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Measuring the Impact of Participation in the Strong4Life Camp Program on the Quality of Life (QL) of Overweight and Obese Campers Using the PedsQL Test.

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Master of Public Health

Measuring the Impact of Participation in the Strong4Life Camp Program on the Quality of Life (QL) of Overweight and Obese Campers Using the PedsQL Test.

By Salma Abuznada

Background: More than 14% of world's children and adolescents are either overweight or obese and 15% of children and adolescents are at risk of being overweight. Overweight and obesity negatively affect several different life quality factors including social, emotional, physical functioning and school performance. The Pediatric Quality of Life (PedsQL) is a validated, and reliable instrument used to measure the quality of life among children and adolescents. It is a self-reflection of overall health and wellbeing. Residential camp programs have been used to support improvements in the weight status of children but little is known about their impact on other factors such as quality of life with or without weight improvement.

Methods: A secondary analysis was conducted to evaluate the impact of the Camp Strong4Life, a family centered, fun-filled, healthy behaviors camp program for overweight and obese children age 9-15 years, based in Georgia, USA. One of the camp goals is to improve the overall quality of life among campers, therefore, we measured the quality of life using the PedsQL before and after participation in the 2015 camp program. We also took into account other demographic factors that might influence quality of life, including race, gender, and household income.

Results: A total sample of 95 boys and girls attended camp in May 2015 and a total of 55 returned in August 2015. The majority of our camp attendees were girls. The mean and standard deviation (SD) of the total PedsQL score at baseline was 77.81 $\pm$ 13.83. In Reunion Weekend, the total mean of the PedsQL was 81.53 (SD=13.77). Using t-tests, we found that the total score improved significantly between the Welcome Weekend(baseline) and the Reunion Weekend (3 month follow-up) ($P<0.05$, Mean=-5.2, Std Error= 1.4) The sub-scores also improved significantly.

Discussion: Our study's findings were consistent with previous studies that found relationship between body weight, BMI and PedsQ. Although we found evidence of improvement, a major limitation is the small sample size and high loss to follow-up that makes it harder to generalize our results regarding the effectiveness of Camp Strong4Life. We would like to make more periodic follow up (semi-annually or annually) to see how effective is the camp in the long run.

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Chapter I: Introduction

Context of Project (Background)

Worldwide, childhood obesity is a major public health concern as childhood obesity rates are continuously increasing. Now more than 14% of world's children and adolescents are either overweight or obese and 15% of children and adolescents are at risk of being overweight (Modi, 2006 ; Kolotkin, 2006). In 2014, Georgia ranked 17th in the United States for childhood obesity with 16.5% of children and 12.7% of high school students having a body mass index (BMI) within the obese range (Trust for America's Health and Robert Wood Johnson Foundation, 2014). A growing body of literature suggests that overweight and obesity affect different life quality factors including social, emotional and, physical functioning and school performance. Psychological and psychosocial factors showed to be among the most significant side effects of childhood obesity (Modi, 2006; Kolotkin, 2006).

In the past few years, it has become well known that obesity increases the risk of morbidity and mortality, affects mental and physiological development, and significantly lowers confidence, especially among youth. There are several factors on different levels that contribute to weight problems worldwide. There are also significant contributors related to social, emotional and physical factors. Some of the primary barriers that prevent students from adhering to a healthy diet include a lack of effort by the school to educate students about good eating habits, a lack of parents' encouragement to consume healthy food at home and outside, and insufficient time to cook or prepare nutritious meals. To strengthen the relationship between the quality of life and body weight, there is a need to document the changes seen in the quality of life scores before and after attending weight control programs.

The Pediatric Quality of Life (PedsQL) is a validated and reliable survey used to

measure the quality of life among children and adolescents. It takes into account four functioning factors: physical, social, emotional and cognitive functioning. The PedsQL is a self-reported reflection of overall health and wellbeing (Modi, 2006; Varni, 2001). Health-related quality of life (HRQOL) questionnaires are either generic (e.g. Pediatric Quality of Life Questionnaire) or condition-specific (e.g. Impact of Weight on Quality of Life (IWQOL). Generic pediatric HRQOL surveys contain questions that can be easily applicable to a wide spectrum of population with or without diseases. On the other hand, condition-specific tools like the IWQOL ask about specific details of disease-related problems or aspects, which may make them more appropriate for populations with specific conditions (e.g., diabetes, cardiac diseases or renal problems) (Tsiros et al., 2009). We used the Generic PedsQL, because it focuses less on the diseases and more on overall quality of life in healthy individuals

The PedsQL has been used widely to determine the quality of life in populations of interest. Zeller, et al. have linked significant low quality of life among overweight and obese children (Modi, 2006). Compared to children with other chronic diseases, obese children had lower quality of life than children with cardiac problems, gastrointestinal disorder or diabetes (Varni, 2007). However, children who attended a certain kind of weight control camp or program were shown to have improve quality of life as demonstrated by the Impact of Weight on Quality of Life (IWQOL)-Kids questionnaire (Ronette, 2006).

Gaining weight during childhood and adolescents is linked to poor quality of life, and it can significantly affect children's and adolescents' physical, social and psychological well-being and moderately affecting their emotional and cognitive functioning (Varni, 2007). Other studies including the one conducted by Pinhas and colleagues showed that moderately obese children (BMI between 85th percentile and below the 95th) had similar PedsQL scores when compared to their normal weight peers (Pinhas-Hamiel et al., 2006). The present study

examines quality of life scores in overweight and obese children and adolescent campers at two different time points, before and after attending Camp Strong4Life, to determine the impact of the program. Camp Strong4Life is a one week weight control camp that aims to teach children healthy behaviors, including the benefits of physical activity and proper nutrition.

Problem Statement

A growing body of literature suggests that overweight and obesity affect different life factors including social functioning, emotional functioning, physical functioning and school performance. Taking into account these four aspects, our research and camp work planned to evaluate and improve the quality of life among overweight and obese children and adolescents at two different time points, before and after attending the Camp Strong4Life (S4L) using the Pediatric Quality of Life Scale (PedsQL).

Significance of the Problem

In the past few years, it has been well known that obesity increases the risk of morbidity and mortality, affects mental and physiological development and significantly lower confidence, especially among youth (Modi, 2006).

Childhood obesity is continuously increasing in both developed and developing countries, overweight and obesity related problem can lead to other comorbidities that require an immediate action (Kolotkin, 2006). Georgia's childhood obesity rate is ranked as the 17th highest in the U.S with 16.5% and 12.7% of obese children and high school students, respectively (Trust for America's Health and Robert Wood Johnson Foundation, 2014).

There are several factors on different levels contribute to weight problems worldwide, one of the significant contributors is related to social factors; absence of knowledge about good eating habits, lack of parents encouragement to consume healthy food and not having enough time to cook or prepare nutritious meals are some of the primary boundaries to adhere to a good diet among both males and females (Viner, 2006).

Behavioral factors are also significant leading causes to obesity; calorie-dense food and sugar-sweetened drinks are progressively accessible to school children and adolescents (Varni, 2001). Moreover, the time spent in sedentary activities, for example, watching TV and playing video games, has strongly increased (Varni, 2001).

Childhood obesity can negatively influence all body organs and regularly causes negative outcomes, including hypertension, dyslipidemia, insulin dyslipidemia, fatty liver disease and psychosocial complications (Tsiros et al., 2009).

That being said, there is an urgent duty to establish and develop a well-based program to control and prevent obesity among school aged children using a well-structured strategies that can be applied at multiple levels.

Purpose

This research proposes to do the following;

- Determine the impact of the Camp Strong4Life in changing children's quality of life scores using the PedsQL.
- Determine if factors such as gender, race, household income, and parent's highest level of education are associated with baseline measurements of children's quality of life

Chapter II: Literature Review

Little is known about the impact of overweight and obesity on children and adolescents' quality of life. Overweight and obesity problems affect children and adolescents physical and mental health. Overweight and obese children are usually less confident when compared to their peers with normal body weights. (Riazi, 2010). Obesity is a major health concern in both developing and developed countries and growing evidence suggests that obesity negatively influence the functional and mental health of obese population, in other terms, obesity affects the health-related quality of life (HRQOL). Studies on adults have shown that weight loss is associated with improved HRQOL (Tsiros, 2009 ; Ul-Haq, 2013). Furthermore, in the last decade, researchers started to determine the relationship between childhood obesity and health-related quality of life using the Pediatric Quality of Life (PedsQL) (Pinhas, 2006 ; Schwimmer, 2003).

Pediatric Quality of Life:

Pediatric Quality of Life (PedsQL) Inventory defines the PedsQL Measurement Model as "a modular approach to measuring health-related quality of life (HRQOL) in healthy children and adolescents and those with acute and chronic health conditions. It integrates seamlessly both generic core scales and disease-specific modules into one measurement system."

The model contains four functioning components, each component contains a set of questions and children's and adolescents combined answers will be calculated to determine their function-specific score and overall score.

The four components include:

1) Physical functioning, which asks about abilities to walk and run, sport activities, lifting heavy objects, ability to take a bath or shower alone, ability to do chores around the house, and it also asks about hurting, aching, and low energy problems.
2) Emotional functioning, which asks about feeling of fear, anxiety, and fear of the future.
3) Social functioning asks about having trouble getting along with other kids, whether they feel other kids don't want to be their friends, feeling teased by other kids, abilities do things other kids their age can do, and ability to keep up when they play with other kids.
4) School functioning, which includes questions about school performance in general.

In our research, we used the Generic Core Scales, which combines four scales including Physical Functioning, Emotional Functioning, Social Functioning, and School Functioning. They are all included in one questionnaire to make it easier to develop scale scores.

Scales	**Summary Scores**
Physical Functioning (8 items)	**Total Scale Score** (23 items)
Emotional Functioning (5 items)	**Physical Health Summary Score** (8 items)
Social Functioning (5 items)	**Psychosocial Health Summary Score** (15 items)
School Functioning (5 items)	

PedsQL Uses

The PedsQL has been used in multiple studies and researches to evaluate the overall quality of life among children. Researchers have used the PedsQL with children with cerebral palsy, asthma (Using the PedsQL™ 3.0 asthma module to obtain scores comparable with those of the PROMIS pediatric asthma impact scale (PAIS), stress disorders (Mitchell, 2015), Juvenile Arthritis (Degotardi, 2003)and End Stage Renal Disease (Goldstein, 2006) . All these diseases and comorbidities can dramatically impact overall well-being and daily movement.

Global Childhood Obesity

Over the last two decades, childhood obesity rates have greatly increased in both developed and developing world. Obesity affects children's physical, functional and mental health and it leads to premature chronic diseases and premature death later in life. Therefore, obesity is a major public health crisis, especially that the current treatments practices of obesity are not greatly effective.

Historically, obese children were referred to as healthy children, as a fat child was a sign of availability of abundant resources of food and a sign of families' wealth and gesture. Recently however, overweight and obesity became the primary childhood problems worldwide (Ebbeling, 2002). Obesity mechanism and biology is not yet fully understood but researchers have agreed that it is a disorder with multiple risk factors and consequences.

CDC Definition of Childhood Overweight and Obesity Based on the CDC Growth Charts:

Overweight: children whom their BMI-for-age fall between 85th to less than the 95th percentiles

Obesity: Children whom their BMI-for-age in on 95th percentile or greater.

In adults, BMI is calculated by dividing weight in kilograms over height squared in meters; weight (kg)/ [height (m)]^2. BMI can be used as a health indicator for body fat and as a screening tool but not it is(as) a diagnostic measure.

In children, BMI calculated by taking the child weight and height, then using the Child and Teen BMI Calculator to calculate their BMI. After calculating BMI, it can be expressed as a percentile using the CDC growth charts. The percentiles are calculated and based on the weights and heights of U.S. children participated in the national survey during the years 1963-1965 and 1988-1994. Children's BMI changes during growth and are interpreted differently between the two genders. Therefore, BMI percentiles are calculated and interpreted based on sex and age.

Lifestyle and Physical Activity

A sedentary lifestyle is characterized by inactivity and often includes long screen time hours. A study that was conducted in the United States found that obese school children spend less time in both moderate and vigorous physical activity compared to classmates with normal body weights (Anderson, 1998). In South America, a cross-sectional study found that spending one hour of moderate physical activity per day decreased risk of obesity by 10%. On the other

hand, the same study found that each screen-time hour spent per day, increased the risk of obesity by 12% (Berkey et al., 2000; Hernández, 1999). Long hours of screen-time are also associated with increased BMI in both genders (Berkey et al., 2000; Hernández , 1999). Screen-time and watching television in particular are thought to influence weight gain because children and adolescents are found to eat more energy and fat-dense food while watching TV. Moreover, food advertisements greatly influence food intake and dietary pattern among young population. Children in the United States and United Kingdom watch around ten foods commercial during only one hour of watching TV, most of which are for junk and fast food and sweetened food and beverages. (Kotz , 1994; Lewis, 1998; Taras, 1995). Most of the studies that concluded strong association between watching television and obesity are cross-sectional, therefore, the causal relationship between watching television and obesity is only suspected and not strongly claimed. More longitudinal studies are needed to show how different number of hours spent on television can show different effect on body weight (Caroli, 2004).

Diet

Recommendations vary in respect to best diet composition for children and adolescents. Until recently, fatty food was believed to be the primary reason of weight gain because fat is the most energy dense macronutrient. Researchers and investigators questioned the relationship between dietary fat and fat adiposity. Epidemiological studies showed that dietary fat is not always associated with fat adiposity in children and adolescents (Davies, 2000; Ludwig et al., 1999). Diet quality consumed during childhood are more important than the amount of fat being consumed. Trans fatty acids, for example, have been always linked to cardiovascular disease and other obesity-related comorbidities. On the other hand, monounsaturated fat found in olive oil is well known to be a preventive dietary component

against different kind of cancer (Toledo et al., 2015). Also, decreased intake of dietary fat is associated with increased intake of refined white carbohydrates, for example, white bread, potatoes, rice and other food items are considered belong to the high glycemic index food group. High glycemic index is associated with nutrition-related problem including obesity, cardiovascular diseases and type 2 diabetes (Cook, 2008; Salmerón, 1997; Toeller, 2001). Moreover, excessive consumption of high glycemic index food is associated with children overeating habits that are influenced by the hormonal changes induced by the high glycemic food. (Ludwig et al., 1999)

Recently, sugar-sweetened beverages such as soft drinks, energy drinks, and flavored milk, have received a lot of attention. Results from a cross sectional study have shown that total energy intake in children who consume sweetened beverages at schools or at home was 10% higher than children who do not (Harnack, 1999). Another observational study, after controlling for confounding factors, found that for every additional serving of sugar sweetened beverages the risk of obesity increased by 60% in school children (Ludwig, 2001). On the other hand, milk, which has lower glycemic index than sugar sweetened beverages is known to protect from obesity(Pereira, 2002).

Welsh and colleagues used sugar sweetened beverage consumption as an estimated measure associated with cardiovascular disease risk. Estimation level were divided into different percent categories from <10% to >30% of total energy. U.S. adolescents' consumption of sugars sweetened beverages between 1999-2004 was estimated to be 21.4 of total energy. Even though overall consumption of sugar decreased, especially between the 2000 and 2007, main intake was still above the recommended level. It is important to note that in this study higher consumption of sugar sweetened beverages were associated with lower high-density lipoprotein cholesterol and higher low-density lipoprotein cholesterol (Welsh et

al., 2011).

Home Environment

Children-parents relationship can affect children and adolescent obesity-related behaviors and attitude. With the new fast lifestyle, families tend to eat outside more than before, it is now more easy and convenient to eat in a restaurant than spending hours preparing and cooking healthy food. Children tend to eat more when in a restaurant than when at home, one reason is restaurants usually serve large portion sizes of energy and fat-dense food (Zoumas-Morse, 2001). Children also often have TVs in their bedroom, which is found to increase screen-time by 38 minutes/day (Zoumas-Morse, 2001). Depressed and neglected children are at a greater risk of developing obesity; hence, it is important to provide children and adolescents with the social support and guidance that they need (Kivimäki, 2009; Mellbin, 1989). Moreover, one study found that children who are supported and guided by their parents and families tend to spend more hours in physical activity (Sallis, 2000). Sallis found that there were certain variables consistently association with physical activities levels among children, among some of these variables are gender -with male participants being more physically active-, parents' weight status, intention to be physically active, and community and parents support

Childhood Obesity Complications

Obesity is a multisystem problem with serious complications and consequences. Childhood obesity is associated with type 2 diabetes, hypertension, cardiovascular diseases and pulmonary complications. Type 2 diabetes which is usually rarely diagnosed during childhood, now accounts for 50% of new diabetes diagnosed cases in some population. The new incidences can be largely attributed to the epidemic of childhood obesity (Ebbeling, 2002).

The consequences of pulmonary problems in an overweight or obese child include apnea, asthma and exercise intolerance. Exercise intolerance can significantly limit children's physical activity, therefore, lead to more weight gain and adapting sedentary lifestyle. Furthermore, studies consistently link childhood obesity with psychosocial consequences. Obese children are stigmatized for being unhealthy, unsuccessful at school, unhygienic and inactive (Hill, 1995). Obese children and adolescents were found to develop negative self-esteem and negative self-image (Davison, 2001; Strauss, 2000)

Health complications related to obesity differ among different races and ethnic groups. In the United States, Black and Hispanic obese children are at a higher risk for developing type 2 diabetes and cardiovascular diseases when compared to white American children and adolescents (Fagot-Campagna, 2000; Park, 2003). On the other hand, white girls are usually at a greater risk of developing severe negative psychosocial effects when compared with girls from other ethnic groups. (Kimm, 1997)

Obesity and School Performance

Studies have shown that childhood obesity is a risk factor for poor health-related quality of life, including low self-esteem, depression, and poor school and social functioning, which includes relationships with peers and teachers, ability to pay attention and complete homework, happiness at school, and absenteeism**.** (Schwimmer et al., 2003; Swallen, et al 2005; Williams, et al. 2005).A limited number of studies suggested that obese children do not perform as well academically as their healthy-weight peers, this is of particular concern, as academic achievement during adolescence is important in predicting adult outcomes, such as unemployment (Laitinen et al., 2002), adult obesity (Lawlor et al., 2006; Chandola et al., 2006)

and adult cardiac risk profiles (Mayer et al, 2004). The underlying mechanism and factors affecting the association of obesity and academic performance are unclear. One study found that social context, such as rates of athletic participation and average body mass index (BMI) in the subjects' school, was a modifier of the association between obesity and school performance (Crosnoe and Muller, 2004). Several studies about adolescents found that the self-perception of obesity is more important than medically defined obesity in predicting poor mental health, self-esteem, psychological distress, and behavior problems. (Bogt et al., 2006; Jansen et al., 2008; Atlantis and Ball 2008; Eaton et al, 2005; Paxton et al., 2006).

Childhood Obesity Prevention

Childhood prevention can be primary or secondary. Primary interventions would involve preventing overweight or obesity occurrence. Secondary intervention would involve preventing weight regain after a successful weight loss, and sustaining current body weight by preventing already overweight and obese children from gaining more weight. Lifestyle, environmental, familial and cultural factors play a significant role in both developing and preventing obesity.

Research has focused on behavioral change factors as a method in preventing weight gain, however, this way had a lower impact in preventing childhood obesity than expected (Dehghan et al., 2005). Deghan et al., believe that as more than 50% of some countries adults are obese, it would be hard to treat and tackle adulthood obesity at this point, therefore, preventing childhood obesity should be the main concern and become the major public health priority (Dehghan et al., 2005). Moreover, childhood is a critical period for effective intervention strategies and policy making. Children have more potential intervention than

adults, for example, children can go to schools where they have a natural setting for healthy eating habits and physical activity at schools' cafeterias and gyms. Other settings include pre-school programs and after-school services, which can also carry similar facilities and opportunities. All these factors would make it more sensible to initiate obesity prevention during childhood and adolescence ages. Childhood obesity prevention programs have become a major public health priority because of the great impact of obesity on different chronic diseases (Waters, 2011). For example, School-based obesity/wellness programs can effectively achieve their goals in a number of ways. First, healthy eating habits and physical activity topics can be added to the school curriculum. Second, the food quality sold at school cafeteria and stores can be improved. Third, children can be encouraged to be active throughout the day, and finally, parents can be more involved by encouraging children to eat healthy and be more active. (Waters, 2011).

Studies have also shown that interventions that aim to reduce sedentary lifestyle and encourage free-style physical activity are more effective than preventions that strictly reduce food intake or force certain types of physical activities (Dehghan et al., 2005)

Childhood and adulthood obesity is a significant public health concern. Childhood should be the priority of public health prevention policies and programs because it is more effective to tackle the problem at an early age and early stage during childhood and adolescence. Moreover, preventing childhood overweight and obesity problems will eventually decrease the incidences of adulthood obesity.

As summer period is a risk window for children to engage in obesogenic activities. Summer camps are one way of maintaining school efforts that target children's body weight, eating habits and lifestyle during the school year. The aim of this thesis is to determine the

effectiveness of Children Healthcare of Atlanta's Camp Strong4Life in improving their overall quality of life. We also aim to examine other demographic determinants of quality of life including gender, their families' annual household income, their parents' highest education and their body weight.

Chapter III: Methodology

Purpose

This research proposes to do the following;

- Determine the impact of the Camp Strong4Life in changing children's quality of life scores using the PedsQL.
- Determine if factors such as gender, race, household income, and parent's highest level of education are associated with baseline measurements of children's quality of life

Methods

Program Design

We conducted an evaluation study to look at the impact of the Camp Strong4Life program on camper's quality of life. Camp Strong4Life is a one week camp program that targets overweight and obese children and adolescents. It focuses on healthy behaviors and making healthy changes including goal setting and tracking, wellness coaching, nutrition counseling and meal planning, and emotional support.

In camp, children and adolescents learn what healthy eating habits are through the nutrition counseling and meal planning. Camp also focuses on emotional support and how children's body weight was affecting their daily activities quality of life. This thesis work is a secondary analysis for the camp work that was conducted by Strong4Life initiative based at Children's Healthcare in Atlanta, Georgia, USA.

The camp is located in Winder, Georgia, USA. One of the camp goals is to improve

the overall quality of life among campers. Therefore, we measured the quality of life among campers using the PedsQL Scale Test at two different time points: baseline at a Welcome Weekend in May, and at a follow-up event (Reunion Weekend) approximately two months after camp in August.

Welcoming Weekend, which was in May, 2015, is when children's weight and height measurement were taken, surveys were filled, and families had an opportunity to learn about healthy behaviors and techniques that will help to support their campers to make sure camp benefits are extended and being utilized at home.

Same measurements were taken four months after camp, in August 2015, to evaluate the effectiveness of camp in changing children's quality of life scores, and stabilizing body weight. Moreover, we took into account the household annual income as a factor that might be the reason behind developing obesity in our camp population, as lower annual household income and socioeconomic disparities are associated with poor eating habits and increased consumption of energy and fat-dense food.

Program Population

Inclusion criteria included all children whose Body Mass Index (BMI) was on or above the 85th percentile using the CDC sex and age adjusted growth charts (Miller et al., 1993). Parents were invited to come over in the weekend before camp (Welcoming Weekend).

Along with CHOA's clinic participants, Camp Strong4Life is open to children ages 9-17 who are overweight or obese (above the 85th and 95th percentile for BMI, using the CDC sex and age adjusted growth charts), or who have participated in the program in a

previous year. Campers pay a nominal fee to participate in the program, and scholarships are available for those who qualify for financial assistance.

Data Collection

Baseline measurements were taken during the Welcome Weekend event.in May. Follow-up measurements were taken at the Reunion Weekend event in August. Campers completed biometric measures (e.g. height, weight, body composition). Campers were weighed using the BIA (Bioelectrical impedance Analysis) machine (InBody 230), which also analyzes and generates information about body composition (BMI, body fat %, lean muscle mass, etc.). Height was measured to the nearest 0.1 cm using a stadiometer. Campers (barefoot) were told to step onto the stadiometer and look straight ahead for each height measurement. Then, campers were told to step off the stadiometer and step back on for the next measurementsThe average of three height measurements was calculated. Data on socio demographic characteristics, beverage consumption, physical activity questionnaire and quality of life were obtained by self-administered questionnaires at Welcoming Weekend and Returning Weekend.

Campers completed age-appropriate versions of the PedsQL scale test (The National Center for Health Statistics, 2000). The individual responses included Never (0), Almost Never (1), Sometimes (2), Often (3), and Almost Always (4) and were used to generate scores on a 0-100 scale such that higher scores indicated better quality of life. Sub-scores mean creation was created by adding the sum of the items over the number of the answered items. The total mean calculated as the sum of all items divided by the number of answered items (Varni , 2016)

Camp Settings

Campers stayed in cabins during camp week according to their gender and age group, along with cabin counselors who were Children's Healthcare of Atlanta staff and volunteers. The campers participated in nutrition education and physical activities sessions, which included both lecture presentations and other interactive activities such as healthy cooking.

Data Analysis

Data was analyzed using SAS version 9.4. Baseline and descriptive statistics (including means, ranges, and frequencies) were generated for all parameters. Paired t-tests were used to analyze pre- and post- data for continuous, normally distributed measures. Two sample t-tests were used to compare PedsQL score differences between the two genders. Paired t-tests were used to compare campers baseline and follow-up PedsQL scores. Regression analysis and analysis of variance were used to determine the relationship between PedsQL, body weight, race, household income and campers' parents highest level of education. BMI percentiles and BMI z-score will be calculated using the CDC sex-specific, BMI-for-age charts.

Data Quality

Data were imported via spreadsheets into the master database housed at Children's Healthcare of Atlanta. Data were cross-matched and checked manually as the import took a

place. Spreadsheets were pulled directly from the BIA (Bioelectrical impedance Analysis). Biometric sheets were entered by a single data analyst and were cross-matched and cross-checked for age, gender, and ID number.

Ethical Considerations

- CHOA's S4L clinic patients who have a BMI at the 85th percentile or above were eligible to attend S4L camp
- Data entry formats were developed and saved in RedCap (CHOA's software portal). Only staff working on Camp Strong4Life were permitted with access to maintain confidentiality.
- This project is exempt from IRB as all data collection and analysis were conducted for program evaluation purposes.

Chapter IV: Results

In baseline -Welcoming Weekend, May, 2015-, we had a sample of 95 boys and girls, of those, 55 returned to Reunion weekend in August, 2015**.** The majority of our camp attendees were girls. At Welcoming Weekend (baseline) we had 32 boys and 67 girls (n=95), and in Reunion Weekend we had 16 boys and 36 girls (n=52) . Table 1 shows the baseline measurement (Mean and Standard Deviation) for different continuous variables including fat, body water, body fat mass, dry lean mass, lean body mass, muscle mass, and BMI. All participants were either overweight or obese with a mean BMI of 33.81 kg/m^2 and a standard deviation of 7.22 kg/m^2. Table 2 shows several sociodemographic characteristics of all participants. We categorized household income into three different categories; less than $30.000 (32.29% of participants), between $30.000 and $70.000 (36.46% of participants), and more than $70.000 (31.25% of participants). More than half of participant came we raised by both their parents (57.29% of participants) and only two participants had widowed participants. We also asked about participants' parents' highest education level, as education also influence eating habits and lifestyle. Our attendees' parents held different kind of degree from high school to professional degree. Fourth of the parents held bachelors and only 10% held some kind of professional degree. Most of our attendees were African American (69.70%) and the rest were Caucasians or from other ethnicities.

PedsQL-Related Results

The core measurements we focused on were the PedsQL scores including its four functioning concepts; physical functioning, emotional functioning, social functioning, and school performance

functioning (cognitive functioning). Table 3 shows the total mean and standard deviation of the PedsQL in baseline was 77.8 + 13.8. Using two sample t-tests, we found that the total score improved significantly between the Welcoming Weekend and the Reunion Weekend ($P<0.01$, Mean=-5.2, Std Error=1.4, 95% CL Mean between -8.1and -2.3). Most of the sub-scores, namely physical functioning, emotional functioning and social functioning increased significantly ($p<0.05$). School functioning score also improved, but the differences was not statistically significant ($p>0.05$).

There were no significant differences by gender for the PedsQL total score but regression analysis showed that campers' body weight was significantly associated ($p<0.01$) with their PedsQL total score and the sub-score for physical functioning, emotional functioning and social functioning (Table 4). We did not find significant associations between household annual income and PedsQL score ($p=0.14$), or other sub scores except for school performance ($p<0.01$). School functioning scores in children were also significantly and positively associated with parental education (table 4). This could be due to higher emphasis and encouragement of educated parents when it comes to their children education. Finally, table 5 compares sociodemographic data of completers and non-completers in baseline measurement. most of completers parents held different academic degrees including bachelors (29.4%) or at least some college (27.5%), while only 19.6% of non-completers parents held bachelors and 10.9% held a master degree.

Table 1: Body composition measures at baseline for all campers

Character	All Campers (n=95)	
	Mean	**Std Dev**
Age	12.9	2.1
Percent fat	43.6	6.6
Total body water	35.1	8.9
Body fat mass	38.6	16.1
Dry lean mass	12.8	3.2
Lean body mass	47.9	12.1
Muscle mass	26.4	7.3
BMI	33.8	7.2

Table 2: Baseline sociodemographic characteristics of all campers (n=95)

Household income	**Frequency**	**Percent**
$30.000 - $70.000	35	36.46
< $30.000	31	32.29
> $70.000	30	31.25
Parental highest level of education	**Frequency**	**Percent**
High School	8	8.33
Some college	22	22.92
Associates	18	18.75

Bachelors	24	25.00
Masters	15	15.63
Professional Degree	9	9.38
Marital status	**Frequency**	**Percent**
Single	24	25.00
Married	55	57.29
Divorced	15	15.63
Widowed	2	2.08
Race	**Frequency**	**Percent**
African American	69	69.70
Caucasians	16	16.16
Other	14	14.14

Table 3: Mean and standard deviation of PedsQL total score and sub-scores (all campers, completers and non-completers (baseline), and completers reunion weekend data)

Questions	All Campers			Non-completers (baseline)			Completers (baseline)			Completers (Reunion Weekend)		
	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev	N	Mean	Std Dev
Physical Functioning	95	80.9	13.6	44	82.2	13.5	51	79.3	13.8	51	84.1	14.5
Emotional Functioning	95	73.6	22.5	44	75.8	21.6	51	72.2	23.3	51	79.6	16.8
Social Functioning	95	80.0	20.1	44	83.1	19.7	51	77.4	20.2	51	82.8	16.6
School Functioning	95	74.8	17.2	44	74.8	17.4	51	74.8	17.2	51	78.0	19.4
Total Score	95	77.8	13.8	44	79.4	13.8	51	76.3	13.8	51	81.5	13.8

Note: The total mean and standard deviation of the PedsQL in baseline was 77.8 $\pm$ 13.8. Using two sample t-tests, we found that the total score improved significantly between the Welcoming Weekend and the Reunion Weekend ($p<0.01$, Mean=-5.2, Std Error=1.4, 95% CL Mean between -8.1and -2.3). Most of the sub-scores, namely physical functioning, emotional functioning and social functioning increased significantly ($p<0.05$). School functioning score also improved, but the differences was not statistically significant ($p>0.05$).

Table 4: Bivariate associations between baseline PedsQL and body weight and selected sociodemographic characteristics.

	Body Weight		Annual Household Income		Parents Highest Level of Education		Race	
	Parameter Estimate	**Std Error**	**Parameter Estimate**	**Std Error**	**Parameter Estimate**	**Std Error**	**Parameter Estimate**	**Std Error**
Physical Functioning	-0.14*	0.05	1.58	1.80	0.79	1.006	1.76*	1.11
Emotional Functioning	-0.27*	0.08	-0.003	2.99	0.31	1.69	1.85	1.85
Social Functioning	-0.17*	0.07	2.23	2.66	1.65	1.47	-0.79	1.65
School Functioning	-0.09*	0.07	7.43*	2.15	4.35*	1.19	1.41	1.41
Total Score	-0.16*	0.05	2.66	1.82	1.73	1.01	0.31	1.14

*P-value < 0.05 using general linear models

Table 5: Frequency and percentages of sociodemographic data total score and sub-scores (non-completers and completers (baseline))

	Non-completers (baseline)	**Completers (baseline)**
Household income	**Frequency (%)** Frequency Missing = 2	**Frequency (%)**
$30.000 - $70.000	10 (21.7)	25 (49.0)
< $30.000	19 (41.3)	12 (23.5)
> $70.000	17 (34.0)	14 (27.5)
Parental highest level of education	**Frequency (%)** Frequency Missing = 2	**Frequency (%)**
High School	7 (15.2)	1 (1.96)
Some college	8 (17.4)	14 (27.5)
Associates	11 (23.9)	7 (13.7)
Bachelors	9 (19.6)	15 (29.4)
Masters	5 (10.9)	10 (19.6)
Professional Degree	6 (13.4)	4 (7.8)
Marital status	**Frequency (%)** Frequency Missing = 2	**Frequency (%)**
Single	13 (28.2)	11 (21.6)
Married	28 (60.8)	28 (54.9)

Divorced	3 (6.5)	12 (23.6)
Widowed	2 (4.4)	0 (0)
Race	**Frequency (%)** Frequency Missing = 2	**Frequency (%)** Missing Frequency=6
African American	35 (76.1)	35 (77.8)
Caucasians	9 (19.6)	7 (15.6)
Other	2 (4.4)	3 (6.4)

Chapter V: Discussion

Our study's findings were consistent with previous studies that found relationship between body weight, BMI and PedsQL (Tsiros et al., 2009). We found insignificant relationship between obesity and school performance measured by school functioning in PedsQL, which is similar to other studies (Pinhas-Hamiel et al., 2005; Petersen 2014).

Studies have mainly linked PedsQL scores and sub score with body weight and body image perception (Riazi, 2010; Williams et al., 2005; O. Pinhas-Hamiel et al., 2005). Our study found a significant improvement in the overall score and sub-scores. We also took into account annual household income as low household income might restrict food choices to unhealthy options due to not being able to afford healthy ones and not because of lack of awareness. As we were concerned that low household income will affect food availability and force parents to allow their children to follow unhealthy eating pattern, surprisingly, we found insignificant relationship between annual household income and obesity (P-value= 0.5677).

Moreover, we linked the relationship between parents highest level of education (awareness) as they will transfer this knowledge to their children. Our attendees' parents held different kinds of degrees from high school to professional degree. We found that $1/4^{th}$ of the parents held bachelors and only 10% held some kind of professional degree. Not surprisingly, there was a significant relationship between parents' highest education and their children's PedsQL school functioning sub score (P-value=0.0004). However, we found an insignificant relationship between parents' highest education and campers' weight (P-value= 0.7411). when comparing the sociodemographic data of completers and non-completers in baseline measurement, we found that most of completers parents held different academic degrees including bachelors (29.4%) or at least some college (27.5%), while only 19.6% of non-

completers parents held bachelors and 10.9% held a master degree.

Our camp achieved its goal by improving the overall quality of life, body weight and body image among our attendees. We also took into account annual household income and the children's parents' highest education level as they might influence children eating patterns and attitude.

In baseline, we had 95 attendees from boys and girls and in baseline we only had 52 returning campers and some of returning campers missed answering some major questions in our survey. Small sample size makes it harder to generalize out findings on larger scale. In the future we will announce camp activities earlier so we can make more children attend and benefit from camp activity as it showed significant improvement and success among former attendees. We did simple analysis to determine if there were some major differences between those who showed up in the Reunion Weekend and those who did not

Another limitation is the short returning period between Welcoming weekend (May) and Reunion Weekend (August). The significant success among most campers might be related to the fact that they are still under the camp influence. Following up the campers over the school year and beyond (semi-annually or annually) will be needed to determine the long term effectiveness of the camp intervention.

Moreover, comparing our results from camp children with either healthy weight children or obese children who were not exposed to camp would show a clear representation of camp impact on overweight and obese campers. Studies have used case control designs in comparing overall wellbeing (Riazi, 2010; Anderson, 1998; Pinhas-Hamiel, Pilpel, Fradkin, D Modan, Reichman 2006; Varni , 2007). Comparing PedQL scores between obese children and children with normal weight (De Beer et al., 2007). Results have shown that normal weight

children always have better PedsQL scores when compared to obese children (De Beer et al., 2007). More studies need to use PedsQL scales as a tool to determine the effectiveness of obesity prevention program in improving not only body weight, image and perceptions but also overall wellbeing.

Chapter VI: Conclusion and Future Recommendations:

Conclusion

More than 14% of world's children and adolescents are either overweight or obese and 15% of children and adolescents are at risk of being overweight. Overweight and obesity affect different life quality factors including social, emotional, physical functioning and school performance. Pediatric Quality of Life Test (PedsQL) is one validated, reliable and consistent way to measure the quality of life among children and adolescents. It is a self-reflection of overall health and wellbeing.

PedsQL test have been used in multiple studies and researches to evaluate the overall quality of life among children. Researchers used the PedsQL with children with cerebral palsy, asthma (Using the PedsQL™ 3.0 asthma module to obtain scores comparable with those of the PROMIS pediatric asthma impact scale (PAIS), stress disorders (Mitchell, 2015), Juvenile Arthritis (Degotardi, 2003)and End Stage Renal Disease (Goldstein 2006) .

The aim of our thesis work was(is) to determine the effectiveness of CHOA's S4L camp in improving their overall quality of life using the PedsQL version 4.0. We also investigated the determinants of quality of life among obese children including their families' annual household income, their parents' highest education and their body weight.

Camp Strong4Life achieved its goal by improving the overall quality of life, body weight and body image among our attendees. We also took into account annual household income and the children's parents' highest education level as they might influence children eating patterns and attitude.

Our camp achieved its goal by improving the overall quality of life, body weight and body image among our attendees. We also took into account annual household income and the children's parents' highest education level as they might influence children eating patterns and attitude.

Future Recommendation:

1- Involvement of families and schools is very important in shaping children and adolescents eating and exercise habits and lifestyles.

2- Encouraging the youth to teach other children and adolescents what they learned in school activities (i.e. activities related to health and obesity), eating habits, and lifestyles is important to ensure that knowledge extended to external populations.

3- Using Pedsql test at different time of the school year to determine if the scores are associated with certain events during the year other than obesity and body image problem, i.e., midterms or the event of losing family member.

4- More studies need to use PedsQL scales as a tool to determine the effectiveness of obesity prevention programs in improving not only body weight, image and perceptions but also overall wellbeing.

5- For the future, having a control group of children who did not attend weight control camp or children who participated in a camp with different settings and goals can be used to clearly interpret the effect of Camp Strong4Life settings and activities.

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APPENDICES

1. Pediatric Quality of Life Questionnaire:

PedsQL 2

*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

2. Bioelectrical impedance Analysis

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 (%)			

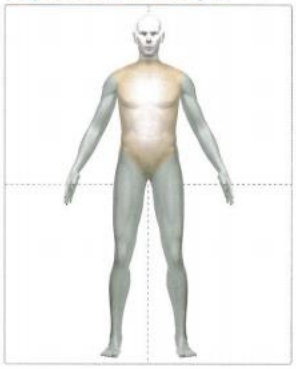
$$BMI = \frac{\text{Weight, kg}}{\text{Height}^2, \text{m}^2}$$

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

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.