the camper's physical activity goal. Analysis was conducted for all outcome variables using nutrition and physical activity goals independently.

Campers were stratified as goal achievers and goal non-achievers based on the self-reported goal progress question above. Campers were categorized as "goal non-achievers" if they had not started working on their goal (level 1 or 2), regardless of future intent, and as "goal achievers" if they had either achieved their goal (level 4) or were currently working on it (level 3).

In order to address the primary research question regarding association between goal progress and health outcomes, first goal achievers and goal non-achievers were compared to determine any significant demographic differences using Chi-Squared tests or significant differences in baseline characteristics using t-tests. To compare health related outcomes in goal achievers and goal non-achievers, changes in each outcome variable from baseline to follow-up were stratified by goal progress (goal achievers vs. goal non-achievers) for both physical activity

goals and nutrition goals. Paired t-tests were used to measure changes from baseline to follow-up for each outcome variable among goal achievers and non-achievers. A final between groups p-value was calculated using an independent samples t-test as a statistical measure of difference between the changes in outcomes for goal achievers and non-achievers. These analyses were done for physical activity goal sand nutrition goals independently.

For the regression modeling, a goal progress score was calculated with a higher goal score indicating more progress towards achieving the goal based on the four levels above. A goal progress score of 1 indicates that the camper has not started working on the goal and does not plan to, a goal progress score of 2 indicates that the camper has not started working on the goal but would still like to, a goal progress score of 3 indicates that the camper has started working on the goal, and a goal progress score of 4 indicates that the camper achieved the goal.

Quality of Life Variables: Physical Functioning Score, Emotional Functioning Score, Social Functioning Score, School Functioning Score, Psychosocial Health Summary Score, Total Score

Analysis for the PedsQL was based on a score along an existing, validated scale for analysis (Varni et al. 2016). Scores are calculated for physical functioning, emotional functioning, social functioning, and school functioning. An overall psychosocial health summary score was calculated from the emotional, social, and school scores. Total QOL score was calculated from the physical, emotional, social, and school scores. Table 10 in Appendix 2 shows the conversion for PedsQL scoring used in coding. Paired t-tests were used to analyze campers' changes in health related quality of life.

Nutrition Variables: Total SSB Consumption, Total SSB Calories

Analysis of the beverage questionnaire was based on the existing Strong4Life protocol. Daily consumption of each beverage was calculated in ounces per day (Frequency*Volume). The frequency indicated on the form was converted into times per day. The volume on the form was converted into ounces. Tables 11 and 12 in Appendix 2 show the conversions from the form's measurements into usable quantitative values for analysis.

For calculating total sugar-sweetened beverage (SSB) intake the following SSBs and sugary beverages were included: sweetened juice, regular soda, sweetened tea, energy/sports drinks, and juice. Throughout this analysis, the term "SSB" is used to describe all of these beverages. For calculating total caloric intake from caloric values were assigned to each beverage (per ounce) based on existing Strong4Life analysis protocol and can be found in Table 13 in Appendix 2.

A paired t-test was used to calculate the change in beverage consumption from baseline to follow-up for SSB consumption. Similarly, paired t-tests were also used to calculate the change in caloric intake from SSB.

Physical Activity Variables: Sedentary Minutes per day, Light Activity Minutes per day, Moderate Activity Minutes per day, Vigorous Activity Minutes per day, Total Activity Minutes per day, Energy Expenditure (light activities) per day, Energy Expenditure (moderate activities) per day, Energy Expenditure (vigorous activities) per day, Total Energy Expenditure per day

Physical activity data is only available for campers who completed both the baseline and the follow-up survey. Data cleaning, entry, and initial analysis was done by NutritionQuest, the owners of the survey instrument. Therefore, for cost considerations, only those campers with

matched baseline and follow-up surveys were sent for analysis. However, for this study all calculations and analyses were conducted by the researcher on the raw data provided by NutritionQuest.

Calculation of energy expenditure and minutes per day were calculated similarly to the calculation of SSB consumption. Throughout analysis, sedentary behaviors referred to the question about watching television or videos, playing video games, or using the internet. Light intensity activities referred to the questions on (1) doing chores inside the house like cleaning, sweeping, cooking, babysitting, or taking care of younger kids and (2) part time work outside of the house like washing dishes in a restaurant, bagging groceries, or painting. Moderate activities included information from 4 questions: (1) walking to school, walking the dog, or walking in the mall, (2) doing chores outside the house like gardening, mowing the lawn, raking or shoveling light snow, (3) activities like dancing, drill team, marching band, or playing games with your friends like tag, hide-and-seek or hopscotch and (4) other activities you do for fun, like riding a bike with your friends, skating, jumping rope, dodge/kickball, sledding, or hiking, camping, or golfing. Vigorous activities referred to the questions about (1) basketball, soccer, football, gymnastics, volleyball, baseball, softball, hockey, tennis, skating, or snowboarding and (2) Running, jogging, bicycling or swimming for exercise, weight training or working out at the gym or at home, or doing heavy farm work.

Data from the screener includes frequency of each category (in the past 7 days) and duration on those days. Activity minutes per day were calculated by (frequency) * (duration). Analysis for frequency and duration were based on the values in the Tables 14 and 15 in Appendix 2.

After minutes per day for each individual question was calculated, light, moderate, and vigorous activity minutes were calculated based on the categorizations above. Total activity minutes per day was calculated as a sum of these three values. These minutes per day values were used later for the calculation of energy expenditure.

To calculate energy expenditure in calories per minute, the following equation was used (Bushman 2012):

Calories expended per minute= (MET value) * 3.5 * (body weight (kg)) / 200

In the above formula, 3.5 and 200 are constants. This process began with finding the metabolic equivalent of the task (MET) for each activity on the physical activity screener. METs compare the energy expenditure for a given activity to energy expenditure at rest (Bushman 2012). Kate Ridley, Barbara Ainsworth, and Tim Olds published a modified Compendium for Energy Expenditures in youth, which was used in this analysis (Ridley et al. 2008). Table 16 in Appendix 2 provides the estimated METs for the physical activities listed in the screener used for Camp. The group average provides the average MET value for each activity level (light, moderate, and vigorous).

The number of calories per minute was calculated through the equation above using the camper's weight and the MET value for the given category of activities (light, moderate, vigorous). This value was multiplied by the minutes per day for each activity group, calculated previously. The result is a measure of calories expended per day for light activities, moderate activities, and vigorous activities. Total calories expended per day were calculated as the sum of these three groups.

Paired t-tests were used to analyze campers' changes in physical activity behaviors. Changes in sedentary, light, moderate, vigorous, and total activity minutes per day were

calculated as well as changes in energy expenditure per day from light, moderate, vigorous, and total activity. Physical activity data was not available for those who completed the baseline survey but not the follow-up survey. Therefore, the baseline data for "all" campers is not truly for all campers, but only for campers who completed both the baseline and follow-up physical activity screeners.

Multivariate Regression

To assess the second question of interest regarding correlates of campers' weight loss at 2015 Camp Strong4Life, multivariate linear regression was used. The dependent variable was change in BMI z-score. First, each independent variable was tested to determine any potential association with the dependent variable using ANOVA and Chi-Squared tests.

The following variables were considered during the modeling process:

Demographic Variables: Age, Gender, Registrant Type (first time camper, returning camper, leader in training), Household income

Biometric Variables: Baseline BMI z-score

Quality of Life Variables: Baseline Total Quality of Life Score

Nutrition Variables: Baseline Total SSB Consumption

Physical Activity Variables: Baseline Sedentary Activity Minutes, Baseline Light Activity Minutes, Baseline Moderate Activity Minutes, Baseline Vigorous Activity Minutes

Goal Variable: Physical Activity Goal Progress Score, Nutrition Goal Progress Score

The model was created in two phases. The first phase was based on the demographic variables listed above and baseline biometric, nutrition, physical activity, and quality of life variables. The second phase added in physical activity and nutrition goal progress scores.

Chapter 4: Results

4.1 Demographic Variables

The demographic characteristics of those included in this analysis are summarized in Table 1. The mean age of the campers included for analysis was 12.3 years. The majority of campers were female (69.2%) and African American (69.2%). The campers were evenly split between first time and returning campers (48.1% each) with the remaining 3.8% of campers being Leaders in Training. Approximately half of campers come from families with married parents (51.92%), with a relatively even distribution of campers from single and divorced parents. 44.2% of campers' parents have an Associates or Bachelors degree, with the remaining campers relatively evenly distributed between High School or some College and a Masters or Professional Degree. Lastly, almost half of campers come from families with a household income between $30,000-70,000 (the middle income level option), with a close to even distribution between <$30,000 per year and >$70,000 per year.

Table 1. Demographic Characteristics of Completer Campers at 2015 Camp Strong4Life

	All Completers (n=52)	
	Mean	**SD**
Age	12.3	2.0
Household Size	3.9	1.3
	N	**%**
Sex		
Male	16	30.8
Female	36	69.2
Race		
African American	36	69.2
Caucasian	7	13.5
Other	9	13.7
Registrant Type		
Returning Camper	25	48.1
First Time Camper	25	48.1
Leader in Training	2	3.9
Primary Language		
English	51	98.1
Spanish	1	1.9
Parent Education		
High School or Some College	14	26.9
Associates or Bachelors Degree	23	44.2
Masters or Professional Degree	15	28.9
Parent Marital Status		
Single	11	21.2
Married	27	51.9
Divorced	14	26.9
Household Income		
< $30,000 per year	13	25.0
$30,000-70,000 per year	24	46.2
> $70,000 per year	15	28.9

4.2 Goal Variable

In order to address the research questions of interest, campers were divided into goal achievers and goal non-achievers for both their physical activity goals and nutrition goals. Based on self-reported goal progress as discussed above, 31 campers (59.6%) were physical activity

goal achievers and 21 campers (40.4%) were physical activity goal non-achievers. For nutrition goals, 35 campers (67.3%) were nutrition goal achievers and 13 campers (25%) were nutrition goal non-achievers (Tables 2-5). 4 campers (7.7%) did not complete the check in question for their nutrition goal.

Table 2 compares the demographics between physical activity goal achievers and non-achievers and between nutrition goal achievers and nutrition goal non-achievers. The table shows that the only significant demographic difference between nutrition goal achievers versus non-achievers is race. Nutrition goal achievers are more likely to be African American ($p=0.04$) while non-achievers are more likely to be Caucasian ($p=0.05$).

Table 3 compares the baseline biometrics, quality of life scores, nutrition behaviors, and physical activity behaviors among goal achievers and goal non-achievers for physical activity goals and nutrition goals independently. This table shows that there are no significant differences at baseline among physical activity goal achievers and non-achievers. However, the analysis shows that nutrition goal achievers had a significantly higher baseline light activity per day compared to nutrition goal non-achievers ($p=0.01$). Nutrition goal achievers averaged 23.0 daily light activity minutes compared to 3.9 minutes per day for nutrition goal non-achievers.

Table 2. Comparison of Demographic Variables among Physical Activity and Nutrition Goal Achievers and Non-Achievers

	Physical Activity Goals (n=51)				Nutrition Goals (n=48)			
	Goal Achievers (n=31)		Goal Non-Achievers (n=21)		Goal Achievers (n=35)		Goal Non-Achievers (n=13)	
	Mean (SD)		Mean (SD)	P-Value	Mean (SD)		Mean (SD)	P-Value
Age	11.9 (2.1)		12.9 (1.8)	0.08	12.2 (1.7)		12.4 (2.6)	0.75
Household Size	3.7 (1.4)		4.1 (1.2)	0.26	3.9 (1.3)		3.6 (0.9)	0.49
	N	**%**	**N**	**%** **P-Value**	**N**	**%**	**N**	**%** **P-Value**
Registrant Type								
Returning Camper	14	45.2	11	52.4 0.61	17	48.6	7	53.9 0.75
First Time Camper	16	51.6	9	42.9 0.54	18	51.4	5	38.5 0.42
Leader in Training	1	3.2	1	4.8 0.78	0		1	7.7 0.10
Camper Sex								
Male	8	25.8	8	38.1 0.35	9	25.7	4	30.8 0.73
Female	23	74.2	13	61.9 0.35	26	74.3	9	69.2 0.73
Race								
African American	22	71.0	14	66.7 0.74	27	77.1	6	46.2 0.04
Caucasian	5	16.1	2	9.5 0.49	3	8.6	4	30.8 0.05
Other	4	12.9	5	23.8 0.31	5	14.3	3	23.1 0.47
Parent Education								
High School or Some College	9	29.0	5	23.8 0.68	8	22.9	3	23.1 0.99
Associates or Bachelors	12	38.7	11	52.4 0.33	15	42.9	7	53.8 0.50
Masters or Professional Degree	10	32.3	5	23.8 0.51	12	34.3	3	23.1 0.46
Parent's Marital Status								
Single	6	19.4	5	23.8 0.70	8	17.1	4	30.8 0.30
Married	14	45.2	13	61.9 0.24	18	51.4	7	53.9 0.88
Divorced	11	35.5	3	14.3 0.09	11	31.4	2	15.4 0.27
Household Income								
<30,000 per year	8	25.8	5	23.8 0.87	11	31.4	2	15.4 0.27
30,000-70,000 per year	15	48.4	9	42.9 0.69	15	42.9	5	38.5 0.78
>70,000 per year	8	25.8	7	33.3 0.39	9	25.7	6	46.2 0.17

Table 3. Comparison of Baseline Characteristics among Physical Activity and Nutrition Goal Achievers and Non-Achievers

	Physical Activity Goals (n=51)			Nutrition Goals (n=48)		
	Goal Achievers	Goal Non-Achievers		Goal Achievers	Goal Non-Achievers	
	Mean (SD)	Mean (SD)	P-Value	Mean (SD)	Mean (SD)	P-Value
Biometric	**(n=31)**	**(n=21)**		**(n=35)**	**(n=13)**	
BMI z-score	2.3 (0.4)	2.3 (0.4)	0.99	2.3 (0.4)	2.5 (0.3)	0.06
Dry Lean Mass Percent	15.1 (1.8)	14.9 (2.0)	0.69	15.3 (1.9)	14.6 (1.8)	0.24
Fat Percent	43.2 (6.4)	44.2 (7.0)	0.60	42.6 (6.6)	45.2 (6.4)	0.22
Quality of Life	**(n=30)**	**(n=21)**		**(n=34)**	**(n=13)**	
Physical QOL Score	78.6 (15.4)	80.2 (11.5)	0.69	78.3 (12.1)	83.2 (18.8)	0.29
Emotional QOL Score	72.5 (22.4)	71.4 (25.2)	0.87	70.7 (22.2)	77.7 (26.6)	0.37
Social QOL Score	77.3 (21.9)	76.4 (17.2)	0.88	78.2 (18.5)	80.0 (23.4)	0.79
School QOL Score	73.3 (18.4)	77.0 (15.6)	0.46	73.1 (16.1)	83.6 (18.5)	0.06
Psychosocial QOL Summary Score	74.4 (17.3)	74.9 (15.9)	0.91	74.0 (15.1)	80.4 (19.4)	0.23
Total QOL Score	75.4 (15.3)	76.3 (13.5)	0.84	75.1 (12.7)	81.1 (18.0)	0.20
Nutrition Behaviors	**(n=30)**	**(n=21)**		**(n=34)**	**(n=13)**	
SSB Consumption per day (ounces)	12.0 (21.9)	11.4 (21.1)	0.93	10.3 (19.2)	18.2 (28.3)	0.27
SSB Calories per day (kcals)	324.4 (462.2)	266.8 (334.2)	0.63	293.3 (436.8)	389.8 (392.0)	0.49
Physical Activity Behaviors	**(n=27)**	**(n=20)**		**(n=30)**	**(n=13)**	
Sedentary Minutes per day	138.5 (76.9)	143.3 (84.6)	0.84	140.4 (74.4)	137.5 (96.1)	0.91
Light Activity Minutes per day	23.8 (38.5)	10.7 (15.0)	0.12	23.0 (34.9)	3.9 (5.0)	0.01
Moderate Activity Minutes per day	78.8 (97.8)	53.6 (68.4)	0.34	47.2 (38.0)	99.1 (114.0)	0.15
Vigorous Activity Minutes per day	49.4 (90.1)	40.8 (62.3)	0.72	33.4 (48.5)	68.6 (119.8)	0.34
Total Activity Minutes (Light, Moderate, Vigorous) per day	152.0 (183.2)	105.2 (123.3)	0.34	103.5 (80.4)	171.6 (219.1)	0.32
Energy Expenditure (light activities) per day (kcals)	94.0 (157.8)	39.4 (49.6)	0.11	87.8 (140.9)	17.3 (20.7)	0.01
Energy Expenditure (moderate activities) per day (kcals)	502.5 (668.1)	412.3 (486.9)	0.62	323.8 (257.2)	650.9 (703.2)	0.14
Energy Expenditure (vigorous activities) per day (kcals)	491.8 (862.3)	419.4 (616.2)	0.75	339.8 (486.7)	671.4 (1085.9)	0.32
Total Energy Expenditure (all activities) per day (kcals)	1088.4 (1473.1)	871.1 (1018.1)	0.58	751.4 (672.4)	1339.7 (1666.5)	0.26

Physical Activity Goal Progress

Table 4 shows the average baseline value, the average change, and a p-value comparing the campers' scores at baseline and follow-up for physical activity goal achievers and physical activity goal non-achievers. Physical activity goal achievers showed significant improvements in all biometric outcomes (BMI z-score: -0.04, p=0.01; dry lean mass percent: +0.3, p=0.03; fat percent: -1.2, p=0.03), significant increases in all quality of life scores (physical score: +5.8, p=0.02; emotional score: +10.9, p=0.01; social score: +7.6, p=0.03; school score: +5.9, p=0.05; psychosocial summary score: +8.1, p<0.01; and total score: +7.5, p<0.01), significant decreases in daily SSB consumption ounces per day (-10.4, p=0.04), and a significant increase in daily light activity minutes (+12.4, p=0.01).

Physical activity goal non-achievers only showed significant changes in three total variables—two positive outcomes and one negative outcome: an improvement in physical quality of life score (+3.3, p=0.03), a decrease in SSB consumption (in ounces per day) (-9.5, p=0.05), and a decrease in daily vigorous activity minutes (-13.0, p=0.05).

The between group p-value compares the changes in each outcome variable among the physical activity goal achievers versus the non-achievers. Comparing the changes between goal achievers and non-achievers, there is a significant difference in change in BMI z-score and change in sedentary minutes per day. Physical activity goal achievers averaged a reduction in BMI of 0.04 z-scores while physical activity goal non-achievers averaged an increase in BMI of 0.01 z-scores (p=0.05). Achievers also showed an average of reduction of 20.5 minutes of sedentary activity per day while non-achievers showed an average of increase of 30.0 minutes of sedentary activity per day (p=0.03).

Table 4. Comparison of Outcome Variables and Changes in Outcome Variables among Physical Activity Goal Achievers and Non-Achievers

Outcome	Physical Activity Goal Achievers			Physical Activity Goal Non-Achievers			Between Group P-Value
	Baseline	Δ	P-Value	Baseline	Δ	P-Value	
Biometric	**(n=27)**			**(n=21)**			
BMI z-score	2.4 (0.4)	-0.04	0.01	2.3 (0.4)	0.01	0.67	0.05
Dry Lean Mass Percent	15.1 (1.9)	0.3	0.03	14.9 (2.0)	0.1	0.69	0.14
Fat Percent	43.5 (6.7)	-1.2	0.03	44.2 (7.0)	-0.2	0.64	0.12
Quality of Life	**(n=29)**			**(n=21)**			
Physical QOL Score	78.7 (15.7)	5.8	0.02	80.2 (11.5)	3.3	0.03	0.37
Emotional QOL Score	73.1 (22.5)	10.9	0.01	71.4 (25.2)	2.9	0.50	0.16
Social QOL Score	77.2 (22.3)	7.6	0.03	76.4 (17.2)	4.1	0.28	0.48
School QOL Score	74.3 (17.9)	5.9	0.05	77.0 (15.6)	-1.0	0.75	0.12
Psychosocial QOL Score	74.9 (17.4)	8.1	<0.01	74.9 (15.9)	2.0	0.46	0.11
Total QOL Score	75.8 (15.5)	7.5	<0.01	76.3 (13.5)	2.3	0.28	0.10
Nutrition Behaviors	**(n=30)**			**(n=20)**			
SSB Consumption per day (ounces)	16.5 (27.7)	-10.4	0.04	15.5 (24.7)	-9.5	0.05	0.79
SSB Calories per day (kcals)	404.1 (582.5)	-163.2	0.06	342.6 (444.7)	-140.7	0.06	0.89
Physical Activity Behaviors	**(n=27)**			**(n=20)**			
Sedentary Minutes per day	138.5 (76.9)	-20.5	0.12	143.3 (84.6)	30.0	0.15	0.03
Light Activity Minutes per day	23.8 (38.5)	12.4	0.01	10.7 (15.0)	8.8	0.11	0.60
Moderate Activity Minutes per day	78.8 (97.8)	-7.6	0.61	53.6 (68.4)	-11.3	0.25	0.83
Vigorous Activity Minutes per day	49.4 (90.1)	-17.7	0.60	40.8 (62.3)	-13.0	0.05	0.78
Total Activity Minutes (Light, Moderate, Vigorous) per day	152.0 (183.2)	-12.9	0.70	105.2 (123.3)	-15.5	0.25	0.92
Expenditure (light activities) per day (kcals)	94.0 (157.8)	48.5	<0.01	39.4 (49.6)	49.1	0.12	0.99
Expenditure (moderate activities) per day (kcals)	502.5 (668.1)	-16.6	0.87	412.3 (486.9)	-114.3	0.17	0.49
Expenditure (vigorous activities) per day (kcals)	491.8 (862.3)	-165.2	0.29	419.4 (616.2)	-143.9	0.07	0.90
Total Expenditure (all activities) per day (kcals)	1088.4 (1473.1)	-133.3	0.55	871.1 (1018.1)	-209.1	0.09	0.76

Nutrition Goal Progress

Table 5 uses the same analyses to compare changes in outcome variables between nutrition goal achievers and non-achievers. Nutrition goal achievers showed significant improvements in all quality of life outcomes (physical score: +5.2, p=0.02; emotional score: +7.4, p=0.04; social score: +7.0, p=0.02; school score: +5.8, p=0.04; psychosocial summary score: +6.7, p=0.01; and total score: +6.4, p<0.01), significant reductions in both nutrition behavior outcomes (SSB daily consumption: -9.7, p=0.04; SSB calories per day: -165.4, p=0.04), and a significant improvement in daily light activity minutes (+8.4, p=0.05).

Nutrition goal non-achievers only showed a significant improvement in physical quality of life score (+4.8, p<0.01) and a reduction in SSB consumption (-14.7, p=0.05). However, the between group comparison does not suggest any significant differences in health related outcomes between nutrition goal achievers and non-achievers.

Table 5. Comparison of Outcome Variables and Changes in Outcome Variables among Nutrition Goal Achievers and Goal Non-Achievers

Outcome	Nutrition Goal Achievers			Nutrition Goal Non-Achievers			Between Group P-Value
	Baseline	Δ	P-Value	Baseline	Δ	P-Value	
Biometric	**(n=31)**			**(n=13)**			
BMI z-score	2.3 (0.4)	-0.004	0.79	2.5 (0.3)	-0.04	0.10	0.17
Dry Lean Mass Percent	15.3 (1.0)	0.2	0.19	14.6 (1.8)	0.3	0.28	0.61
Fat Percent	42.8 (7.0)	-0.5	0.23	45.2 (6.4)	-1.1	0.20	0.44
Quality of Life	**(n=33)**			**(n=13)**			
Physical QOL Score	78.4 (12.2)	5.2	0.02	83.2 (18.8)	4.8	<0.01	0.87
Emotional QOL Score	71.2 (12.2)	7.4	0.04	77.7 (26.6)	6.5	0.29	0.90
Social QOL Score	78.2 (18.8)	7.0	0.02	80.0 (23.4)	3.5	0.56	0.55
School QOL Score	73.9 (15.6)	5.8	0.04	83.6 (18.5)	-2.0	0.62	0.12
Psychosocial QOL Summary Score	74.4 (15.1)	6.7	0.01	80.4 (19.4)	2.7	0.52	0.38
Total QOL Score	75.4 (12.7)	6.4	<0.01	81.1 (18.1)	3.2	0.32	0.97
Nutrition Behaviors	**(n=34)**			**(n=12)**			
SSB Consumption per day (ounces)	14.9 (25.3)	-9.7	0.04	23.9 (32.0)	-14.7	0.05	0.48
SSB Calories per day (kcals)	373.7 (557.1)	-165.4	0.04	495.4 (509.9)	-189.6	0.10	0.87
Physical Activity Behaviors	**(n=30)**			**(n=13)**			
Sedentary Minutes per day	140.4 (74.4)	-6.7	0.55	137.5 (96.1)	36.7	0.36	0.30
Light Activity Minutes per day	23.0 (34.9)	8.4	0.05	3.9 (5.0)	14.9	0.06	0.41
Moderate Activity Minutes per day	47.2 (38.0)	-8.0	0.44	99.1 (114.0)	-6.9	0.75	0.96
Vigorous Activity Minutes per day	33.4 (48.5)	-15.3	0.06	68.6 (119.8)	-11.8	0.61	0.88
Total Activity Minutes (Light, Moderate, Vigorous) per day	103.5 (80.4)	-14.9	0.35	171.6 (219.1)	-3.8	0.91	0.73
Total Expenditure (light activities) per day (kcals)	87.8 (140.9)	42.4	0.05	17.3 (20.7)	56.9	0.04	0.69
Total Expenditure (moderate activities) per day (kcals)	323.8 (257.2)	-44.3	0.57	650.9 (703.2)	-38.8	0.79	0.97
Total Expenditure (vigorous activities) per day (kcals)	339.8 (486.7)	-158.6	0.07	671.4 (1085.9)	-69.0	0.77	0.71
Total Expenditure (all activities) per day (kcals)	751.4 (672.4)	-160.4	0.24	1339.7 (1666.5)	-50.9	0.85	0.68

4.3 Outcome Variables

The baseline values, average changes, and p-value testing the significance of the change from baseline to follow-up are presented in Table 6 for all completers at 2015 Camp Strong4Life.

Table 6. Outcome Characteristics of All Completers at 2015 Camp Strong4Life

Outcome	All Completers		
	Baseline	Δ	P-Value
Biometric	**(n=48)**		
BMI z-score	2.34 (0.40)	-0.02	0.15
Dry Lean Mass Percent	15.0 (1.91)	0.2	0.04
Fat Percent	43.8 (6.76)	-0.8	0.04
Quality of Life (Out of 100)	**(n=50)**		
Physical QOL Score	79.4 (14.0)	4.7	<0.01
Emotional QOL Score	72.4 (23.4)	7.5	0.01
Social QOL Score	76.9 (20.1)	6.1	0.02
School QOL Score	75.4 (16.9)	3.0	0.17
Psychosocial Summary QOL Score	74.9 (16.6)	5.5	0.01
Total QOL Score	76.0 (14.5)	5.3	<0.01
Nutrition Behaviors	**(n=51)**		
SSB Consumption (oz/day)	15.8 (76.5)	-9.8	<0.01
SSB Calories per day	372.0 (525.1)	-151.2	0.01
Physical Activity Behaviors	**(n=47)**		
Sedentary Minutes per day	140.5 (79.2)	2.3	0.85
Light Activity Minutes per day	18.2 (31.3)	10.9	<0.01
Moderate Activity Minutes per day	68.2 (86.6)	-9.2	0.34
Vigorous Activity Minutes per day	45.8 (78.9)	-15.8	0.09
Total Activity Minutes (Light, Moderate, Vigorous)	132.2 (160.7)	-14.0	0.37
Energy Expenditure (light activities) per day (kcals)	70.9 (126.1)	48.8	<0.01
Energy Expenditure (moderate activities) per day (kcals)	464.4 (593.8)	-56.6	0.41
Energy Expenditure (vigorous activities) per day (kcals)	461.2 (761.0)	-156.5	0.11
Total Energy Expenditure (all activities) per day (kcals)	996.6 (1291.8)	-164.3	0.24

Biometric

The baseline BMI z-score for all campers included in analysis was 2.34, with an average reduction of 0.02 z-scores, though not statistically significant. The average dry lean mass percent was 15.0% at baseline with a significant average increase of 0.2% ($p=0.04$). The average fat percent at baseline was 43.8% with a significant average reduction of 0.8% ($p=0.04$).

Quality of Life

All quality of life scores showed statistically significant improvements from baseline to follow-up except for School QOL Score. The average Psychosocial Summary Score was 74.9 (out of 100) at baseline and the average increase was 5.5 points ($p=0.01$). The average Total Score was 76.0 (out of 100) at baseline and the average increase was 5.3 points ($p<0.01$).

Nutrition Behaviors

The reduction in SSB consumption and calories also proved to be statistically significant. The average baseline SSB consumption was 15.8 ounces per day with an average decrease of 9.8 ounces per day ($p<0.01$). The average calories from SSB consumption was 372.0 calories per day at baseline with an average reduction of 151.2 calories per day ($p=0.01$).

Physical Activity Behaviors

Baseline light activity minutes per day for all campers was 18.2 minutes with a significant increase of 10.9 minutes ($p<0.01$). Daily energy expenditure from light activity was 70.9 calories at baseline with a significant increase of 48.8 calories per day ($p<0.01$). Baseline sedentary activity for all campers was 140.5 minutes per day with an increase of 2 minutes,

though not statistically significant. At baseline, average moderate activity was 68.2 minutes per day and average vigorous activity was 45.8 minutes per day. Average moderate and vigorous total activity minutes per day actually decreased (-9.2 minutes and -15.8 minutes respectively), though neither proved to be statistically significant. Overall, average baseline total activity was 132.2 minutes per day at baseline and there was a decrease in total activity minutes (14.0 minutes per day), though not statistically significant.

4.4 Multivariate Analysis

To address the second research question regarding correlates of successful weight loss, a two-step multivariate linear regression analysis was performed with change in BMI z-score as the dependent variable. The final model can be seen in Table 7 with the variables included, their coefficients, a p-value for significance, and the model's overall coefficient of determination (R^2). The first step includes demographic and baseline variables and has an R^2 of 0.32, suggesting that 32% of the variability in change of BMI z-score for campers at 2015 Camp Strong4Life can be accounted for by the camper's age, sex, registrant status, household home, and baseline BMI z-score. The second step includes the demographic and baseline variables and adds in the physical activity and nutrition goal scores. The final model has an R^2 of 0.42, meaning that the addition of physical activity and nutrition goals accounted for an additional 10% of the change in BMI z-scores. The significant variables in the model are age ($p=0.03$), registrant type ($p=0.02$), baseline total quality of life score ($p=0.04$), and physical activity goal progress score ($p=0.05$).

Table 7. Multivariate Regression Model of Change in BMI Z-Score at 2015 Camp Strong4Life

	B	SE	t	P-Value	Model R^2
Phase 1: Demographics and Baseline Characteristics					**0.32**
Age (years)	-0.020	0.009	-2.27	0.03	
Sex (vs Male=0)					
Female	0.007	0.038	0.18	0.86	
Registrant Type (vs First Time camper=0)					
Returner	0.084	0.034	2.46	0.02	
Household Income (vs Low Income=0)					
Middle Income	0.047	0.043	1.09	0.29	
High Income	0.006	0.050	0.12	0.90	
Baseline BMI z-score	-0.064	0.038	-1.67	0.11	
Baseline Total QOL Score	-0.003	0.001	-2.18	0.04	
Baseline SSB Consumption (oz/day)	0.0002	0.001	0.29	0.78	
Baseline Sedentary Minutes	0.0002	0.0002	1.27	0.21	
Baseline Light Minutes	-0.0002	0.001	-0.62	0.54	
Baseline Moderate Minutes	-0.0003	0.0003	-0.94	0.36	
Baseline Vigorous Minutes	0.0001	0.0003	0.45	0.66	
Phase 2: Demographics, Baseline Characteristics, and Goal Progress					**0.42**
Physical Activity Goal Progress	-0.030	0.015	-2.03	0.05	
Nutrition Goal Progress	-0.0001	0.016	-0.01	0.99	

4.5 Sensitivity Analysis

Of the 96 total campers with baseline data, 52 total campers have follow-up data and were therefore included in analysis. This sensitivity analysis was conducted to determine any significant differences between completers and non-completers. Table 8 provides a comparison of demographics of completers and non-completers with a p-value to determine any significant differences between the two groups. Those who identified as "other" race, those with divorced parents, and those with the middle level of household income (between $30,000 and $70,000 per year) were more likely to attend the reunion event and therefore be considered a completer.

Table 9 compares baseline biometric, quality of life, and nutrition behaviors among completers and non-completers. There were no significant differences in any of the variables of

interest between the two groups. As discussed above, baseline data for the physical activity screener was only available for those who completed both the baseline and the follow-up surveys. Therefore, this comparison between completers and non-completers is not possible for baseline physical activity behaviors.

Table 8. Comparison of Demographics among Completers and Non-Completers at 2015 Camp Strong4Life

	Completers (n=52)		Non-Completers (n=44)		
	Mean (SD)		Mean (SD)		P-Value
Age	12.3 (2.01)		12.34 (2.12)		0.97
Household Size	3.85 (1.32)		4.32 (1.46)		0.10
	N	**%**	**N**	**%**	**P-Value**
Registrant Type					
Returning Camper	25	48.08	13	29.55	0.06
First Time Camper	25	48.08	29	65.91	0.08
Leader in Training	2	3.85	2	4.55	0.86
Camper Sex					
Male	16	30.77	16	36.36	0.56
Female	36	69.23	28	63.64	0.56
Race					
African American	36	69.23	33	75.0	0.53
Caucasian	7	13.46	9	20.45	0.36
Other	9	13.71	2	4.55	0.05
Primary Language					
English	51	98.08	44	100.0	0.36
Spanish	1	1.92	0		0.36
Parent Education					
High School or Some College	14	26.92	16	36.36	0.32
Associates or Bachelors	23	44.23	19	43.18	0.92
Masters or Professional Degree	15	28.85	9	20.45	0.34
Parent's Marital Status					
Single	11	21.15	13	29.55	0.34
Married	27	51.92	28	63.64	0.25
Divorced	14	26.92	1	2.27	<0.001
Widowed	0		2	4.55	0.12
Household Income					
<30,000 per year	13	25.00	18	40.91	0.10
30,000-70,000 per year	24	46.15	11	25.00	0.03
> 70,000 per year	15	28.85	15	34.09	0.58

Table 9. Comparison of Baseline Characteristics among Completers and Non-Completers at 2015 Camp Strong4Life

	Completers (n=52) Mean (SD)	Non-Completers (n=44) Mean (SD)	P-Value
Biometric			
BMI z-score	2.34 (0.39)	2.32 (0.34)	0.96
Percent Dry Lean Mass	15.05 (1.85)	14.93 (1.78)	0.71
Percent Fat	43.57 (6.56)	43.83 (6.77)	0.83
Quality of Life			
Physical Score	79.27 (13.83)	82.68 (13.47)	0.23
Emotional Score	72.06 (23.33)	75.71 (21.91)	0.44
Social Score	76.96 (19.93)	82.98 (20.18)	0.15
School Score	74.80 (17.22)	74.29 (17.62)	0.89
Psychosocial Summary Score	74.61 (16.55)	77.66 (16.56)	0.38
Total Score	75.77 (14.47)	78.92 (14.55)	0.30
Nutrition Behaviors			
SSB Consumption (oz/day)	15.77 (26.08)	15.72 (24.97)	0.91
Calories from SSB per day	372.03 (525.06)	494.17 (606.98)	0.24

Chapter 5: Discussion

This study had two objectives. The first objective was to determine the effect of self-reported goal progress on biometric, quality of life, nutrition, and physical activity outcomes. The second objective was to determine correlates of weight management among Strong4Life campers. The analysis showed that those campers who achieved their physical activity goals or were working towards their goals showed significant improvements in BMI z-score, dry lean mass percent, fat percent, quality of life, SSB consumption, and light physical activity. However, campers who reported no progress towards their physical activity goals only showed significant improvements in physical quality of life score and SSB consumption. Nutrition goal achievers saw significant improvements in all quality of life scores, SSB consumption, SSB calories, and light physical activity. However, nutrition goal non-achievers only saw progress in physical quality of life score, SSB consumption, and light physical activity.

In terms of predicting weight loss, when considering demographic variables, baseline characteristics, and goal progress, 42% of the variation in change in BMI z-score in 2015 Camp Strong4Life Campers was accounted for. Significant correlates of BMI z-score reductions included age, registrant type, baseline quality of life score, and physical activity goal progress.

These results contribute to the existing literature regarding behavioral change interventions for overweight and obese children. This study is unique in that it is centered around goal setting and its impact on health related outcomes and behavior improvements. Additionally, this analysis is for a 1-week summer camp program with a four-month period from baseline to follow-up. Most existing evidence comes from longer summer camps and intensive behavioral interventions.

Goal Setting

This analysis compares the biometric, quality of life, nutrition, and physical activity changes of children who achieved their goal or are working on their goal ("achievers") with children who never started working on their goal ("non-achievers"). The analysis shows that physical activity goal achievers and nutrition goal achievers saw many more significant changes in health related outcomes than physical activity goal non-achievers and nutrition goal non-achievers respectively. Further, the between group comparison shows that compared to non-achievers, physical activity goal achievers saw statistically significant decreases in BMI z-score and sedentary minutes.

Although these are the only statistically significant difference between the two groups, the side-by-side comparison illustrates the relative benefit of making progress towards achieving one's goals. While the non-achievers showed significant changes in some important categories, the number of significant changes among goal achievers is much higher in terms of biometrics, quality of life, nutrition behaviors, and physical activity behaviors. The significant differences in change in BMI z-score and change in sedentary activity minutes between physical activity goal achievers and non-achievers provide further support for the evidence gathered from this side-by-side comparison.

Though this analysis does not measure the mechanisms of how goal setting affects health outcomes, we can use existing evidence to make a number of hypotheses. The literature indicates that goal setting leads to improved performance because goals promote direction, motivation, persistence, and development of new skills (Locke and Latham 2002; White and Skinner 1988). Goals control outside stimuli and work to regulate behavior through an individual's self-efficacy, decision-making, and self-regulation (Locke et al. 1981; Horowitz et al. 2004).

Based on the SCT, we might hypothesize that goal achievers exhibited higher self-efficacy and determination in reaching their goal, thus leading to significant changes in the outcomes of interest. Additionally, we can hypothesize differences in the goals set by the two groups. Goals set by the goal achievers may have been more specific and of a difficult yet realistic level. Evidence shows that these goal characteristics, combined with self-efficacy, goal commitment, and a participatory goal setting approach lead to higher goal achievement and ultimately improved performance or outcomes (Locke et al. 1981; Alexy 1985; Dishman et al. 2009; Cullen et al. 2001; Pearson 2012; Locke et al. 1989). Because changes in health and lifestyle habits require changes in the environment, we might also hypothesize that the family environment of the achievers was more supportive and facilitative of healthy habits compared to non-achievers during the time between baseline and follow-up. Further, the Camp Strong4Life environment, lessons learned, skills built, and social network created may have catalyzed each of these mechanisms.

The results from this analysis also fit in with the larger transtheoretical model of health behavior change and the readiness to change framework (Prochaska and Velicer 1997). In this model, the stages of change are pre-contemplation, contemplation, preparation, action, maintenance, and termination (Prochaska and Velicer 1997). As an individual moves from pre-contemplation to contemplation and to preparation, intent to make behavior change becomes more active and apparent (Howard 2007). After action has been taken, an individual continues through maintenance and ultimately to termination where full self-efficacy in the healthy behavior is achieved (Howard 2007). In this analysis, all campers and families have registered for camp and have set at least one behavior change goal with the help of an exercise physiologist and nutritionist. Therefore, these families are already in the preparation stage. Goal achiever

status, as described throughout this study, indicates that the camper and the family have begun adopting the necessary changes towards reach their desired outcome. Therefore, goal achievers have moved through the action stage and even into the maintenance stage, showing increased self-efficacy and consistency in healthy habits. However, goal non-achievers may have made some action, but have not yet reached maintenance in their healthy behaviors.

Further, it is interesting to note the differences in the analysis between the physical activity goals and nutrition goals. While physical activity goal achievers and nutrition goal achievers were both more successful than their goal non-achieving counterparts, it appears that improvement in body composition and lifestyle behaviors were more strongly associated with progress towards physical activity goals. Overall, physical activity goal achievers were more successful than nutrition goal achievers. Both groups of goal achievers saw significant improvements in quality of life scores, nutrition behaviors, and light physical activity behaviors. However, physical activity goal achievers also saw improvements in biometric outcomes while nutrition goal achievers did not. Therefore, we might hypothesize that physical activity goals were more influential in leading to positive biometric outcomes for campers at 2015 Camp Strong4Life. This might also be important in programming when goal setting protocols are created based on a single goal. This analysis suggests that if one topic must be focused on, the setting of a physical activity goal over a nutrition goal should be prioritized.

Though goal setting theory is well established, as discussed in the introduction and literature review, there is a lack of evaluation of goal setting used in health-related behavior changes programs, especially those targeted at children and adolescents. By isolating physical activity and nutrition goal progress, the positive results of this study, though limited by sample size, provide additional support for the use of goal setting in behavioral interventions. Further,

goal setting is an inexpensive technique that does not require specialized tools or equipment. Beyond training of staff, goal setting can quickly and easily be integrated into an existing behavior change program.

Camp Strong4Life

Overall, the analysis illustrates the positive benefits of Camp Strong4Life for all campers. As Table 6 shows, regardless of the campers' progress towards their goals, campers overall showed positive changes in a number of outcome categories. All campers on average showed significant increases in dry lean mass percent, quality of life, light activity minutes per day, and total expenditure from light activities. Campers also showed significant decreases in fat percent, and SSB consumption. These positive outcomes match Strong4Life's evaluation of previous years of Camp Strong4Life and further support the success of Camp Strong4Life moving forward.

However, the overall changes in physical activity behaviors showed less change compared to the biometric, quality of life, and nutrition behaviors. The only statistically significant change was in light activity minutes per day and corresponding daily energy expenditure. Overall, the campers did not show significant changes in sedentary, moderate, or vigorous minutes per day. Further, moderate, vigorous, and total minutes per day and energy expenditure from moderate, vigorous, and total activities and actually decreased, though not statistically significant. Although the sample size for this analysis is small, these results might call for a re-consideration of the physical activity components of Camp Strong4Life, especially if 2016 Camp data shows similar trends. If the Camp messaging and activities are directed towards increasing light physical activity minutes, the results show success. However, if Camp activities

and education is focused on reducing sedentary minutes and increasing moderate and vigorous activity minutes, there may be a need for changes in programming.

Correlates of Weight Loss

This study also set out to determine the significant correlates of weight loss for campers at Camp Strong4Life, measured by change in BMI z-score. The literature indicates that race, age, baseline BMI, baseline nutrition, baseline physical activity, and baseline quality of life might all be associated with weight loss after a weight-related behavioral treatment program (Delahanty et al. 2013; Shalitin et al. 2015; Braet et al. 2006; Teixeira et al. 2004).

This analysis supports with some of the correlates in existing literature, contradicts the evidence of other associations, and contributes a number of additional factors found to be significant in Camp Strong4Life campers. The final model includes: (1) demographic variables and baseline biometrics, quality of life, and nutrition and physical activity behaviors and (2) physical activity and nutrition goal progress scores.

This model indicates that for every year increase in age, a camper's BMI would decrease by 0.02 z-scores. This supports the existing evidence that older campers will show more success in weight management or weight loss (Braet 2006; Delahanty et al. 2013). Older children are believed to have more of the skills necessary to make behavior change. With the ability for independent decision making, older children likely have more capacity for personal investment and understanding of the need for behavior change and ultimately positive health outcomes. The model also suggests that for every point increase in baseline quality of life score, a camper's BMI would decrease by 0.003 z-scores. This indicates that those with higher initial QOL scores are more likely to see a decrease in BMI z-score, consistent with existing literature (Teixeira et

al. 2004). Increased baseline QOL might be consistent with higher baseline self-efficacy or self-confidence, both important factors in achieving behavior change goals and seeing positive health related outcomes. Because of the difficulty in building these mental skills, campers with higher initial QOL are at an advantage compared to campers with lower baseline QOL.

This study did not find sex, race, baseline BMI z-score, baseline SSB intake, or baseline physical activity behaviors to be significant correlates, though these variables have support in the literature. However, the results of this analysis are limited by the study's sample size.

This analysis also contributes evidence for additional correlates to consider in weight-loss programs for children. Registrant type (first time camper versus returning camper) was found to be significant. Compared to first time campers, returning campers saw an increase in BMI z-score. This model supports the idea that first time campers are more likely to see a decrease in BMI z-score. This could be an indicator of previous attempts at weight loss or previous participation in weight-management programs. This might indicate that because first time campers have not been exposed to behavior change programming, they might therefore have more room for learning, for behavior change, and for potential decrease in BMI z-score.

Additionally, physical activity goal progress proved to be a significant correlate. For every point increase in goal progress score, campers decreased their BMI by 0.03 z-scores. This suggests that those who have made more progress towards their physical activity goal (goal achievers) reduced their BMI z-score by more than those with less physical activity goal progress (goal non-achievers). This supports the evidence from objective one of this study which shows the health related benefits of being a physical activity goal achiever compared to a non-achiever. A camper and their family's readiness to change and adoption of healthy habits, particularly those related to physical activity behaviors, are important factors in weight management. As

described in the SCT, self-efficacy, motivation, outcome expectations, and self-regulation are all important factors in setting and reaching goals (Horowitz et al. 2004; Shilts et al. 2004). Goal achievers are more likely to have developed these skills, moved through the readiness to change stages, and made the necessary lifestyle changes to see positive healthy outcomes after Camp Strong4Life.

In general, the significant correlates in the final model add to existing literature surrounding weight maintenance and weight loss in children. Age, baseline QOL, registrant type, and physical activity goal progress, all found to be significant correlates of change in BMI z-score, help propel a camper and their family from the action phase into the maintenance phase and towards maintaining the healthy habits promoted at Camp Strong4Life. Given the variable nature of these studies, as discussed previously, as well as the small sample size of the study, it is not surprising that there are a number of factors not found to be significant correlates.

Sensitivity Analysis

The sensitivity analysis shows that the campers who completed follow-up are not much different than those who did not complete follow-up in terms of both demographics and baseline characteristics. Overall, our analyses do not show evidence of any systematic non-response bias due to follow-up.

Strengths and Limitations

There are a number of strengths and limitations of this study. An important limitation throughout was the small sample size. Though 97 campers attended camp, the analysis was limited to the campers who attended the reunion weekend and thus have follow-up data to match

to the baseline data. As discussed in the sensitivity analysis, our analyses do not support a systematic non-response bias on follow-up. However, the small sample size limits the power of the analyses. We must be cautious in generalizing these results beyond the scope of 2015 Camp Strong4Life. Future analyses could increase sample size by aggregating data from previous and future years of Camp Strong4Life, given data collection is done in a consistent manner. Further, in order to improve the evaluation of Camp, Strong4Life would benefit from increased number of campers attending the follow-up event. Strong4Life might want to consider incentivizing campers and families to attend this event and contribute follow-up data.

An additional limitation is from the self-reporting of quality of life, nutrition behaviors, and physical activity behaviors. Though these survey instruments have been previously validated, self-report, especially from children, is still a concern. Additionally, the use of SSB intake as a measure of nutrition behavior is also limiting. SSB behaviors are one of the four Strong4Life Healthy Habits, however, they cannot be considered indicative of all nutrition behaviors in general. To better assess nutrition behaviors, future evaluation might also want to consider some form of food intake questionnaire. However, accuracy in food intake questionnaires, especially with children and adolescents, would continue to be a challenge.

An additional limitation is the lack of randomization of the exposure. Whether considering the exposure as the overall Camp Strong4Life program or specifically goal setting in regards to the research question, the exposure is not randomized. In the future, in order to evaluate the total package of Camp, it would be beneficial to create a control group of children who are at a similar risk but do not attend Camp. Further, in order to evaluate the role of goal setting, it would be ideal to randomize the exposure of goal setting among campers at Camp.

However, because goal setting is an important part of Camp and of Strong4Life programming in general, this randomization might not be possible.

This study also has a number of strengths. First, the study uses multiple outcome measurements for measuring health outcomes. Beyond changes in BMI z-score, we also considered quality of life, nutrition, and physical activity outcomes. By considering quality of life, this analysis emphasizes the importance of emotional and social health in addition to just physical health. The literature shows that childhood obesity can influence many facets of a child's life, thus it is important to examine these non-biometric outcomes as well (DiClemente et al. 2009; Kirschenbaum et al. 2013).

Another strength is use of objective measures to support the self-reported data. Though, as discussed above, quality of life, nutrition behaviors, and physical activity behaviors were informed by self-reported data, biometric outcomes were measured objectively using biometric impedance measures. Therefore, the fact that the changes in BMI z-score, Dry Lean Mass Percent, and Fat Percent support the general conclusions is encouraging. However, it is important to note that there is still room for human error with biometric data through the measuring and inputting of height and the correct usage of the InBody machine. Further, bioelectrical impedance has known limitations including total water consumption and body build disposition (Coppini et al. 2005; Deurenberg 1996).

Lastly, this analysis is able to isolate goal progress for both physical activity goals and nutrition goals. By showing that the goal achievers and non-achievers were not significantly different at baseline, the significant differences at follow-up provide support for goal setting as a behavior change technique. This study contributes to the limited research around goal setting for

health related outcomes in children and adolescents. Further, this study is among the limited evidence for short-term behavior change programs targeting this population.

Public Health Implications and Future Research

The public health implications of this study can be specific to Camp Strong4Life and also, to some extent, applicable to behavior change programs. First, the analysis of goal progress through the comparison of goal achievers and goal non-achievers serves as support for the use of goal setting in behavior change interventions. Many programs include goal setting but there is little evidence of its utility among children and in health related interventions. This study shows that goal setting, an inexpensive and easy to use technique, does makes a contribution to health related behavior change interventions in children including biometric outcomes, quality of life outcomes, nutrition behavior outcomes, and some physical activity outcomes. Further, this analysis also suggests a slightly increased advantage of physical activity goal achievers over nutrition goal achievers. Therefore, if only one goal is being set, this analysis could serve as evidence promoting a physical activity goal over a nutrition goal. However, it is important to note that the professionals involved in the goal setting process at Camp Strong4Life are trained in patient centered goal setting and motivational interviewing. Training of professionals is an important part in a successful goal setting process.

The modeling of correlates of weight loss also has important implications. Before a behavioral intervention, a child's demographic and baseline characteristics can be used to predict success for a short-term weight related program. This targeting of the intervention could allow for more specialized treatment and improved program efficiency, such as a focus on older, first-time campers, as suggested by the regression model. Further, the support for physical activity

goal progress as a correlate of decrease in BMI z-score can be used to help promote goal setting and maintenance among providers and their patients. The support generated from this analysis could help encourage the use of goal setting in all Strong4Life programing in conjunction with increased follow-up and support to help patients and their families reach their behavior change goals. However, the limited sample size of this study likely limits the applicability of model for programs outside of Camp Strong4Life.

There are a number of recommendations for future research. Specifically for Strong4Life, this analysis can be continued with data from future Camp Strong4Life years to increase sample size and improve validity of the results. Additionally, future evaluations of Camp Strong4Life should consider some sort of incentive method for increasing follow-up participation, the use of multiple indicators of nutrition behaviors, and an objective measure of physical activity. With the increasing popularity of wearable physical activity devices, it would be beneficial to include this type of objective measure of physical activity in the evaluation process. Future analyses might also benefit from the modeling of other health related outcomes beyond change in BMI z-score including change in fat percent, change in QOL scores, and change in nutrition and physical activity behaviors.

In terms of goal setting theory in general, future research should consider the specific factors of goals considered to be influential in improving performance. Research shows that goals that are more difficult, more specific, and are created with the patient's participation are likely to lead to improved self-efficacy, goal commitment, and ultimately task performance (Locke at al. 1981; Alexy 1985; Dishman et al. 2009; Cullen et al. 2001; Pearson 2012; Locke et al. 1989). However, there is no standard method for categorizing goals and therefore this type of

analysis becomes very subjective. The creation of a standard method for assessing or ranking goals would help further test the effectiveness of goal setting in behavior change programs.

This study contributes to the growing body of knowledge surrounding weight management in children. With evidence of a pressing obesity epidemic and the demonstrated implications on physical health, mental health, and other important outcomes, any knowledge we can attain on how to reverse this epidemic is crucial. Strong4Life is a child wellness movement that extends well beyond Camp Strong4Life. This study provides important information that can be used in other facets of Stong4Life programming. The important role of goal setting determined through this study can be conveyed as additional evidence to support patient centered counseling and motivational interviewing techniques. The significant correlates of weight loss could potentially be used to help target programing for at-risk Strong4Life patients. Lastly, this study can serve as additional evidence for similar health related behavior-change interventions targeting overweight and obese children.

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Appendix 1: Survey Instruments
InBody 230 Biometric Assessment

InBody230

Body Composition

	Values	Lean Body Mass	Weight
Total Body Water			
Dry Lean Mass			
Body Fat Mass			

Body Composition Analysis

	Under	Normal	Over
Weight			
Skeletal Muscle Mass			
Body Fat Mass			

UNIT: %

Obesity Analysis

	Under	Normal	Over
BMI Body Mass Index (kg/m²)			
PBF Percentage of Body Fat (%)			

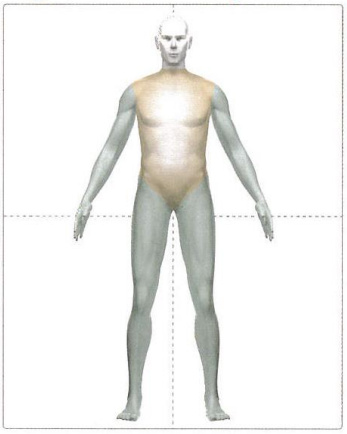
$$BMI = \frac{\text{Weight, kg}}{\text{Height}^2, \text{m}^2}$$

$$PBF = \frac{\text{Fat}}{\text{Weight}} \times 100$$

BMI Body Mass Index ☐ Under ☐ Normal ☐ Over

PBF Percentage of Body Fat ☐ Under ☐ Normal ☐ Over

Segmental Lean Analysis



Segmental Lean Analysis

Use this section to understand how your muscle mass is distributed throughout your body. Your segmental distribution could indicate that you have maintained or developed muscle mass proportionately. You may discover that you have a tendency toward a disproportionate amount of muscle in your legs or your trunk and arms. Genetically there are inherent tendencies toward more or less musculature in any of these areas. It's true that you can't "spot lose" fat but you can develop or maintain certain muscles by using them more.

Body Composition

Body composition testing is the process of measuring the components of your body, in short what you're made of. Weight alone is not a clear indication of good health because it does not distinguish how many pounds are fat and how many pounds are lean body mass. By regularly monitoring your Body Fat, and Muscle Mass or Muscular Development, you can understand how your diet, lifestyle and exercise regime are influencing your body composition. Knowing what's working for you can help you target and reach your wellness, appearance and longevity goals.

Body Composition Analysis

What we're made of impacts our health, appearance and our capabilities. Too much Body Fat increases our risk of developing diseases such as diabetes, heart disease and cancer. Carrying too much weight places undo strain on our joints, heart and vital organs. Ideally, the Skeletal Muscle Mass graph to the left should reach or surpass the normal range and the Body Fat Mass graph should be falling within the Normal Range.

Obesity Analysis

BMI isn't a measurement but a calculation based on your height and weight. A BMI over the normal range can indicate a weight problem, or a degree of obesity. Individuals with large amounts of muscle mass for their height may also have a BMI over the normal range; this is not indicative of obesity or a health risk. Percentage of Body Fat is a measured component of your actual body composition, PBF is the percentage of your total weight that isn't muscle, bone or excess fluid. PBF is a more accurate means of assessing degrees of obesity or degrees of fitness.

Body Fat & LBM

Body Fat

LBM

Fat : + (need more body fat mass)
- (lose body fat mass)

LBM : +(need more lean body mass)
0.0 lbs.(maintain current LBM)

Basal Metabolic Rate

BMR

The BMR is the minimal number of calories needed to sustain life at a resting state. BMR is directly correlated with Lean Body Mass. With age muscle depletes and BMR steadily decrease.

PedsQL: Quality of Life

*In the past **ONE month**, how much of a **problem** has this been for you …*

ABOUT MY HEALTH AND ACTIVITIES *(problems with…)*	Never	Almost Never	Some-times	Often	Almost Always
1. It is hard for me to walk more than one block	0	1	2	3	4
2. It is hard for me to run	0	1	2	3	4
3. It is hard for me to do sports activity or exercise	0	1	2	3	4
4. It is hard for me to lift something heavy	0	1	2	3	4
5. It is hard for me to take a bath or shower by myself	0	1	2	3	4
6. It is hard for me to do chores around the house	0	1	2	3	4
7. I hurt or ache	0	1	2	3	4
8. I have low energy	0	1	2	3	4

ABOUT MY FEELINGS *(problems with…)*	Never	Almost Never	Some-times	Often	Almost Always
1. I feel afraid or scared	0	1	2	3	4
2. I feel sad or blue	0	1	2	3	4
3. I feel angry	0	1	2	3	4
4. I have trouble sleeping	0	1	2	3	4
5. I worry about what will happen to me	0	1	2	3	4

HOW I GET ALONG WITH OTHERS *(problems with…)*	Never	Almost Never	Some-times	Often	Almost Always
1. I have trouble getting along with other kids	0	1	2	3	4
2. Other kids do not want to be my friend	0	1	2	3	4
3. Other kids tease me	0	1	2	3	4
4. I cannot do things that other kids my age can do	0	1	2	3	4
5. It is hard to keep up when I play with other kids	0	1	2	3	4

ABOUT SCHOOL *(problems with…)*	Never	Almost Never	Some-times	Often	Almost Always
1. It is hard to pay attention in class	0	1	2	3	4
2. I forget things	0	1	2	3	4
3. I have trouble keeping up with my schoolwork	0	1	2	3	4
4. I miss school because of not feeling well	0	1	2	3	4
5. I miss school to go to the doctor or hospital	0	1	2	3	4

Beverage Questionnaire

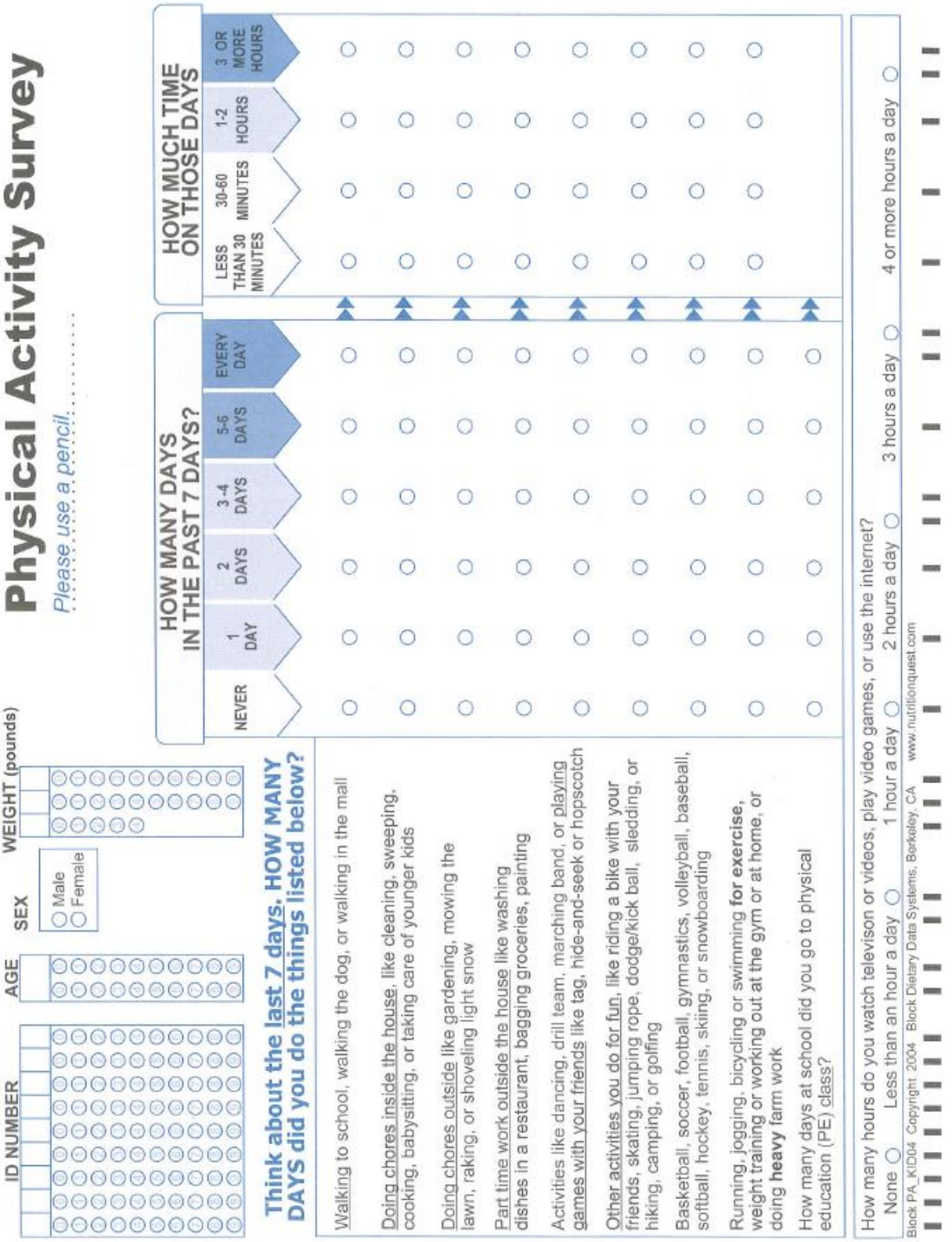
Instructions: Think about all the kinds of drinks you have had in the **PAST MONTH:**

1. For each of the drink types, BUBBLE *how often* you drank the beverage (Blue Column)
2. Then BUBBLE *how much* you drank each time (Orange Column) **(Make sure you fill in a bubble in each column)**
   - For example if you drink water every day, at breakfast, lunch, and dinner (3 times a day), you would fill in the bubble **"3+ times per day".** If each time you have water, you have a cup, you would fill in the **"8 fl. oz. (1 cup)"**
   - **Do not count beverages that are used in foods, such as milk in cereal.**

	HOW OFTEN DID YOU DRINK ANY OF THESE? (Mark one)							HOW MUCH DID YOU DRINK EACH TIME?(Mark one)				
Beverage Types	Never or less than once a week	Once a week	2-3 times per week	4-6 times per week	Once a day	2 times per day	3 + times per day	Less than 6 fl. oz. (3/4 cup)	8 fl. oz. (1 cup)	12 fl. oz. (1.5 cups)	16 fl. oz. (2 cups)	More than 20 fl. oz. (2.5+ cups)
Water	○	○	○	○	○	○	○	○	○	○	○	○
100% fruit juice	○	○	○	○	○	○	○	○	○	○	○	○
Sweetened juice beverage/ drink (fruit ades, lemonade, punch, Sunny D)	○	○	○	○	○	○	○	○	○	○	○	○
Whole milk	○	○	○	○	○	○	○	○	○	○	○	○
Reduced fat milk (2%)	○	○	○	○	○	○	○	○	○	○	○	○
Low fat/ fat free milk (Skim, 1%, buttermilk, soymilk)	○	○	○	○	○	○	○	○	○	○	○	○
Regular soda	○	○	○	○	○	○	○	○	○	○	○	○

Diet soda/ artificially sweetened drinks (Crystal Light)	○	○	○	○	○	○	○	○	○	○	○	○
Sweetened Tea	○	○	○	○	○	○	○	○	○	○	○	○
Tea or coffee, with cream and/ or sugar (includes non-dairy creamer)	○	○	○	○	○	○	○	○	○	○	○	○
Tea or coffee, black with/ without artificial sweetener (no cream or sugar)	○	○	○	○	○	○	○	○	○	○	○	○
Energy and sports drinks (Red Bull, Rockstar, Gatorade, Powerade, etc.)	○	○	○	○	○	○	○	○	○	○	○	○
Other (list): _____	○	○	○	○	○	○	○	○	○	○	○	○

Nutrition Quest Physical Activity Block Screener



Physical Activity Survey

Please use a pencil.

ID NUMBER

AGE

SEX ○ Male ○ Female

WEIGHT (pounds)

Think about the last 7 days. HOW MANY DAYS did you do the things listed below?

	HOW MANY DAYS IN THE PAST 7 DAYS?							HOW MUCH TIME ON THOSE DAYS			
	NEVER	1 DAY	2 DAYS	3-4 DAYS	5-6 DAYS	EVERY DAY		LESS THAN 30 MINUTES	30-60 MINUTES	1-2 HOURS	3 OR MORE HOURS
Walking to school, walking the dog, or walking in the mall	○	○	○	○	○	○	→	○	○	○	○
Doing chores inside the house, like cleaning, sweeping, cooking, babysitting, or taking care of younger kids	○	○	○	○	○	○	→	○	○	○	○
Doing chores outside like gardening, mowing the lawn, raking, or shoveling light snow	○	○	○	○	○	○	→	○	○	○	○
Part time work outside the house like washing dishes in a restaurant, bagging groceries, painting	○	○	○	○	○	○	→	○	○	○	○
Activities like dancing, drill team, marching band, or playing games with your friends like tag, hide-and-seek or hopscotch	○	○	○	○	○	○	→	○	○	○	○
Other activities you do for fun, like riding a bike with your friends, skating, jumping rope, dodge/kick ball, sledding, or hiking, camping, or golfing	○	○	○	○	○	○	→	○	○	○	○
Basketball, soccer, football, gymnastics, volleyball, baseball, softball, hockey, tennis, skiing, or snowboarding	○	○	○	○	○	○	→	○	○	○	○
Running, jogging, bicycling or swimming **for exercise**, weight training or working out at the gym or at home, or doing **heavy** farm work	○	○	○	○	○	○	→	○	○	○	○
How many days at school did you go to physical education (PE) class?	○	○	○	○	○	○	→				

How many hours do you watch televison or videos, play video games, or use the internet?

None ○ Less than an hour a day ○ 1 hour a day ○ 2 hours a day ○ 3 hours a day ○ 4 or more hours a day ○

Appendix 2: Data Analysis Conversion Tables

Table 10. PedsQL Conversion for Quality of Life Scoring

Survey Response Choices	Raw Scores	0-100 Scale Scores
Never	1	100
Almost Never	2	75
Sometimes	3	50
Often	4	25
Almost Always	5	0

Table 11. Beverage Consumption Frequency Conversions for Beverage Questionnaire

Data Collection Form Measurement	Value for analysis (times per day)
Never or less than one time per week	0.07
Once per week	0.14
2-3 times per week	0.35
4-6 times per week	0.71
Once per day	1
Twice per day	2
3 or more times per day	3

Table 12. Beverage Consumption Volume Conversions for Beverage Questionnaire

Data collection form measurement	Value for Analysis (ounces)
Less than 60 fl. Oz. (3/4 cup)	3
8 fl. Oz. (1 cup)	8
12 fl. Oz. (1.5 cups)	12
16 fl. Oz. (2 cups)	16
20 fl. Oz. (2.5 cups) or more	20

Table 13. Caloric Conversions of Beverages Included in Beverage Questionnaire Analysis

Beverage	Kcal/oz
Water	0
100% Fruit Juice	17.67
Sweetened Juice	14.3
Whole Milk	22.8
Reduced Fat Milk (2%)	18.7
1% or Fat Free Milk	11.45
Regular Soda	13.3
Diet Soda	0.3
Sweetened Tea	10.0
Coffee with Cream or Sugar	8.2
Black Coffee (unsweetened)	0.35
Energy or Sports Drink	14.0

Table 14. Physical Activity Frequency Conversions for Physical Activity Block Screener

Data Collection Form Measurement	Value for analysis (times per day)
Never	0
1 day	0.14
2 days	0.29
3-4 days	0.5
5-6 days	0.79
Every day	1

Table 15. Physical Activity Duration Conversions for Physical Activity Block Screener

Data collection form measurement	Value for Analysis (minutes)
Less than 30 minutes	15
Less than 1 hour a day (sedentary behaviors question)	30
30-60 minutes	45
1-2 hours	90
3 or more hours	180
4 or more hours a day (sedentary behaviors question)	240

Table 16. Estimated METs for Physical Activities Included in Physical Activity Block Screener

Physical Activity Category	METs	Group MET Average
Light Activities		**2.67**
Doing chores inside the house		
Cleaning	3.0	
Sweeping	3.6	
Cooking	2.0	
Taking care of younger kids	3.0	
Part time work outside the house		
Washing dishes	1.9	
Bagging groceries	2.5	
Moderate Activities		**5.06**
Walking	3.6	
Doing chores outside		
Gardening	3.7	
Mowing the lawn	5.5	
Raking	4.3	
Shoveling	4.3	
Playing games with your friends		
Dancing	5.5	
Tag	5.0	

Hide-and-seek	4.0	
Hopscotch	5.9	
Other activities you do for fun		
Riding a bike with friends	6.2	
Skating	7.0	
Jumping rope	8.3	
Dodge/kick ball	3.8	
Sledding	7.0	
Camping	2.5	
Golfing	4.3	
Vigorous Activities		**6.70**
Sports		
Basketball	8.2	
Soccer	8.8	
Football	8.8	
Gymnastics	4.0	
Volleyball	4.0	
Baseball	5.0	
Softball	5.0	
Hockey	8.0	
Tennis	7.0	
Skiing	6.0	
Activities for exercise or heavy work		
Running or jogging	8.5	
Bicycling for exercise	7.8	
Swimming for exercise	9.9	
Weight training	2.8	