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# Camp-Based Intervention for Overweight Children with Developmental Disabilities

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# Camp-Based Intervention for Overweight Children with Developmental Disabilities

by

Allyson Davis

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A Dissertation submitted in partial satisfaction of
the requirements for the degree
Doctor of Philosophy in Clinical Psychology

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Each person whose signature appears below certifies that this thesis in his/her opinion is adequate, in scope and quality, as a thesis for the degree Doctor of Philosophy.

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# ABBREVIATIONS

| | |
|---|---|
| IDD | Intellectual and Developmental Disabilities |
| BMI | Body Mass Index |
| ASD | Autism Spectrum Disorders |
| KBIT | Kauffman Brief Intelligence Test |
| CBCL | Child Behavior Checklist |
| CFQ | Child Feeding Questionnaire |
| SSIS | Social Skills Improvement System |

ABSTRACT OF THE DISSERTATION

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Doctor of Philosophy, Graduate Program in Clinical Psychology
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Dr. Cameron L. Neece, Chairperson

Childhood obesity is a growing epidemic and results in negative health and psychosocial outcomes. Children with intellectual and developmental disabilities (IDD) experience increased rates of obesity compared to typically developing children, but interventions targeting health behaviors in this population have been limited. We examined the feasibility and efficacy of a health behaviors camp for children and adolescents with IDD. We also tested the correlation of child behavior problems and social skills with baseline weight status and health behaviors. Furthermore, we examined these psychosocial risk factors as moderators of camp outcomes. The camp included participants aged 9 – 15 years who were diagnosed with mild to moderate IDD and were overweight. Based on demand, practicality, implementation, and acceptability, camp-based intervention appeared to be feasible for this population. There were no significant changes in child BMI, hours of physical activity, or parental feeding practices. We observed a significant increase in health and fitness related knowledge during the intervention, but this was not maintained at a four-month follow-up assessment. At baseline, there were no significant correlations between behavior problems or social skills and BMI, physical activity, or parental feeding practices. Social skills also did not predict

intervention outcomes. However, higher levels of externalizing behavior problems predicted larger changes in hours of physical activity and parental restriction in feeding and reduced changes in child BMI. Increased internalizing and total behavior problems also predicted lesser changes in BMI. Total behavior problems had a trending relationship with changes in physical activity. Given the elevated obesity rates in children with IDD and associated negative outcomes, it will be crucial to continue examining risk factors and interventions for this population.

# CHAPTER ONE

# INTRODUCTION

Obesity has become an epidemic in the United States and affects many children across the country (Anderson & Butcher, 2006; Ng et al., 2013; Ogden, Carroll, Kit, & Flegal, 2014). Children and adolescents with intellectual and developmental disabilities (IDD) show higher rates of overweight status compared to their typically developing peers (De, Small, & Baur, 2008; Evans et al., 2012; Groundhuis & Aman, 2014; Maiano, 2011; Rimmer, Yamaki, Davis Lowry, Wang, & Vogel, 2010; Strahan & Elder, 2013). Elevated obesity rates are associated with negative social, behavioral, and health outcomes for these children (De et al., 2008; Emerson, 2009; Groundhuis & Aman, 2014; Rimmer et al., 2010; Salaun & Berthouze-Aranda, 2008). Despite the growing problem of obesity and associated negative consequences, obesity interventions for children and adolescents with IDD have been limited (Davis, Zhang, & Hodson, 2011; Fleming et al., 2008; Hinckson, Dickinson, Water, Sands, & Penman, 2013; Maiano et al., 2014; Reinehr, Dobe, Winkel, Schaefer, & Hoffmann, 2010; Strahan & Elder, 2013). In the current studies, we examined the feasibility of a health behavior intervention for children and adolescents with IDD, along with child characteristics that impacted the efficacy of that intervention.

## Childhood Obesity

Over the last 30 years, children's weight status has increased at alarming rates and childhood obesity is now considered to be an epidemic in the United States (Anderson & Butcher, 2006; Bethell, Simpson, Stumbo, Carle, & Gombojov, 2010; Brownell,

Schwartz, Puhl, Henderson, & Harris, 2009; Deckelbom & Williams, 2001; Ng et al., 2013; Ogden et al., 2014; Strauss & Pollack, 2001; Wang & Beydoun, 2007). For children and adolescents, "overweight" is defined as body mass index (BMI) over the 85$^{th}$ percentile for the child's gender and age range, while "obese" is defined as greater than the 95$^{th}$ percentile (Dietz & Bellizzi, 1999). In the 1970s, approximately 15% of children and adolescents in the United States were categorized as overweight or obese, and 5% of those in the overweight category were obese (Ogden et al., 2014). Currently, it is estimated that 31.8% of American children are overweight and 16.9% of these children fall into the obese category (Ogden et al., 2014). Unfortunately, rates of obesity in children and adolescents have shown a persistent rise and, thus, the problem is likely to continue expanding and further contribute to negative outcomes for affected children (Bethell et al., 2010; Ng et al., 2013; Wang & Beydoun, 2007). Not only does childhood obesity contribute to negative individual outcomes, but is also associated with high health care cost estimates over $14.1 billion per year in the United States (Cawley, 2010; Trasande & Chatterjee, 2009), which is significantly higher than other childhood chronic health problems like asthma, which costs approximately $1.01 billion per year (Wang, Zhong, & Wheeler, 2005). Furthermore, children who are obese are more likely to be overweight as adults, thus contributing to the extensive health care burden of adult obesity, which is currently estimated at $113.9 billion per year (Anderson & Butcher, 2006; Tsai, Williamson, & Glick, 2011).

## Risk Factors for Childhood Obesity

A number of risk factors for childhood obesity have been identified for typically

developing children. Children and adolescents from lower socioeconomic status backgrounds are more likely to be overweight or obese compared to children from higher socioeconomic status backgrounds (Bethell et al., 2010; Wang & Beydoun, 2007). More specifically, children whose family incomes fall below the poverty level show a higher incidence of obesity than children whose family incomes are above the poverty line (Bethell et al., 2010; Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010; Singh, Siahpush, & Kogan, 2010). Increased rates of childhood obesity are also observed in children of ethnic minority backgrounds, specifically Hispanic and African American children (Anderson & Whitaker, 2015; Bethell et al., 2010; Kumanika, 2007; Singh et al., 2010; Snethen, Broome, & Cashin, 2006; Wang & Beydoun, 2007). There also appears to be a genetic link for obesity, with children who have overweight or obese parents being more likely to be overweight or obese themselves (Anderson & Butcher, 2006; Gyovai, Gonzales, Ferran, & Wolff, 2003; Monasta et al., 2010; Snethen et al., 2006; Stice, Presnell, Shaw, & Rohde, 2005; Wardle, Guthrie, Sanderson, Birch, & Plomin, 2001). This relationship may be partially due to similar dietary and exercise habits (Anderson & Butcher, 2006; Gyovai et al., 2003; Stice et al., 2005), but genetics appears to contribute to childhood obesity above and beyond family environmental factors (Monasta et al., 2010). This risk appears greatest if both parents are overweight or obese (Snethen et al., 2006; Wardle et al., 2001). Additionally, the risk of obesity increases with age in children and peaks during adolescence (Wang & Beydoun, 2007).

In addition to individual and family factors that increase obesity risk, environmental influences have also contributed to the rise in weight status. The impact of the environment on weight status is highlighted by the differential rates of obesity based

on geographical location, as children in Southern states show greater rates of obesity compared to the rest of the country (Bethell et al., 2010; Liu, Bennett, Harun, & Probst, 2008; Strauss & Pollack, 2001). Furthermore, children in rural areas have higher weight statuses than their counterparts in urban settings, which is likely due to the increased caloric content of diets and decreased access to adequate health care and interventions (Liu et al., 2008). Across the country, environmental changes related to diet and nutrition have been observed in recent decades. An increase in processed foods has resulted in higher fat and calorie content (Anderson & Butcher, 2006; Snethen et al., 2006). Unfortunately, many pre-packaged foods are less expensive than healthy alternatives and, as such, children from lower socioeconomic backgrounds have been disproportionately impacted by changes in food content (Biro & Wien, 2010; Kumanyika, 2008). In many areas, access to high-calorie foods, such as those served in fast food restaurants, has increased while access to healthier foods and fresh produce has simultaneously decreased (Anderson & Butcher, 2006; Kumanyika, 2008). Similarly, many children do not have access to parks and outdoor activities that have traditionally encouraged higher levels of physical activity (Biro & Wien, 2010; Kumanyika, 2008).

School settings have not been exempt from negative changes in diet and nutrition. Despite mandates regarding the nutritional content of school lunches, the majority of schools provide access to vending machines that dispense snacks and beverages that are high in calories and low in nutritional value (Anderson & Butcher, 2006). Not only have foods themselves changed in recent years, the marketing of foods has changed as well and marketing for many unhealthy, processed foods and sugary beverages is geared towards children and adolescents (Anderson & Butcher, 2006; Harris, Schwartz, &

Brownell, 2009). All of these food and diet related changes have culminated in an environment of obesity that has had an adverse impact on children and adolescents in the United States.

While there are numerous uncontrollable obesity risk factors, such as socioeconomic status and environment, there are also modifiable, behavioral factors. Sedentary behaviors have increased among children and adolescents and, thus, calorie expenditure has decreased while caloric intake has risen (Anderson & Butcher, 2006; Biro & Wien, 2010; Snethen et al., 2006). Furthermore, sedentary behaviors are often associated with even higher intake of calorie-dense foods, as children tend to snack while engaging in activities such as watching television (Anderson & Butcher, 2006; Monasta et al., 2010). Individual eating patterns, particularly binge eating and other disordered eating behaviors, and dieting are also highly predictive of obesity (Puder & Munsch, 2010; Stice et al., 2005).

Different types of behavioral problems also appear to be related to obesity risk. Externalizing behaviors, especially disruptive behaviors and impulsivity, have been associated with increased weight (Anderson, Cohen, Naumova, & Must, 2006; Puder & Munsch, 2010). This relationship may be due in part to caregivers' use of food to control negative behaviors or soothe children who are emotionally dysregulated (Anderson et al., 2006). Additionally, the impulsivity observed in children with disruptive behavior disorders likely contributes to obesity directly, as children with high levels of impulsivity are less likely to appropriately regulate their own food choices (Puder & Munsch, 2010). Research has also shown that internalizing behavior problems, such as depression and anxiety, are associated with increased weight (Puder & Munsch, 2010). Children with

internalizing behavior disorders who experience difficulty regulating their emotions tend to often self-soothe using food (Puder & Munsch, 2010). Obesity also appears to be related to child social skills in children with typical development (Datar & Sturm, 2006). Children with lower levels of social skills may be less likely to engage in social physical activities and may use food to manage negative emotions related to interpersonal stress (Puder & Munsch, 2010). In summary, there are a number of behavioral and socio-emotional factors that contribute to the problem of obesity in childhood.

## Negative Implications of Obesity

Obesity is related to many negative health and psychosocial outcomes, both proximally and distally. Not surprisingly, children who are categorized as obese are more likely to be overweight or obese as adults than their normal weight peers (Anderson & Butcher, 2006; Deckelbaum & Williams, 2001; Freedman, Mei, Srinivasan, Berenson, & Dietz; 2007). Adults who have been overweight since childhood have more negative health outcomes and greater difficulty losing weight than those who become overweight during adulthood (Biro & Wien, 2010). Even as children, those who are overweight or obese face the same negative health risks as overweight adults (Deckelbaum & Williams, 2001; Freedman et al., 2007). Elevated weight across the lifespan is strongly associated with cardiovascular problems, including hypertension, hyperlipidemia, and hypercholesterolemia (Deckelbaum & Williams, 2001; Freedman et al., 2007). Additionally, the rates of non-insulin dependent diabetes mellitus, or Type II diabetes, have risen in children as obesity has increased (Deckelbaum & Williams, 2001).

In addition to negative physical health outcomes, obesity is also predictive of

poorer mental health outcomes (Deckelbaum & Williams, 2001). Children and adolescents who are overweight or obese often experience negative psychological symptoms, including low self-esteem and depression (Deckelbaum & Williams, 2001). Furthermore, children and adolescents who are overweight are often victims of social aggression or bullying and experience social isolation (Brownell et al., 2009; Eisenberg, Neumark-Sztainer, & Story, 2003; Neumark-Sztainer, Falkner, Story, Perry, & Hannan, 2002). Specifically, weight-based teasing is common and this has been shown to have a negative impact on mental health, leading to increased psychological symptoms, such as binge eating, depressive symptoms, and elevated suicide risk (Brownell et al., 2009; Eisenberg et al., 2003; Neumark-Sztainer et al., 2002; Pulgarón, 2013). Increased weight is also associated with poorer school outcomes and lower academic achievement (Datar & Sturm, 2006).

## Obesity in Children with Intellectual and Developmental Disabilities

Children who are diagnosed with IDD show even higher rates of overweight and obesity than their typically developing peers (De et al., 2008; Evans et al., 2012; Groundhuis & Aman, 2014; Maiano, 2011; Rimmer et al., 2010; Strahan & Elder, 2013). Studies have shown that as many as 55% of children and adolescents with IDD are overweight and up to 31% of those children are categorized as obese (Groundhuis & Aman, 2014; Maiano, 2011). Among children with IDD, children with Down syndrome, Autism Spectrum Disorders (ASD), and Prader-Willi syndrome generally have the highest rates of obesity (Groundhuis & Aman, 2014; Rimmer et al., 2010).

While children and adolescents with IDD experience the same risk factors that contribute to obesity in children with typical development, there are additional risks specific to this population. The increased rates of obesity in certain diagnoses may be related to genetic disorders that predispose children to weight gain (Groundhuis & Aman, 2014). For example, children with Down syndrome frequently exhibit hypothyroidism and decreased metabolism (Murray & Ryan-Krause, 2010) and children with Prader Willi syndrome experience hormonal deficiencies that contribute to weight gain (Dudley, McManus, Vogels, Whittington, & Muscatelli, 2008). Prescription medications also play a role in the rates of obesity in this population, as many children with IDD are on medications such as anticonvulsants for epilepsy and the atypical antipsychotics that are often prescribed for behavior control and may result in changes in appetite and weight gain as side effects, (Groundhuis & Aman, 2014; Maiano, 2011). Children with IDD, particularly those with ASD, frequently exhibit selective eating patterns that appear to be related to sensory selectivity or behavior problems (Bandini et al., 2010; Groundhuis & Aman, 2014). These selective eating patterns may also contribute to increased weight status, as selected foods are often high in fat and calorie content (Bandini et al., 2010; Groundhuis & Aman, 2014).

Furthermore, children with IDD often experience comorbid physical limitations that contribute to lack of physical activities and increased sedentary behaviors (Groundhuis & Aman, 2014; Rimmer et al., 2007). The demanding therapy schedules for children with IDD may also prevent adequate levels of physical activity (Groundhuis & Aman, 2014). Children with IDD often exhibit higher levels of behavior problems compared to typically developing children (Emerson & Einfeld, 2010), so the associated

risk of obesity is likely exacerbated in this population. Behavioral programming may also be related to increased intake of obesity-related foods given that appropriate behaviors are commonly reinforced with preferred food items (Groundhuis & Aman, 2014). Moreover, social skill impairments play a role in obesity in the IDD population, as they are frequently related to sedentary behaviors (Curtin, Anderson, Must, & Bandini, 2010; Rimmer, Rowland, & Yamaki, 2007). Children with lower levels of social skills are less likely to participate in physical activities, such as playing group games or sports (Curtin et al., 2010; Grandisson, Tetreault, & Freeman, 2012; Marquis & Baker, 2015; Rimmer et al., 2007). Thus, while psychosocial risk factors play a role in obesity for typically developing children, the elevated levels of behavior problems and social skill deficits in children with IDD may increase the relevance of these factors for obesity in this population.

Children and adolescents with IDD who are overweight or obese face the same negative health and psychosocial outcomes as children with typical development. However, children with IDD who are obese face additional challenges, including decreased quality of care due to challenges that increased weight pose for caregivers who may not be able to properly aid children in activities of daily living or lift children that are not ambulatory (De et al., 2008). This may lead to negative consequences, such as inadequacy of hygienic routines and lower availability of appropriate health care workers (De et al., 2008). Overweight and obesity may exacerbate other problems associated with IDD, such as congenital heart defects in those with Down syndrome or motor deficits in children with ASD (De et al., 2008; Emerson, 2009; Frey & Chow, 2006; Reinehr et al., 2010). Children with IDD represent a medically underserved population, which creates a

healthcare gap between this population and children who are typically developing; obesity contributes to the widening of this gap (Lloyd, Temple, & Foley, 2012; Rimmer et al., 2007). Finally, increased weight may also lead to increased social isolation and victimization, which are problems for children with IDD regardless of weight status (Reinehr et al., 2010).

## Obesity Interventions for Children with IDD

Evidence-based treatments for children and adolescents who are typically developing are largely behavioral interventions, most often family-based, involving both reduced caloric intake and increased physical activity (Barlow & Dietz, 1998; Faith & Wrotniak, 2009). Although the increased risk for obesity in children with IDD has been well-established, obesity interventions for this population have been extremely limited (Davis et al., 2011; Fleming et al., 2008; Hinckson et al., 2013; Maiano et al., 2014; Reinehr et al., 2010; Strahan & Elder, 2013). Effective interventions can be difficult to implement for children and adolescents with IDD given the cognitive and behavioral limitations inherent in this population. However, the need to develop effective interventions is clear and researchers have begun to examine interventions targeting weight and physical activities.

Thus far, studies have primarily used single-group designs as a result of small sample sizes and have been implemented in schools, which are convenient settings for interventions that can be built into existing curriculums (Maiano et al., 2014). Intervention targets have included both physical activity and diet independently or in combination, although most researchers have primarily focused on increasing physical

activity levels (Elmahgoub et al., 2011; Maiano et al., 2014). One physical activity intervention developed by Davis and colleagues (2011) was implemented with 25 children with IDD and children showed significant improvements in physical fitness. Over the course of eight weeks, children learned specific exercises related to physical fitness, such as aerobic endurance activities and muscular strength exercises (Davis et al., 2011). Additionally, one of the only randomized control trials of an obesity intervention for children with IDD was an exercise program that examined two groups of 13 children with the experimental group engaging in a plyometric program for 21 weeks, which resulted in significant changes for both physical activity levels and weight (González-Agüero et al., 2011).

Comprehensive programs that target both nutrition and physical activity appear to be effective based on the small studies that have been completed (Hinckson et al., 2013; Maiano et al., 2014). For example, Hinckson and colleagues (2013) implemented a 10-week program for 22 children with ID or ASD and their parents. The sessions alternated between psychoeducation regarding nutritional diets and physical fitness lessons with results showing enhanced physical fitness and improved diet (Hinckson et al., 2013). Similarly, a number of single-case studies have examined comprehensive programs aimed at improving multiple health behaviors with promising results (Maiano et al., 2014; Messersmith, Slifer, Pulbrook-Vetter, & Bellipanni, 2008). While some studies have examined the initial effectiveness of educational or physical activity programs (Maiano et al., 2014), the interventions that have been developed to address both physical activity and nutrition are limited. Many of the interventions that have been developed have examined only one weight-loss related aspect or have included very small samples.

Therefore, despite the initial studies of weight-reduction programs, there is a clear need for novel comprehensive interventions for obesity in children and adolescents with IDD.

## Camp-Based Interventions

Camp-based interventions targeting overweight and obesity have been widely utilized for typically developing children (Baranowski et al., 2003; Gately, Cooke, Butterly, Mackreth, & Carroll, 2000; Snethen et al., 2006; Van Sluijs, McMinn, & Griffin, 2007). Camps during typical periods in which school is not in session appear beneficial due to the availability of time and low levels of activity often observed during these periods (Jago & Baranowski, 2004). Weight-related camps have resulted in both decreased weight and increased physical fitness (Gately et al., 2000; Snethen et al., 2006; Van Sluijs et al., 2007). However, camp-based interventions have not been researched for children and adolescents with IDD who are also overweight, although research has shown that children with IDD can benefit from other types of camp-based interventions (Van Vugt, Deković, Prinzie, Stams, & Asscher, 2013). For example, researchers have shown that camp-based interventions for children with IDD can result in improvements in social skills (Brookman et al., 2003; Holbein et al., 2013; Van Vugt et al., 2013; Walker, Barry, & Bader, 2010) and decreased behavior problems (Van Vugt et al., 2013). These studies have also shown that summer is an ideal intervention period for children and adolescents with IDD due to the lack of structure and opportunity for social interaction that this school-free period provides (Walker et al., 2010). Additionally, camps are optimal as a result of the poor availability of social opportunities for children and adolescents with IDD during the summer (Walker et al., 2010). While there have been no studies

examining camp-based interventions for weight in children and adolescents with IDD, the gains in other skills taught in a camp format highlight the potential benefit of a camp-based intervention for obesity in children and adolescents with IDD.

## Feasibility Studies

Previous research has indicated that weight-loss and health behavior interventions are especially difficult to implement with children and adolescents diagnosed with IDD. Therefore, it is important to evaluate the feasibility of potential interventions for this population. Feasibility involves multiple components, including demand, acceptability, implementation, practicality, and adaptation (Bowen et al., 2009; Glasgow, Klesges, Dzewaltowski, Estabrooks, & Vogt; 2006). Demand can be operationalized as recruitment potential and treatment completion, while acceptability is primarily focused on participant satisfaction (Bowen et al., 2009). Practicality includes resources required and implementation is an examination of the intervention itself and consistency of delivery (Bowen et al., 2009; Glasgow et al., 2006). Additionally, the adaptation of an intervention allows researchers to address potential modifications required to accommodate a target population (Bowen et al., 2009).

## The Current Studies

### *Study One*

The first study addressed the feasibility and preliminary efficacy of a camp-based intervention targeting obesity and health behaviors in children and adolescents with IDD. This first specific aim of the study was to examine the feasibility of implementing a

community-based camp for health behavior education in a sample of children with IDD. We operationalized feasibility to include demand (recruitment potential and participant completion rates), practicality and implementation (necessary resources, personnel, time, and components required for consistency in replication), and acceptability (participant satisfaction and obstacles; Bowen et al., 2009). The second aim was to assess changes in health-related behaviors and body mass index at a four-month follow-up assessment after camp completion. Our third aim was to examine changes in diet and fitness related knowledge over the course of a one-week camp and the maintenance of these changes at a four-month follow-up assessment after camp completion. Given the lack of previous studies, the aims for the current study were exploratory and no specific hypotheses were proposed.

### *Study Two*

In the second study, we investigated the relationships between child risk factors and initial weight status as well as response to an obesity and health behaviors intervention. The first aim was to examine the relationship between two psychosocial risk factors, child behavior problems and social skills, and baseline weight status and health-related behaviors. While many obesity-related factors have been identified in typically developing children, behavior problems and social skills have been identified as negative outcome risk factors for children with IDD in general, and have also been shown to have a negative impact on other forms of intervention for this population. Furthermore, behavior problems and social skill deficits are highly prevalent in children with IDD and, thus, may play larger roles in obesity development for this population compared to

typically developing children. The second aim was to examine whether child behavior problems and social skills moderate intervention outcomes, specifically body mass index and health-related behaviors.

# CHAPTER TWO

# MATERIALS AND METHOD

## Participants

The current studies involved participants from Operation FIT, a one-week day camp for children and adolescents with IDD who are overweight or obese. Recruitment for the two cohorts included in the current studies was completed over a two-year period. Participants were primarily recruited through the Inland Regional Center, which is the agency through which children with IDD in the Inland Empire receive services. The Regional Center's computer databases selected all children who met the basic age and diagnostic criteria. Each family then received a letter and brochure informing them of the study. Each year of the study, approximately 1,000 brochures were mailed to families who had children within the eligible age range. Additional recruitment sources included local parent support groups and societies for specific disabilities. Parents who were interested in the camp contacted study personnel by phone or email. Among the potential participants who were contacted through recruitment sources, 172 families contacted Operation Fit personnel, 145 families were screened, and 83 were eligible for the camp. Among eligible participants, 53 enrolled in the camp.

Criteria for inclusion in the study were: (1) age 9 – 15 years, (2) child was diagnosed by the Regional Center or outside agency as having a mild to moderate intellectual or developmental disability, (3) child was overweight or obese based on CDC BMI recommendations (BMI percentile $\geq$ 85), (4) child and parent needed to be able to speak English, (5) child was reportedly able to follow simple group directions. Exclusion criteria included severe aggressive behaviors and physical disabilities that prevented

physical mobility (i.e., children were not ambulatory). In order to optimize the feasibility and efficacy of the intervention, inclusion criteria was further refined during the second cohort of the study based on findings from the first cohort. Additional inclusion criteria included basic verbal skills, including one- to two-word responses to direct questions and the ability to independently make one- to two-word requests to satisfy basic needs. Verbal scores were assessed through subjective parent report, clinical interview, and objective measurement using the verbal subtests of the Kauffman Brief Intelligence Test (KBIT; Kaufman, 1990). The cut-off utilized was a verbal IQ standard score of 45 or above, placing scores in the mild to moderate intellectual functioning range. Furthermore, the level of impairment was evaluated through the KBIT and children who did not fall at or above the mild or moderate range (standard score > 45) for non-verbal intelligence were considered ineligible and not included in the camp. Additionally, parents and children in the second cohort were required to attend an intake lab assessment. All participants were required to attend a registration session prior to the start of the camp and complete a packet of questionnaires.

The sample included 53 children and adolescents aged 9-15 years who have been diagnosed with IDD. The majority of children were male (71.4%) and the average age was 11.67 years (*SD* = 1.89). Almost half of children were from families whose incomes fall below the poverty level (41.9 %). The sample was racially and ethnically diverse with parents reporting 63.0% as Hispanic, 18.5% as Caucasian, 13.0% as African American, 1.9% as Asian, and 3.7% as "Other." Regarding diagnoses, 58.9% of the children were reported to have an autism spectrum disorder, while the remaining children are diagnosed with another form of IDD, including Down syndrome and global developmental delays.

All children were categorized as overweight or obese based on BMI percentile, with 70.9% of the children falling into the obese category (*z*-score, *M* = 1.90, *SD* = .50). Of those children who attended the follow-up assessment and fell in the moderate IQ range or above, 61.1% did not have ID, while 30.6% fell in the mild ID range and the remaining 8.3% fell in the moderate ID range. There were no significant differences between children with ASD and children without ASD or between cohorts across all demographic variables.

## Procedures

Parents who were interested contacted the Operation Fit staff by phone or email and a phone screen was conducted to determine eligibility. This study was conducted in two cohorts and the intervention was delivered over the course of two summers. In the first cohort, children who met the basic inclusion criteria received a packet of questionnaires and participants were asked to complete the measures before the camp. In the second cohort, children who met the basic inclusion criteria attended an initial assessment to confirm eligibility. At this assessment, the Kaufman Brief Intelligence Test (KBIT; Kaufman & Kaufman, 1990) was conducted to evaluate severity of IDD. Additionally, for both cohorts, parents completed demographic information and the Child Behavior Checklist (CBCL). Participants who met the inclusion criteria at the initial assessment received a packet of questionnaires for both parent and child to be completed prior to the camp. For both cohorts of the study, parents and children attended a registration day that also served as a baseline assessment the week before the camp. At the registration, parents signed the informed consent and children signed assent forms.

Height and weight were measured for the children using a medical beam scale and eating behavior and body image interviews were conducted with parents and children. Families also returned completed packets as the final registration requirement.

The Operation Fit intervention is a week-long, camp-based program that was developed by a local pediatrician and has been implemented as a community outreach program for typically developing children and adolescents who are overweight or obese for approximately eight years. It was established to improve the physical health of typically developing children who have been identified by pediatricians as being overweight or obese. In a previous year of the camp, typically developing children showed significant increases in knowledge and significant decreases in weight ($t = 3.29$, $p < .01$; Gutierrez, Sihotang, Tung, Westerberg, & Baum, 2013) over the course of the one-week camp. The camp targets both nutrition-related knowledge and physical activity levels. Throughout each day of camp, educational and physical activities are alternated and skill practice is built into the activities. Medical students lead the physical activities, while nutrition students conduct the educational activities. All educational activities involve a combination of didactic information and hands-on practice, generally with a short lesson followed by a demonstration or game. Medical residents are also on staff in order to address medical needs and administer medications, as needed. In order to meet the behavioral needs of children with intellectual and developmental disabilities, psychology doctoral students were added to the camp staff. Additionally, there is a family dinner night on the last day of the camp where children attempt to teach parents what they have learned over the course of the week. The simplified version of the camp curriculum and an example of a daily schedule are included in Appendices A and B.

For the first cohort, we chose to implement the camp with few modifications in order to determine the feasibility and effectiveness of this intervention for a new population. The modifications that were utilized included the removal of one outing, roller-skating, that appeared difficult to coordinate for the population involved and the removal of videos that seemed above the developmental level of the children included in the IDD week. For the second cohort of the study, educational information was further simplified and time between activities was minimized (see Appendix C for curriculum changes). More specifically, additional physical games, such as relays, were added to the curriculum and educational activities that involved independent reading were removed. For example, serving sizes were taught with only basic food groups, such as fruits and vegetables, and a plate was used as a visual instead of specific measurements. Additionally, longer activities, including a one-hour documentary about fast food and extended lectures on specific nutrition topics, were either removed or shortened in order to account for the symptoms of inattention frequently observed in this population. Despite these modifications, the basic information included and structure of the curriculum remained the same, so the samples were combined for the current studies. For a full review of the curriculum for the most recent camp phase, please refer to Appendix A.

## Measures

### *Studies One and Two*

#### Demographic Data

Demographic data were collected in the set of pre-treatment questionnaires prior to the camp. Data included child's age, ethnicity, gender, diagnostic information, and family income.

#### Body Mass Index (BMI)

Each child's BMI was used to determine eligibility and to examine weight-related changes resulting from the intervention. In order to calculate BMI, the following formula was be used: (Weight in Pounds/(Height in Inches x Height in Inches)) x 703. The child's BMI was then plotted on gender-specific age and growth charts in order to determine the appropriate percentile. Children in the range of the 85$^{th}$ percentile to less than the 95$^{th}$ percentile were considered overweight, while children at or above the 95$^{th}$ percentile fell into the obese category (Dietz & Bellizzi, 1999). In order to account for growth when measuring weight change over the course of the intervention, each child's BMI was converted to a standardized z-score (Epstein et al., 2012).

#### Marquis Sports Coding Scheme (Marquis, 2015)

The Marquis Sports Coding Scheme was utilized to examine baseline and post-treatment levels of physical activities. Given an open response format, parents are asked to list both formal and informal physical activities, such as organized sports or taking

walks, and then provide the number of hours per week for each activity. The number of physical activities and the hours of activity per week were utilized for the current studies.

**Child Feeding Questionnaire (CFQ; Birch et al., 2001)**

The CFQ was used to examine baseline feeding behaviors and changes in parent feeding practices. The measure includes 28 items that are ranked on a five-point Likert scale ranging from " Never" or "Disagree" (1) to "Always" or "Agree (5)." The CFQ results in four subscales regarding parental perceptions of weight, including perceived responsibility, perceived child weight, perceived parent weight, and concern about child weight, and three subscales assessing parental feeding practices. Monitoring assesses parents' management or supervision of their child's eating (e.g., "Do you keep track of the high fat foods that your child eats"). Pressure to eat includes items examining parents' propensity to encourage increased eating (e.g., "If my child said 'I'm not hungry,' I try to get him/her to eat anyway"). Restriction is a measure of parents' limits on their child's access to foods (e.g., "I have to be sure that my child does not eat too many sweets"). The measure has been validated in multiple populations and the reliability of the measure has been strong in other studies (Monitoring $\alpha$ = .92; Pressure to Eat $\alpha$ = .79; Restriction $\alpha$ = .73; Birch et al., 2001). The reliability for the monitoring and restriction subscales is adequate in the current sample (Monitoring $\alpha$ = .84; Restriction $\alpha$ = .74), while the reliability for the pressure to eat subscale was low ($\alpha$ = .37). The three CFQ subscales measuring parental feeding practices were used to examine baseline feeding behaviors and changes in parent feeding practices.

## *Study One*

### Daily Quiz

A ten-item, multiple-choice quiz based on the camp curriculum was developed and data was collected at baseline, the end of each day of the camp, and 4-month follow-up. This quiz was utilized to measure changes in health- and food-related knowledge over the course of the intervention and maintenance of those changes at follow-up.

### Participant Satisfaction Interview

A participant satisfaction interview was developed to examine parents' experiences of the camp. This questionnaire was composed of open-ended questions regarding parents' perceptions of the camp, including "Do you think your child benefitted from the program" and "If you could repeat this summer, would you enroll your child again?" This questionnaire was utilized to address participant satisfaction in the feasibility data.

## *Study Two*

### Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001)

The CBCL was used to assess child behavior problems. The CBCL contains 113 items that are rated as "not true" (0), "somewhat or sometimes true" (1), or "very true or often true" (2). Parents completed the questionnaire at the baseline assessment prior to the camp. Each item on the CBCL represents a problem behavior, such as "demands a lot of attention" or "impulsive or acts without thinking." The reliability for the total CBCL subscale is 0.96 in the current sample. The CBCL also shows strong convergent validity with both diagnoses based on DSM-IV-TR diagnostic criteria and similar scales

measuring child behavior problems (Achenbach & Rescorla, 2001). The empirically-based, broad-band scales and the total behavior problem score were used to examine the relationship between behavior problems and initial weight status and the impact of behavior problems on intervention outcomes.

### Social Skills Improvement System (SSIS; Gresham & Elliott, 2008)

Child social skills were assessed using the SSIS, which is a parent-report measure of social skills and problem behaviors. The SSIS includes 79 social skills and problem behaviors that are rated on a four-point scale from "never" to "almost always." The 46-item Social Skills scale was utilized for the current study and is comprised of seven subscales, including communication, cooperation, self-control, responsibility, empathy, engagement, and assertion. The SSIS has been shown to have adequate validity and the internal reliability for the current sample was strong ($\alpha$ = 0.93; Gresham & Elliot 1990).

## Data Analytic Plan

According to power calculations (using G*Power, Faul, Erdfelder, Bychner & Lang, 2009) based on the hierarchical regression that required the highest power, the total follow-up sample size of 30 allowed for 87.7% power to detect a large effect size ($f^2$ = .35), 53.4% power to detect a medium effect size ($f^2$ = .15), and 11.6% power to detect a small effect size ($f^2$ = .02).

### *Data Analyses for Study One*

This first specific aim of the study regarding feasibility of implementing a

community-based camp for health behavior education in a sample of children with IDD was examined using descriptive statistics. The second aim regarding changes in health-related behaviors and body mass index at a four month follow-up assessment after camp completion was assessed using dependent sample T-tests. Our third aim, assessing changes in diet and fitness related knowledge over the course of a one-week camp and the maintenance of these changes at a four month follow-up assessment after camp completion, was also examined using dependent sample T-tests. Given that we determined the camp was not feasible for children in the severe intellectual functioning range, we restricted the sample to those with mild to moderate intellectual functioning for all outcome analyses.

### *Data analyses for Study Two*

Prior to conducting analyses for the aims in the second study, the distribution of the data was examined for normality and the presence of outliers. No outliers or violations of the assumptions of linear regression were found. Additionally, demographic variables that had a significant relationship ($p < .05$) with one or more of the independent variables *and* one or more of the dependent variables were tested as covariates in the analyses. However, none of the demographic variables were significantly correlated with both the independent variables and the dependent variables and, thus, no covariates were included in the analyses.

The first aim examining the relationship between risk factors, specifically child behavior problems and child social skills, and initial weight status and eating behaviors were assessed with Pearson correlations. The second aim studying the moderating effect

of child behavior problems and social skills on intervention outcomes, specifically body mass index and health-related behaviors, was examined utilizing hierarchical linear regressions. In each regression, the baseline BMI or health behavior were included in the first step. The second step included social skills or behavior problems. This allowed us to examine the effect of behavior problems and social skills over and above the baseline levels of BMI and health behaviors.

# CHAPTER THREE

# RESULTS

## Study One Results

### *Aim One: Feasibility of Camp-Based Intervention for IDD and Obesity*

#### Demand

For each cohort, approximately 1,000 brochures were mailed to families in the Inland Regional Center database who had children within the eligible age range. Across the two cohorts, 172 families contacted Operation Fit personnel, 145 families were screened, and 83 were eligible for the camp. The primary reason for ineligibility was child BMI that did not fall into the overweight or obese range. The remaining children were ineligible due to elevated behavior problems or level of functioning below the mild to moderate range. Of those who were determined to be eligible, 53 participants enrolled. The other 30 who were considered eligible were no longer interested in the intervention after the phone screen or were unable to attend due to scheduling conflicts. Of those who enrolled in the camp, 92.5% ($N$ = 49) of the participants were recruited through Inland Regional Center, while the remaining families reported learning of the study through societies for disabilities (3.8%, $N$ = 2), and referrals from friends/family (3.8%, $N$ = 2). Of those that enrolled in the intervention, 52 participants attended the camp and one attended the registration day but did not attend the camp, resulting in a completion rate of 98.1% and attrition rate of 1.9%. The majority of participants attended all four days of the camp (80.77%), while 11.30% attended three days, 5.7% attended two days, and only 1.9% (one participant) attended one day of the camp.

**Practicality and Implementation**

The resources necessary for this intervention included funding, personnel, training, time, facilities, and a manual. The cost of the intervention was approximately $75.00 per child, with this cost covering all food, facility fees, and activity supplies (M. Baum, personal communication, April 20, 2016). An institutional seed grant was obtained in order to fund the intervention. However, the larger Operation Fit camp for typically developing children is funded through a combination of local agencies and institutional resources, including the San Bernardino county department of health, the county Medi-Cal health plan (IEHP), and a federally qualified health center within Loma Linda University (Social Action and Community Health System). This intervention required a relatively high number of personnel from multiple disciplines, including five medical students to direct group physical activities, five nutrition students to lead educational nutrition activities, two to three medical residents to address medical emergencies and administer medications, and twenty psychology doctoral students to shadow the children in order to manage behavior problems, review materials, repeat instructions and information, encourage on-task behaviors, and provide 1:1 to 1:2 supervision. Additionally, one of the medical students was designated at the camp director and managed personnel, scheduling, training, and daily set up. The qualifications for camp staff included graduate level education and knowledge specific in each discipline. Medical and nutrition students received one week of didactic training and camp planning prior to the summer in order to review the camp manual, learn camp procedures, games and educational activities, and the daily materials and preparation required. A pediatrician who served as the medical director of the camp supervised these

students and provided the week-long training. All camp personnel involved in the daily intervention activities also received a one-hour training on working with children diagnosed with IDD and basic behavior management. A licensed clinical psychologist provided supervision as needed for all psychology doctoral students. The time commitment necessary for the intervention was four nine-hour camp days with thirty minutes before and after each day for setup and takedown. Furthermore, the registration day required an additional six hours. These time commitments were in addition to the standard research activities, including participant recruitment and screening. Additional resources were required in order to ensure consistent implementation of the intervention. The manual detailing the activities involved in the camp and daily schedules were necessary for adherence to the camp curriculum. Camp supervisors were physically present during each day of the intervention to confirm that the curriculum was implemented according to the manual. Regarding participants in the camp, severity level was determined via parent report and children who were non-verbal were included in the intervention for the first cohort. However, the children with more severe impairments showed increased behavior problems and limitations to active participation during the camp. Therefore, we determined that the camp was not feasible for implementation with children who were non-verbal or fell below the mild to moderate range of impairment and adjusted the inclusion criteria and recruitment process accordingly.

**Acceptability**

Following the intervention, 78.8% of parents (N = 41) completed the participant satisfaction interview. These responses were recorded and reviewed to determine

satisfaction with the intervention. Of those parents who completed the interview, 100% provided positive feedback, stated that they would recommend the intervention to other parents, and reported that they would enroll their child again given the opportunity to repeat the summer. When asked about the aspects of the intervention that they liked most, the themes that were repeated included interaction with other children, opportunities to engage in physical activity, exposure to healthy eating, and children's enjoyment of the camp. Many parents reported that the camp was the first health-behavior intervention and first opportunity for their child to attend a summer camp. Furthermore, all parents reported that their child benefitted from the program, listing greater openness to food, increased physical activity, increased water intake, and positive changes in overall mealtime behaviors as improvements following the camp. Suggestions for improvement were also solicited and the most common response was greater parent involvement and education. Remaining feedback was largely related to obstacles encountered, such as parking, transportation, and distance to the camp. Overall, participant satisfaction appeared high based on the participant satisfaction interview.

### *Aim Two: Changes in Body Mass Index and Health-Related Behaviors*

Changes in BMI, hours of physical activity, and child feeding behaviors were examined using paired-samples t-tests (see Table 1). There was no significant difference between baseline BMI z-scores ($M$ = 1.75, $SD$ = .47) and BMI z-scores four months following the intervention ($M$ = 1.73, $SD$ = .48, $t$ = .73, $p > .05$, $d$ = .04). Of those assessed, 16 children showed decreased BMI and 14 showed BMI increases. There was also no significant difference in baseline hours of physical activity ($M$ = 4.15, $SD$ = 4.94)

and hours of physical activity following at the follow-up assessment ($M$ = 4.36, $SD$ = 5.16, $t$ = -.24, $p$ > .05, $d$ = -.04). Following the intervention, 11 children showed increased physical activity, seven remained stable in their physical activity, and 12 participated in fewer hours of physical activity. Regarding child feeding, parents showed increased monitoring from baseline ($M$ = 11.75, $SD$ = 2.71) to the follow-up assessment ($M$ = 12.93, $SD$ = 2.30, $t$ = -2.53, $p$ < .05, $d$ = -.47). They did not experience significant changes between baseline pressure to eat ($M$ = 9.22, $SD$ = 3.06) or restriction ($M$ = 31.79, $SD$ = 5.82) compared to the follow-up assessment (pressure to eat, $M$ = 10.74, $SD$ = 4.54, $t$ = -1.80, $p$ > .05, $d$ = -.39; restriction, $M$ = 32.90, $SD$ = 5.10, $t$ = -1.13, $p$ > .05, $d$ = -.20).

**Table 1.** Changes in Health-Related Behaviors

| Health-Related Behavior | Baseline | | Follow-Up | | | |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *t* | *d* |
| BMI z-score | 1.75 | .47 | 1.73 | .48 | .73 | .04 |
| Physical Activity Hours | 4.15 | 4.94 | 4.36 | 5.16 | -.24 | -.04 |
| CFQ Pressure to Eat | 9.22 | 3.06 | 10.74 | 4.54 | -1.80 | -.39 |
| **CFQ Monitor** | **11.75** | **2.71** | **12.93** | **2.30** | **-2.53*** | **-.47** |
| CFQ Restrict | 31.79 | 5.82 | 32.90 | 5.10 | -1.13 | -.20 |

*$p$ < .05

### *Aim Three: Changes in Diet and Fitness Related Knowledge*

Changes in diet and fitness related knowledge were also examined using t-tests (see Table 2). Children showed significant increases in knowledge from baseline ($M$ = 5.85, $SD$ = 2.57) to the last day of camp ($M$ = 9.44, $SD$ = 3.32, $t$ = -6.52, $p$ < .001, $d$ = -1.21). There was a significant decrease in knowledge from the last day of camp to the

four-month follow-up ($M$ = 7.04, $SD$ = 2.65, $t$ = 2.20, $p$ < .05, $d$ = .53), indicating that the knowledge was not successfully retained. The mean score at follow-up was higher than at baseline with a small effect size, although the difference in scores was not significant ($t$ = -1.29, $p$ > .05, $d$ = -.31).

**Table 2.** Changes in Diet and Fitness Related Knowledge

| Comparison | Baseline | | Day 4 | | Follow-Up | | | |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *t* | *d* |
| Baseline and Last Camp Day | 5.85 | 2.57 | 9.44 | .32 | | | -6.52* | -1.21 |
| Last Camp Day and Follow-Up | | | 8.86 | 4.03 | 7.04 | 2.65 | 2.20* | .53 |

*$p$ < .05

## Study Two Results

### *Aim One: Psychosocial Risk Factors and Baseline Status*

#### Behavior Problems and Baseline Sstatus

The relationship between child behavior problems and baseline BMI, hours of physical activity, and child feeding was examined using correlations (see Table 3). Child behavior problems were not significantly related to baseline BMI, hours of physical activity, parental monitoring, parental restriction, or parental pressure to eat ($p$ > .05).

**Table 3.** Behavior Problems: Correlation with Baseline Health-Related Behaviors

| | CBCL Subscale | | |
|---|---|---|---|
| Health-Related Behavior | Internalizing Problems | Externalizing Problems | Total Problems |
| BMI *z*-score | .229 | .035 | .131 |
| Physical Activity Hours | .003 | .027 | .025 |
| CFQ Pressure to Eat | -.055 | -.048 | -.105 |
| CFQ Monitor | -.159 | -.160 | -.127 |
| CFQ Restrict | .088 | .008 | .067 |

*$p < .05$

**Social Skills and Baseline Status**

The relationship between child social skills and baseline BMI, hours of physical activity, and child feeding was also examined using correlations (see Table 4). There was no significant correlation between child social skills and baseline BMI, hours of physical activity, parental monitoring, parental restriction, or parental pressure to eat ($p > .05$).

**Table 4.** Social Skills: Correlation with Baseline Health Predictors

| Health-Related Behavior | Pearson Correlation for SSIS |
|---|---|
| BMI *z*-score | .218 |
| Physical Activity Hours | .022 |
| CFQ Pressure to Eat | -.048 |
| CFQ Monitor | -.108 |
| CFQ Restrict | -.039 |

*$p < .05$

### *Aim Two: Psychosocial Risk Factors and Intervention Outcomes*

#### Behavior Problems and Intervention Outcomes

The impact of behavior problems on intervention outcomes was examined using hierarchical liner regressions. By including the baseline levels of each outcome measure as the first step in each model, we controlled for these scores so as to examine changes from baseline to four-month follow-up. Externalizing behavior problems significantly predicted changes in BMI, with a one standard deviation increase in externalizing problems predicting an average of .14 standard deviation decrease in change ($\beta$ = -.14, 95% CI = [-.012, .000], $p < .05$; see Table 5). Externalizing behavior problems significantly predicted changes in hours of physical activity, such that each one standard deviation increase in externalizing problems was related to .39 standard deviation greater increase in hours of activity ($\beta$ = .39, 95% CI = [.046, .316], $p < .05$). Externalizing behavior problems also significantly predicted changes in parental restriction of food with each one standard deviation increase in externalizing problems predicting .35 standard deviation greater increase in restriction ($\beta$ = .35, 95% CI = [.015, .293], $p < .05$).

Internalizing behavior problems significantly predicted changes in child BMI such that behavior problems that were one standard deviation greater resulted in .15 standard deviation decrease in BMI change ($\beta$ = -.15, 95% CI = [-.014, .000], $p < .05$; see Table 6). Internalizing behavior problems were not significantly related to changes in hours of physical activity or parental feeding practices ($p > .05$).

Total behavior problems also significantly predicted changes in BMI, as each one standard deviation increase in total behavior problems was related to a -.17 standard deviation change in BMI ($\beta$ = -.17, 95% CI = [-.004, .000], $p < .05$; see Table 7). Overall,

higher levels of behavior problems resulted in decreased changes in BMI following the intervention. Additionally, there was a trending relationship between total behavior problems and hours of activity, with higher levels of behavior problems related to greater increases in hours of physical activity ($\beta$ = .31, 95% CI = [-.001, .092], $p$ = .053). Total child behavior problems did not significantly predict changes in parental feeding practices ($p$ > .05).

**Table 5.** Externalizing Behavior Problems: Results of Linear Regressions Predicting Health Changes

| | *b* | *β* | *t* | Sig. | 95% CI (*b*) | $\Delta R^2$ |
|---|---|---|---|---|---|---|
| **Step 1** | | | | | | .86 |
| (Constant) | .03 | | .25 | .81 | [-.24, .31] | |
| Baseline BMI z-score | .96 | .93 | 13.04 | .000 | [.81, 1.12] | |
| **Step 2** | | | | | | .02 |
| (Constant) | .07 | | .51 | .62 | [-.20, .33] | |
| Baseline BMI z-score | .99 | .95 | 13.96 | .000 | [.84, 1.13] | |
| CBCL Externalizing | -.006 | -.14 | -2.06 | .049 | [-.01, .000] | |
| **Step 1** | | | | | | .31 |
| (Constant) | 1.82 | | 1.66 | .11 | [-.43, 4.07] | |
| Baseline Physical Activity | .59 | .56 | 3.52 | .002 | [.25, .94] | |
| **Step 2** | | | | | | .16 |
| (Constant) | -.26 | | -.21 | .83 | [-2.81, 2.28] | |
| Baseline Physical Activity | .57 | .54 | 3.76 | .001 | [.26, .88] | |
| CBCL Externalizing | .18 | .39 | 2.76 | .01 | [.05, .32] | |
| **Step 1** | | | | | | .26 |
| (Constant) | 7.85 | | 4.5 | .000 | [4.31, 11.40] | |
| Baseline CFQ Monitoring | .43 | .51 | 3.04 | .005 | [.14, .73] | |
| **Step 2** | | | | | | .02 |
| (Constant) | 8.29 | | 4.55 | .000 | [4.54, 12.03] | |
| Baseline CFQ Monitoring | .43 | .50 | 2.96 | .007 | [.13, .72] | |
| CBCL Externalizing | -.03 | -.14 | -.80 | .43 | [-.10, .04] | |
| **Step 1** | | | | | | .19 |
| (Constant) | 4.86 | | 1.82 | .08 | [-.66, 10.37] | |
| Baseline CFQ Pressure to Eat | .66 | .43 | 2.36 | .03 | [.08, 1.24] | |
| **Step 2** | | | | | | .001 |
| (Constant) | 4.95 | | 1.79 | .09 | [-.78, 10.68] | |
| Baseline CFQ Pressure to Eat | .67 | .44 | 2.31 | .03 | [.07, 1.27] | |
| CBCL Externalizing | -.01 | -.04 | -.19 | .85 | [-.17, .14] | |
| **Step 1** | | | | | | .29 |
| (Constant) | 17.80 | | 3.89 | .001 | [8.41, 27.20] | |
| Baseline CFQ Restriction | .48 | .54 | 3.35 | .002 | [.18, .77] | |
| **Step 2** | | | | | | .12 |
| (Constant) | 17.13 | | 4.01 | .000 | [8.35, 25.91] | |
| Baseline CFQ Restriction | .44 | .50 | 3.29 | .003 | [.16, .71] | |
| CBCL Externalizing | .15 | .35 | 2.28 | .03 | [.02, .29] | |

**Table 6.** Internalizing Behavior Problems: Results of Linear Regressions Predicting Health Changes

| | *b* | *β* | *t* | Sig. | 95% CI (*b*) | $\Delta R^2$ |
|---|---|---|---|---|---|---|
| **Step 1** | | | | | | .86 |
| (Constant) | .03 | | .25 | .81 | [-.24, .31] | |
| Baseline BMI z-score | .96 | .93 | 13.04 | .000 | [.81, 1.12] | |
| **Step 2** | | | | | | .02 |
| (Constant) | .05 | | .36 | .75 | [-.22, .31] | |
| Baseline BMI z-score | 1.02 | .98 | 13.71 | .000 | [.86, 1.17] | |
| CBCL Internalizing | -.007 | -.15 | -2.06 | .049 | [-.014, .000] | |
| **Step 1** | | | | | | .31 |
| (Constant) | 1.82 | | 1.67 | .11 | [-.43, 4.07] | |
| Baseline Physical Activity | .59 | .56 | 3.52 | .002 | [.25, .94] | |
| **Step 2** | | | | | | .02 |
| (Constant) | .76 | | .48 | .64 | [-2.54, 4.06] | |
| Baseline Physical Activity | .59 | .56 | 3.51 | .002 | [.25, .94] | |
| CBCL Internalizing | .08 | .14 | .90 | .38 | [-.10, .25] | |
| **Step 1** | | | | | | .26 |
| (Constant) | 7.85 | | 4.55 | .000 | [4.31, 11.40] | |
| Baseline CFQ Monitoring | .43 | .51 | 3.04 | .01 | [.14, .73] | |
| **Step 2** | | | | | | .01 |
| (Constant) | 8.31 | | 3.97 | .001 | [3.99, 12.62] | |
| Baseline CFQ Monitoring | .42 | .49 | 2.74 | .01 | [.10, .73] | |
| CBCL Internalizing | -.02 | -.07 | -.40 | .69 | [-.11, .07] | |
| **Step 1** | | | | | | .19 |
| (Constant) | 4.86 | | 1.82 | .08 | [-.66, 10.37] | |
| Baseline CFQ Pressure to Eat | .66 | .43 | 2.36 | .03 | [.08, 1.24] | |
| **Step 2** | | | | | | .02 |
| (Constant) | 4.29 | | 1.53 | .14 | [-1.53, 10.11] | |
| Baseline CFQ Pressure to Eat | .62 | .41 | 2.17 | .04 | [.03, 1.22] | |
| CBCL Internalizing | .06 | .14 | .72 | .48 | [-.12, .24] | |
| **Step 1** | | | | | | .29 |
| (Constant) | 17.80 | | 3.89 | .001 | [8.41, 27.20] | |
| Baseline CFQ Restriction | .48 | .54 | 3.35 | .002 | [.18, .77] | |
| **Step 2** | | | | | | .005 |
| (Constant) | 17.42 | | 3.67 | .001 | [7.68, 27.17] | |
| Baseline CFQ Restriction | .47 | .54 | 3.27 | .003 | [.16, .77] | |
| CBCL Internalizing | .04 | .07 | .42 | .68 | [-.14, .21] | |

**Table 7.** Total Behavior Problems: Results of Linear Regressions Predicting Health Changes

| | *b* | *β* | *t* | Sig. | 95% CI (*b*) | $\Delta R^2$ |
|---|---|---|---|---|---|---|
| **Step 1** | | | | | | .86 |
| (Constant) | .03 | | .25 | .81 | [-.24, .31] | |
| Baseline BMI z-score | .96 | .93 | 13.04 | .000 | [.81, 1.12] | |
| **Step 2** | | | | | | .03 |
| (Constant) | .08 | | .68 | .50 | [-.17, .34] | |
| Baseline BMI z-score | 1.01 | .97 | 14.54 | .000 | [.87, 1.15] | |
| CBCL Total | -.002 | -.17 | -2.59 | .02 | [-.004, .000] | |
| **Step 1** | | | | | | .31 |
| (Constant) | 1.82 | | 1.66 | .11 | [-.43, 4.07] | |
| Baseline Physical Activity | .59 | .56 | 3.52 | .002 | [.25, .94] | |
| **Step 2** | | | | | | .09 |
| (Constant) | -.65 | | -.41 | .69 | [-3.94,2.64] | |
| Baseline Physical Activity | .60 | .56 | 3.73 | .001 | [.27, .92] | |
| CBCL Total | .05 | .31 | 2.03 | .05 | [-.001, .09] | |
| **Step 1** | | | | | | .26 |
| (Constant) | 7.85 | | 4.55 | .000 | [4.31, 11.40] | |
| Baseline CFQ Monitoring | .43 | .51 | 3.04 | .005 | [.14, .73] | |
| **Step 2** | | | | | | .02 |
| (Constant) | 8.52 | | 4.40 | .000 | [4.54, 12.51] | |
| Baseline CFQ Monitoring | .42 | .50 | 2.90 | .008 | [.12, .72] | |
| CBCL Total | -.009 | -.14 | -.79 | .44 | [-.03, .02] | |
| **Step 1** | | | | | | .19 |
| (Constant) | 4.86 | | 1.82 | .08 | [-.66, 10.37] | |
| Baseline CFQ Pressure to Eat | .66 | .43 | 2.36 | .03 | [.08, 1.23] | |
| **Step 2** | | | | | | .008 |
| (Constant) | 4.43 | | 1.55 | .14 | [-1.49, 10.35] | |
| Baseline CFQ Pressure to Eat | .64 | .42 | 2.21 | .04 | [.04, 1.23] | |
| CBCL Total | .01 | .09 | .48 | .64 | [-.04, .06] | |
| **Step 1** | | | | | | .29 |
| (Constant) | 17.80 | | 3.89 | .001 | [8.41, 27.20] | |
| Baseline CFQ Restriction | .48 | .54 | 3.35 | .002 | [.18, .77] | |
| **Step 2** | | | | | | .06 |
| (Constant) | 16.99 | | 3.79 | .001 | [7.78, 26.21] | |
| Baseline CFQ Restriction | .44 | .50 | 3.13 | .004 | [.15, .73] | |
| CBCL Total | .04 | .25 | 1.59 | .12 | [-.01, .08] | |

**Social Skills and Intervention Outcomes**

The impact of child social skills on changes following the intervention was also analyzed using hierarchical linear regressions (see Table 8). Similar to the regression analyses examining behavior problems, we included the baseline levels of each outcome measure as the first step in the regression models in order to control for these levels and examine changes in each. Child social skills did not significantly predict changes in BMI, hours of physical activity, or parental feeding practices ($p > .05$).

**Table 8.** Social Skills: Results of Linear Regressions Predicting Health Changes

| | *b* | *β* | *t* | Sig. | 95% CI (*b*) | $\Delta R^2$ |
|---|---|---|---|---|---|---|
| **Step 1** | | | | | | .85 |
| (Constant) | .06 | | .40 | .70 | [-.23, .34] | |
| Baseline BMI z-score | .96 | .92 | 12.57 | .000 | [.80, 1.11] | |
| **Step 2** | | | | | | .003 |
| (Constant) | -.06 | | -.29 | .77 | [-.49, .37] | |
| Baseline BMI z-score | .94 | .91 | 12.04 | .000 | [.78, 1.10] | |
| SSIS Social Skills | .002 | .06 | .74 | .46 | [-.003, .007] | |
| **Step 1** | | | | | | .31 |
| (Constant) | 1.95 | | 1.79 | .09 | [-.28, 4.18] | |
| Baseline Physical Activity | .58 | .55 | 3.45 | .002 | [.23, .92] | |
| **Step 2** | | | | | | .02 |
| (Constant) | 5.66 | | 1.26 | .22 | [-3.59, 14.92] | |
| Baseline Physical Activity | .57 | .54 | 3.35 | .002 | [.22, .92] | |
| SSIS Social Skills | -.05 | -.14 | -.85 | .40 | [-.16, .07] | |
| **Step 1** | | | | | | .27 |
| (Constant) | 7.78 | | 4.54 | .000 | [4.26, 11.31] | |
| Baseline CFQ Monitoring | .44 | .51 | 3.06 | .01 | [.14, .73] | |
| **Step 2** | | | | | | .000 |
| (Constant) | 7.89 | | 2.53 | .02 | [1.47, 14.31] | |
| Baseline CFQ Monitoring | .43 | .51 | 2.89 | .01 | [.12, .74] | |
| SSIS Social Skills | -.001 | -.01 | -.04 | .97 | [-.06, .06] | |
| **Step 1** | | | | | | .15 |
| (Constant) | 5.44 | | 2.05 | .05 | [-.03, 10.91] | |
| Baseline CFQ Pressure to Eat | .58 | .39 | 2.10 | .046 | [.01, 1.14] | |
| **Step 2** | | | | | | .01 |
| (Constant) | 3.79 | | .74 | .47 | [-6.84, 14.42] | |
| Baseline CFQ Pressure to Eat | .57 | .39 | 2.06 | .05 | [-.002, 1.15] | |
| SSIS Social Skills | .02 | .07 | .38 | .71 | [-.09, .14] | |
| **Step 1** | | | | | | .31 |
| (Constant) | 18.60 | | 4.26 | .000 | [9.61, 27.58] | |
| Baseline CFQ Restriction | .46 | .56 | 3.40 | .002 | [.18, .74] | |
| **Step 2** | | | | | | .01 |
| (Constant) | 6.60 | | 3.13 | .004 | [7.05, 34.23] | |
| Baseline CFQ Restriction | .14 | .54 | 3.23 | .003 | [.16, .74] | |
| SSIS Social Skills | .05 | -.07 | -.42 | .68 | [-.13, .09] | |

# CHAPTER 4

# DISCUSSION

## Study One Discussion

In the first study, we evaluated the feasibility of a camp-based intervention for children with IDD and overweight or obesity. We also examined the initial outcomes of the intervention, including BMI, physical activity levels, parent feeding behaviors, and diet and fitness related knowledge. Overall, camp-based intervention for children with IDD who are overweight or obese appeared to be feasible based on demand, practicality, implementation, and acceptability. Regarding camp outcomes, there were no significant changes in child BMI, hours of physical activity, or the parental feeding practices of restriction and pressure to eat at the four-month follow-up assessment. There was a significant increase in parental monitoring. However, this may have resulted from our limited follow-up sample size and inadequate power. There was a significant increase in health and fitness related knowledge during the intervention. Unfortunately, that knowledge was not maintained at follow-up, although this finding may have again been related to limited power.

Although the camp appeared to be feasible in the current study, there were a number of resources required for successful implementation and these must be addressed for feasibility in other settings. There were a large number of families who were interested in the camp, so there appeared to be adequate recruitment potential given the appropriate sources. Given that the majority of our participants were recruited through the local regional center, a central agency through which potential participants can be accessed may be critical to the feasibility of this group-based intervention. The cost of the

intervention was relatively low considering the hours of intervention that were provided during the week of the camp, but funding sources are still necessary unless parents are asked to cover the cost of their child's attendance.

The greatest potential barrier to the feasibility of this intervention was the high staffing that was required to ensure adequate supervision and participation of children with IDD. In certain settings, such as universities or academic medical centers, graduate students (e.g., psychology, speech and language pathology, occupational therapy, etc.) hoping to gain experience with the targeted population can staff the camp. However, in community settings, the cost of paid personnel may be prohibitive and the camp would likely be practical only with the availability of volunteers, which may be difficult to enroll.

Despite the barrier to staffing, camp-based intervention appears to be a promising avenue of research for this population. The camp format allowed for a relatively intensive intervention within a short duration, particularly in comparison to the typical intervention duration of at least eight weeks for children who are overweight or obese (Doak, Visscher, Rendersm & Seidell, 2006). Furthermore, a relatively large number of children were reached with one intervention, allowing for greater potential impact compared to individually based interventions. Finally, the opportunities for attending summer camps and participating in social forms of physical activity are often limited for children with IDD (Curtin et al., 2010; Rimmer et al., 2007), so the camp format may provide the added benefit of novel social experiences and may be particularly appealing for both children and their parents. This appeal was reflected in parent feedback, as many parents reported that they camp was beneficial for their children and expressed appreciation for

the opportunity. The following quotes highlight the benefits that parents observed following the camp. “You guys did a good job because she learned.” “The camp changed a lot of habits. He only eats at the table and eats more vegetables now.” “My daughter was exposed to health ideas she might not otherwise know.” Additionally, many parents reported that they found it easier to discuss positive food choices with their children after they attended the camp.

Unfortunately, we did not observe significant improvements in BMI, physical activity levels, or two of the parental feeding practices. While children did show significant increases in health and fitness related knowledge, this knowledge was not maintained at the follow-up assessment. Although the quantitative results were impacted negatively by the small sample size and limited power to detect changes, these results do have important implications for future interventions. First and foremost, these results highlight the necessity of a control group for intervention studies such as the current study. While we did not see significant reductions in BMI overall, less than half of children showed increased BMI at the four-month follow-up. Therefore, it is possible that the benefit of the camp was improving stability of weight, theoretically changing the long-term trajectory for these children. The inclusion of a control group would allow us to test this hypothesis.

Although a larger sample and a control group may have allowed for detection of intervention benefits, it is important to recognize aspects of the camp that likely need further development. Parents are largely responsible for children’s food choices and activities, particularly parents of children with IDD (Groundhuis & Aman, 2014; Rimmer et al., 2007), so these parents should be incorporated into future interventions in order to

create lasting change in diet and physical fitness following the intervention. Incorporating parents and families is standard practice in pediatric obesity interventions (Barlow & Dietz, 1998; Faith & Wrotniak, 2009). Therefore, inclusion of parents in the intervention is likely a critical element that is missing from the current intervention.

As highlighted through the feasibility study, the camp format allowed for greater reach in a short period of time, but the brief nature of the camp may have limited the gains of participants. In other words, the current intervention was intensive, but provided limited opportunities for the necessary home practice that likely contributes to lasting behavior change (Kamath et al., 2008). The short duration of the intervention appeared to improve the feasibility, but did not allow for repetition of newly acquired skills and knowledge. Thus, it may be necessary to extend the length of the intervention or provide additional sessions after the camp to review concepts. Given these potential adaptations, the results of the camp may be significantly improved.

## Study Two Discussion

In the second study, we examined the relationship between psychosocial risk factors and baseline weight status, as well as the effect of those risk factors on intervention outcomes. At baseline, there were no significant correlations between behavior problems or social skills and weight, hours of physical activity, or parental feeding practices. Similarly, social skills did not predict weight, physical activity, or parental feeding outcomes following the camp-based intervention. However, greater levels of externalizing behavior problems predicted greater changes in hours of physical activity and parental restriction in feeding and reduced changes in child BMI.

Furthermore, elevations in internalizing and total behavior problems also predicted lesser changes in BMI. Total behavior problems had a trending relationship with changes in physical activity.

Although not related to baseline status, behavior problems appeared to be important for changes resulting from the camp-based intervention. Of the types of behavior problems examined, externalizing problems appeared to have be the most important for predicting camp outcomes. This finding is consistent with research in risk factors for typically developing children, as studies have shown a link between externalizing behavior problems and obesity (Anderson et al., 2006; Puder & Munsch, 2010). The underlying mechanisms proposed for this relationship include caregivers' use of food to reduce behavior problems and elevated levels of impulsivity. These mechanisms are likely at play in children with IDD as well due to the elevated levels of behavior problems frequently observed in this population (Emerson & Einfeld, 2010). Additionally, food is often used in behavioral programming for children with IDD, further contributing to the obesity risk for children with IDD (Groundhuis & Aman, 2014). It is also important to note that research with children who have IDD has consistently shown poorer long-term psychological outcomes for children who exhibit elevated levels of externalizing behavior problems (Campbell, Shaw, & Gilliom, 2000). Consequently, the impact of externalizing behaviors on obesity and health-behavior interventions may be important, as this extends the finding from psychological to health outcomes for these children. We also examined social skills, which were not shown to correlate with baseline status or have an impact on changes following the intervention. However, a certain level of social skills is likely required to participate in a camp-based

or other group intervention and thus, they may still be important in the context of these types of interventions. Furthermore, aside from the intervention itself, both behavior problems and social skills may impact participation in sports and other group-based activities, so they may be important despite not being significant here.

## Overall Discussion of Studies

### *Limitations*

The results of the current studies must be considered within the context of several limitations. The first limitation was the small sample size, particularly for the four-month follow-up assessment. Given a larger sample, we would have had the sufficient power for detecting small and medium effect sizes and may have observed significant improvements following the intervention. The length of time between the intervention and the follow-up assessment may also be viewed as a limitation, particularly considering the brief nature of the intervention and the lack of additional sessions to promote review and generalization of new habits and knowledge. Ideally, follow-up assessment would be conducted at multiple time points, such as one month, three months, and six months following the intervention. Another limitation was the lack of a control group, which would have allowed for comparisons between groups instead of examining only pre- to post-intervention changes. The use of BMI as the only objective measure of physical health was a limitation and additional markers of physical health, such as fitness tests or physicals from a pediatrician, may have provided a broader understanding of the participants' health status for the current study. Furthermore, child behavior problems and social skills were measured via parent report. The inclusion of observational

measures of these areas and additional reporters, including teachers, would have strengthened the second study. These additional measures would have provided a more comprehensive examination of behavior problems and social skills, as well as allowing for assessment of children's behavior in social settings, such as classrooms, and of behaviors during the camp. Behaviors in these types of settings may have been more directly relevant to group-based intervention outcomes. Finally, we did not have a fidelity tool in order to ensure consistent implementation of the camp manual, so it is difficult to objectively state that the intervention was delivered with fidelity to the manual across both cohorts.

### *Directions for Future Research*

Future directions for camp-based intervention for children with IDD and obesity include adding a parent education component, which will likely improve the carryover of skills and overall efficacy of the camp. As highlighted by the limited gains observed at the four-month follow-up assessment in the current study, targeting behavior change without parent involvement results in limited improvement, as parents are largely responsible for food selection and behavior modification in the home setting. Therefore, including parents in obesity interventions may improve generalization of skills and home practice following the camp. The parent component of the camp would likely involve a parallel curriculum that is delivered concurrently with the camp sessions. In addition to incorporating parents into the intervention, follow-up or booster sessions may be valuable to improve the generalization of knowledge and habits to home and school environments given the decrease in knowledge over time and the lack of significant changes in weight

or physical activity across a four-month period. These sessions would serve as a brief review of camp materials for both children and their parents to provide the repetition that is likely needed for lasting behavioral changes. In order to evaluate the duration of camp-related changes and the frequency necessary for potential booster sessions, additional and repeated follow-up assessments may be useful. For example, it may be beneficial to conduct assessments immediately, one month, three months, and six months following the camp. This would allow us to determine if changes are present but short-lived or if there is truly no change in behaviors following the camp. Our results also highlight the need for a matched control group, as a comparison is needed in order to determine effects of the camp that are difficult to examine in a pre-post design, such as stabilization of weight. Given the demand for interventions in this population, a waitlist control design may be the most feasible design initially although an active treatment control group would be the strongest research design and the eventual research plan. Finally, it may be valuable to develop a fidelity tool to examine the adherence to the intervention in future studies.

### *Summary*

Given the prevalence of overweight and obesity in children with IDD and the scarcity of effective interventions, it is crucial to continue examining treatments for these populations in order to improve both physical and psychological outcomes. This is particularly important considering the elevated risk for poor outcomes in children with IDD and the challenges that these children face apart from the added consequences of increased weight status. Furthermore, it will be critical to evaluate risk factors for obesity,

including those that are observed in typically developing children and those that are unique to children with IDD. Therefore, interventions may be better targeted to alleviate these factors and improve outcomes for children and their families.

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## APPENDIX A

## CAMP CURRICULUM

### Disability week:
### (Monday-Thursday ONLY)

Monday: **MyPlate + Exercise**

- **8:00-9:30** Check in (**1 nutr & 1 med student**)
    - Kids:
    - Do name tags
    - Decorate water bottles
    - Decorate chair: locker space
    - Pass out t-shirt
    - Assign pods based on age and gender
    - Do journal activity
    - Free play (hula hoops, four-square, jump ropes, etc.)

    **9:30-10:00** Introduction to Camp

    - Introduce staff (name, occupation, something the staff member is "famous for").
    - Go over camp rules (emphasize the importance of treating Drayson staff/property with respect).
    - Explain ticket competition.
        - Campers can get tickets 5 ways: having a positive attitude, encouraging others, winning games, and working extra hard.
        - When a kid receives a ticket, he/she must put it in the appropriate jar.
        - At the end of the week, tickets will be counted. Whoever has the most tickets wins a prize!
    - Play a get-to-know-you game. Suggestion: With the group in one large circle, have each person say their name with a descriptor that starts with the same letter of their name; for a fun twist, incorporate goofy movement (for example, "Kinetic Karisa" could do jumping jacks). Have the whole group go around the circle and repeat everybody's adjective, name, and movement.

    **10:00-10:30** Outdoor Games (**med student**); Take kids to the Super Field and play games

    - Duck-duck-goose
    - Red-light, green-light
    - Etc.

- **Team 1** will come in at 10:15 to help prepare snack
    - Have students wash the fruit that will be used for the parfait
    - Set out the spoons, bowls, and napkins
    - Set out the yogurt with correct measuring tools
    - Set out the granola with correct measuring tools
    - Set out the fruit with the correct measuring tools

**10:30-11:15** Come inside—snack

- Bathroom break—clean up for snack
- Snack—Parfait
- Explain journals and talk about food records
    - Food Record
        - Have the students sit on the floor and a nutrition student will introduce what the journal is and the purpose of it
        - It is helpful to go through the journals together in their perspective pods. Pods can join up if their ages are similar, as long as it will not get too loud or disruptive. Both Pod leaders need to be present though.
        - Have the students fill out the Demographics survey here, Pod leaders can explain the importance of keeping you answers private

**11:15-11:35** MyPlate Video (**Nutr student**)

**11:35-12:00** MyPlate Activity (**Nutr student**)

**12:00-12:30** Food Group Relay (**Nutr student**)

- Put equal amounts of plastic food items into 2 large bins.
- Place 6 smaller buckets labeled with food groups several yards away from each large bin.
- Divide campers into Fruits vs. Veggies and line them up behind the bins with the plastic foods across from the labeled buckets.
- Once the relay begins, the kids take turns running with 1 piece of plastic food at a time and sorting it into the appropriate basket.
- If a food is misplaced, have the kid take it back for the next person in line to sort correctly.
- First group to sort all the food correctly wins. Winners receive tickets.

**12:30-1:20** Lunch—Tacos! **(Team 2)**

- Nutrition student will have all food on trays, prepared for assembly line: tortillas, ground turkey, lettuce (washed), tomatoes (cut), cheese (shredded), and tomato/hot sauce.
- While other students are washing their hands, the prep team will go to kitchen to set out all of the food, plates, napkins and utensils on a long table (assembly line style).

- It will work like Chipotle, the prep team will stand behind table and the other students will go through the line, telling the prep team what they want on their taco. Measure tools will be used to emphasize correct portion sizes.

**1:20-1:45** Walk on Indoor Track (**med student**):

- Explain games before getting to track
- For those that are "high energy" one group leader can organize a track game: each of the four edges of the track can be a different exercise (butt kicks, high knees, volleyball shuffles, skipping). Be mindful of elderly or slow-moving Drayson guests. Have the students stick to 2 of the 4 tracks and give the other guests their space.

**1:45-2:15** Dance (**med students**): Find videos on YouTube of Cha-Cha slide, The Macarana, Cupid Shuffle, Gangnam Style to learn as a group. Make sure that the video is not displayed on the screen, put the sounds is projected through Drayson's sound system. All the leaders must participate because the campers will only participate if they see the leaders being goofy/energetic. Another option is to find a kid-friendly Zumba YouTube video or a kid-friendly workout video.

**2:15-2:30** Water/Restroom Break

**2:30-2:45** Food Groups Beach Ball Toss (**Nutr students**):

- Stand in circle and toss a beach ball that has specific food names written on it (ex: blueberries, spinach, spaghetti, mayonnaise, etc.).
- Each time someone catches the ball, they find the food closest to their right index finger and shout out the food group associated with that particular food.
- Pass the ball across the circle so everyone gets to participate.

**2:45-3:30** Zoo Keeper (**Nutr/Med student—doesn't matter)**

- To play zookeeper, create a quadrangular field using 4 orange cones. Have everyone line up on one side of the field and then select 3 kids to come to the center of the field to be "zookeepers". Each zookeeper then chooses a type of animal (example: whale, zebra, snake) and announces the animal to the group. Once the animals have been announced, all of the non-zookeepers decide which animal they want to be. One of the zookeepers then shouts out one of the animals and everyone who has chosen this animal must run to the opposite side of the field without being tagged by a zookeeper. If tagged (or if caught running out-of-bounds), the "animal" becomes "frozen" in place and helps the "zookeepers" tag other "animals" as they run by. Zookeepers can also call "stampede," which means everyone must run across at the same time. Keep playing until 3 "animals" remain – these 3 become the new zookeepers.
- Optional: If extra time, have everyone complete 1 lap around the track (for tickets!).
- Have **Team 3** come in at 3:30 to help with food prep

**3:30-4:15** Circuits (**Med students**): This will take place in Studio B. The room should have been reserved in the morning with the front desk. The room is air-conditioned so that's a good thing! But it is very loud and echoes a lot. So have the students sit on the floor quietly as you explain the game.

- Get 8 note cards and write each of the following activities on separate cards:
    - Pushups, crunches, burpies, squats, lunges, high knees, butt kicks, stretching
- Have a leader leave 2 minutes earlier to lay out the note cards (put the pushups, stretching, crunches and burpies on the blue mat).
- Have each pod (and leader) go to a station. They will do the exercises at each station for 2 minutes then rotate clockwise until all the stations are completed. After 4 stations have been done, have a group rest for approx 1-2 minutes.
- Gather the cards and go back to Collins.
- Have **Team 3** come in at 3:30 to help with food prep
- Make sure students wash their hands!

**4:15-4:35** Snack—Healthy ranch and veggies **(Team 3)**

- Nutrition student will have vegetables already cut up/prepared veggies ready for prep team to wash
- Wash already cut up tomatoes, broccolis, carrots
- Make LF Ranch (Greek yogurt + Ranch packet)
    - 4 cups of Greek yogurt
    - 4 tbsp of ranch seasoning
    - Dash of milk (if needed)

**4:35-5:00** Work on Daily Quiz

**Post Camp**:

- Cook pasta noodles and ground turkey for Tuesday lunch. **Each leader MUST do this once during the summer.**
- Medical students: Input demographic data, updated contact information, and camper measurements into Excel files.
- Make additional recruitment phone calls if necessary. (**Med students**)
- Residents can explain any special medications or students that need attention. **A brief action plan needs to be assigned in case of an emergency.**

Tuesday: **Water + Calcium**

- **Pre Camp Set Up**
    - Same set-up as Monday, get doors unlocked/unalarmed and set out signs.
        - The only registration station table that stays up is the "sign in" table
        - Put tablecloths on the rest of the tables
- Fill grey water container.
- Check to make sure that pasta is cooked the night before!

- Bring 2 additional CrockPots (for 4 total). Start heating spaghetti pasta (add at least 2 cups water) and sauce (1 meat, 1 veggie) in CrockPots on LOW.
    - Place 3 pounds of ground turkey in each CrockPot (adjust number of crock pots to number of campers/staff each week) and cook on HIGH, stirring occasionally. Season as desired. (Around 11:45 begin draining the fat to remove as much as possible. Use a spoon to remove the fat and place into some sort of container/bowl - do not pour down the sink!)

Make sure there are printouts of foods for the "Food Pyramid Cut-Outs Activity" and for Portion Goody Bags.

- **8:00-8:30** Check In
- When checking in parents, remind them of Family Night on Thursday (5pm-7pm)
- **8:30-9:15** Stretching/Games (**Med Students)**
- Have everyone stretch out for ~20 minutes (you will be sore after the first day).
- Divide the campers into boys and girls and design creative relay games to play on the mats in Studio B (you can use balls, jump ropes, plastic eggs/spoons, etc.).
    - Example: bunny hop down, 5 jumping jacks, crab walk back.

Make sure all staff members are energetic and encouraging for these—it really helps the kids!

- **9:15-10:00** Activity **(Med Students)**
- At **9:45** have **Team 2** go to kitchen to set up for snack
- Children will set out different ingredients with correct serving cups
- Need to have bowls
- Wash hands before more
- **10:00-10:30** Snack Time & Calorie Talk (**Nutr students)**
    - What is a Calorie?
        - As feet and meters are measurements of length, a calorie is a measure of energy.

    What is energy?

        - What is it that gives your car the ability to move?... Gas. In the containment of the engine, gasoline is allowed to explode which moves parts that transmits to the tires making you car move!
        - What is or "gas"?... Food. Food gives our body the necessary energy that allowed all our vital functions to work.
        - Given a cube fat, protein, and carbohydrates of equal weight which would have the most energy?... Fats. Still most everything you eat has Calories in it
            - Fat: 1 gram = 9 calories
            - Protein: 1 gram = 4 calories
            - Carbohydrates: 1 gram = 4 calories
        - What happens to the calories that we put in our bodies?... They are used (burned) or they are stored
        - How does the body store energy?... Fat

Calorie Demonstration

- Use 4 Pitchers Labeled:
    - Food
    - Body
    - Storage (Fat)
    - Energy Burned
        - Also place tape on the side of this pitcher to mark level of calories burned for a normal person with low activity in a day
- Stack some boxes and place empty pitchers on table.
    - Side: "Storage" pitcher on top of **one** box
    - Middle: "Body" pitcher on top of **two** boxes
    - Side: "Energy Burned" on table
- Demonstration
    - Fill "Food" pitcher with died water representing Calories
    - Fill the "Body" pitcher with "Food" pitcher to what ever level you or the kids determine appropriate for what ever food the say is being eaten
    - From the "Body" pitcher first fill the "Energy Burned." Once the "Energy Burned" pitcher is filled to the line begin filling the "Storage" pitcher. Do this sequence for the **three** meals of the day then empty the "Energy Burned" pitcher (back into the "Food" pitcher) representing the end of the day. Repeat for however many days that keeps the kids attention showing how one gains weight.
    - Ask how we can pour more calories into the "Energy Burned." By exercising we can increase the calories burned each day.
    - Ask the children how we can empty the "Storage" pitcher. Go through the different ways of losing weight (increase the number of calories burned and/or eat less calories). The "Storage" pitcher should be poured into the "Energy Burned" pitcher

- **10:30-11:00** Portion Goody Bags (**Nutr students)**
  Prepare 6 paper sacks with the following:
  - 1 fake quarter (1 serving of oil)
  - 1 deck of cards (1 serving of meat/beans = 3 oz)
  - 1 ping pong ball (1 serving of cheese = 1 oz)
  - 1 tennis ball (1 serving of whole fruit)
  - 1 fruit cup (1 serving of cut fruit)
  - 1 raisin box (1 serving of dried fruit)
  - 1 cracker pack (1 serving of grains)
  - 1 blank index card (to record serving equivalents)

  Distribute one bag to each table.
  Handout photocopies of each “Portion Goody Bag” to each camper.

Present the bag item-by-item and have campers write down what each item represents (see info in parenthesis above).

After presenting, quiz campers for tickets.

- **11:00-11:30** Games Outside **(Med Students)**
- **11:30-12:00** Food Group Cut Out, What is it? (Is this a PPT?)(grocery fliers?) (**Nutr students)**
  - While students are playing the "Food Group Cut Out" game, **Nutr Students** will set up for "Portion Distortion Activity"
    - 5 plastic pitchers
      - One filled with dry pasta
      - One filled with dry cereal
    - Plastic bowls (1 for each camper)
    - 2 sets of measuring cups
    - 2 large measuring cups for water station
    - Plastic cups (5-8, for the water station)
    - ½ sheets of paper and pens
- **12:00-12:30** Portion Distortion Game (**Nutr students)**
  - There are 5 stations for this activity. Split the kids into 5 groups.
  - Each station will have a pitcher with a food in it (dry rice, dry pasta, dry cereal, dry beans). One station will have water.
  - Each station needs to have a leader.
  - At each station, let each kid scoop (NOT pour) out how much of the food they usually would take into the bowl. Have everyone measure how much they took.
  - Next, ask them to guess what the serving size actually is in cups.
  - Have them practice the appropriate serving size before switching stations.
  - Spend ~6 minutes per station (use the online stopwatch to time the activity).
  - Serving sizes are as follows:
    - Cereal = 1 cup is 1 serving of grains
    - Cooked pasta = ½ cup is 1 serving of grains
      - Trick question: how much soda do we need in a day? NONE!
    - Have students use restroom & wash hands
    - Sent **Team 3** to kitchen to prep for lunch
- **12:30-1:15** Lunch - Pasta & Sauce/Meat/Veg (**Nutr students)**
  - Set out pasta
  - Have Team 3 set out:
    - Set out two bowls of sauce, clearly labeled which is meat and which veggie
    - Set out bowls, forks, and napkins
    - Set out baseball so that kids can visualize the amount of noodles needed (2 oz is a serving)

- **1:15-1:30** Do journal activity
- **1:30-2:00** Change into swimsuits
- **2:00-4:00** Swimming & Games **(Med Students)**
- Walk the kids to the pool and have them place belongings in shaded spot.
- Go over pool rules-
    - No running or diving.
    - Listen to the lifeguards, especially on slide (they tell you when it's safe to go).
    - NO ONE IS ALLOWED TO GO TO THE LAP POOL/DIVING BOARDS!!!!! We are in slide pool only!
    - No cotton t-shirts allowed on slide.
    - You will sit out if you do not act respectfully or safely.
    - You must rinse off in the outside shower before and after swimming.
- Have everyone rinse off in the outdoor showers.
- SWIM TEST!
        - Line the kids up in the shallow end.
        - Have them swim past an adult under water 1-at-a-time.
        - Adults need to know who cannot swim; these kids should stay in the shallow end and adults should play with them/help them learn to swim
    - **4:00-4:30** Change back into dry clothes & wash hands for snack
- **4:30-5:00** Snack and Daily Quiz -- Apples/Celery/P&B
- **5:00** Checkout

Wednesday: **Fruits + Veggies**

- Pre-camp**: Nutr Student** will prepare chicken and rice for lunch
- **8:00-8:30** Check in
- **8:30-9:00** Stretching **(med student)**
- **9:00-10:30** Exercise Stations/Outside games **(med student)**
    - Zookeeper/red light-green light/lap for tickets
    - 4 stations:
        - Exercise video or yoga in Collins
        - Soccer/volleyball on mini field by outdoor volleyball sand court
        - Knock-out or "bump"/passing drill/3-on-3 basketball
        - Dodgeball in a racquetball court
    - Assign a medical student to lead each station. Assign other staff members to travel with a group of kids
    - Divide the group of kids into 4 small groups, each with at least one adult
    - Rotate through the stations, with approximately 15 minutes per station and 4-5 minutes of travel time in between
    - When students come back inside, have them wash their hands
- **10:30-10:45** Snack **(Team 3)** → fruit smoothie
- **Nutrition student** to prep smoothies
    - **Smoothie one:** "Mango Tango"

        - Smoothie ¾ cup serving
        - 1 cup fresh baby spinach leaves (1 Myplate serving)
        - 1 frozen banana (1 Myplate serving)
        - ½ cup frozen mango chunks (1/2 MyPlate serving)
        - ½ cup Greek yogurt (1/2 Myplate serving)
        - Ice
    - **Smoothie Two**: "The Hulk"
        - 1 whole Orange (1 MyPlate serving)
        - 1 frozen banana (1 MyPlate serving)
        - 1cup spinach (1 MyPlate serving)
        - ½ cup Greek yogurt (1/2 MyPlate serving)
        - Ice
    - Have **Team 3** pour smoothies into cups and set out
- **10:45-11:30** Family Feud **(nutr students)**
- This game will take place in the lobby hallway directly outside of Collins. To prepare: have the leader put two strips of painter's tape on the floor. Students will line up on one end of the hallway and run to the other line.
- Do 2 fun relays to get some energy out
- Have the kids split into 2 lines (boys vs. girls or fruits vs. veggies)
- Nutrition students will lead this game. Here is how it works:
    - Ahead of time, fill a bucket with some plastic food but keep it out of sight.
    - Ahead of time, come up with about 40 questions that relate to what the kids have learned. For example:
        - Hold a plastic food item. Ask what food group it belongs to.
        - True or False: green beans are in the meat/beans group (false).
        - In your goody bag, what does the deck of cards represent?
    - 2 kids will line up on the line
    - When the leader says "GO!," the 2 kids will run form the line to the leader to slap the leader's hand.
    - Whoever slaps first will get to answer the question. If they get it right, their team gets 1 point. If they get it wrong, the other team can steal it if they know the answer. If no one knows it, someone else can volunteer to answer for no points.
    - Whoever gest the point is exempt from doing a mini exercise. In other words, the losing team o each point will have to do a few little exercises (i.e. 2 burpies, 10 jumping jacks. 5 pushups)
    - The lines rotate through so everyone gets a chance. Only the 2 people who are up can answer and their team CANNOT help them.
    - Reward tickets to the team with the most points
- **11:30-12:00** Food Label Lesson **(nutr students)**
- "Nutrition Label 101"
- Teach campers how to identify the calorie, fat, and sodium content of food
    - Pass out food packages with labels
    - Staff needs to sit with kids to help them out
- **12:00-12:20** Food Label Game **(nutr students)**

- Pick out food packages with labels and sort and label 4 bins according to:
    - High fat
    - Low fat
    - High calories
    - Low calories
- Make sure to use an equal number of packages dealing with both fat and calories
- Separate into teams (boy vs. girl)
- Give one line the packages dealing with fat and other with calories
- Place appropriately labeled bins across respective groups
- One at a time, kids will grab a package and run down to sort it into the correct bun according to what the food label says. If they sort incorrectly, they must bring the package back and the next person tries to sort it correctly before the next package can be taken.
- Whichever team finishes first wins and gets tickets. Then switch the sorting topic and play again.
- When students are finished playing, have them wash their hands

- **12:20-1:00** Lunch **(Team 1)** → chicken, rice, vegetable
    - Let the kids practice serve themselves using measuring cups
- **1:00-1:45** Tomato Planting
    - Station 1: Pot decorating - each child decorates pot
    - Station 2: Planting tomatoes – each child places tomato plant in pot and then adds soil
- **1:45-2:15** Change into swim clothing
- **2:15-4:10** Swim (**Med students**)
- **4:10-4:35** Change out of swim clothes into dry clothes
- **4:35-4:50** Snack: hummus & cucumber, tomato, broccoli
    - **Nutrition student** will have vegetables already cut up/prepared veggies ready for prep team to wash
    - Have **Team 2** wash already cut up tomatoes, broccolis, carrots
    - Set out hummus and serving spoons
    - **4:50-5:00** Daily Quiz
    - **5:00** Checkout

Thursday: **Grains/legumes + Sleep (8 hours)**

Pre-Camp Set Up

- Same set-up as Monday, get doors unlocked/unalarmed and set out signs.
    - The only registration station table that stays up is the "sign in" table
    - Put tablecloths on the rest of the tables
- Fill grey water container.
- Start cooking the chili base in the 4 CrockPots (on LOW). A good rule of thumb is **1 pot of chili feeds 8 children and their families.** The base in each pot is composed of the following:
    - 2 cups canned stewed tomatoes + juice

- 3 cans vegetarian chili
- 2 cans pinto beans (drained)
- 2 cans black beans (NOT drained)
- 1 can kidney beans (NOT drained)
- ½ cup to 1 cup of chopped white onion

- Be sure the other veggies that go in the chili are easily accessible.
- Prepare for the hiking food:
  - Write the Pod names on separate pieces of paper and tape it to the wall spread out. When the students are done making their sak-lunches then can stack their food by their Pod's name. The leader will then put the food in their backpack and carry the food for the hike.
  - Prepare the lunch-making assembly line on a table. They will eat a sak-lunch on the peak of the hike so each student needs to prepare their own lunch. Set out:
    - Ziplock baggies
    - Bread
    - Sandwich materials (cheese, turkey slices, lettuce, tomatoes. Ect)
    - Cut watermelon (pod leader will grab a tupperwear full of watermelon for their pod and enough forks)
    - Wash and put carrots in bowls
    - Bags of "Baked Lays Chips" (1 bag per student)
    - Sacks and sharpie marker for their name
    - Fill their water bottle

When parents come, remind them about Family Dinner night

Make sure supplies for the FIT STATIONS are prepared. See the description below.

- **8:00-8:30** Check in
- **8:30-8:45** Prepare Snack—Chex Mix
  - **Team 1** Set out:

    2 TBS Cheerios (1oz)
    ¼ cup Pretzels (2oz)
    2 TBS Chex (1oz)
    ¼ cup Popcorn (2oz)
    1 TBS semi sweet chocolate chips
    Measuring cups
    Have each student get a baggie and go through the assembly line and make their own mix

**8:45-9:00** Restroom break; prepare for hike to Nichol Hall
**9:00-9:30** Hike to Nichol Hall
**9:30-10:30** Scavenger Hunt (**Med students)**
**10:30-11:00** Snack at Nichol Hall
**11:00-11:30** Hike down from Nichol Hall to Drayson
**11:30-11:45** Bathroom Break
**11:45-12:30** Physical Activity
**12:30-1:15** Lunch
**1:15-2:30** Fit Stations! (**Nutr student)**

- There are 4 stations (listed below). Spend 13 minutes/station with 2 minutes for transition in between. Have an adult or two man each station while the kids rotate.
- Healthy Choices Suit (outside Collins hallway)
    - Set up cones in hallway in the form of a zigzag course.
    - Ask kids how many pounds they think they would gain if they ate cake/cookie/potato chips every day for a year. Let them make guesses. Answers are recorded on a sheet with the Healthy Choices Suit.
    - Introduce the Healthy Choices Suit (extra weight is an estimated equivalent of how much a person would put on if they ate cake/cookie/potato chips every day for a year).
    - One at a time, have kids walk zigzag course as fast as possible (time with stopwatch) and record their times.
    - Suit the kids up one at a time, let them really experience the weight and have them do the zigzag course again (wearing the suit). Did they get a longer time?
    - Debrief: How did it feel to race with the extra weight? Is it worth it?
- Taste Testing/Guess the Food (inside Collins)
    - Make Mystery Food Bags ahead of time by putting a different raw fruit/vegetable in each bag (carrot, broccoli, cauliflower, whole bell pepper, orange, snap pea, apple, etc.)
    - Put a number on each bag.
    - Have the kids number a blank 3X5 card.
    - One bag-at-a-time let the kids stick their hand in WITHOUT LOOKING.
    - Have them write their guesses on the card. Go over the answers after the last bag.
    - Include unique foods for tasting (prunes, soy beans, colored cauliflower, etc.).
- Endurance Corner (do NOT do this by the boys bathroom! Drayson Center president's office is right next door and the exercises can get very loud and disruptive).
    - Do several endurance exercises (wall sits, holding cans out, sit ups, etc.) and see who can do each one the longest. Each winner gets tickets.
- Chili Making (residents can run this station!)
    - Bring the group back into the kitchen area.
    - Have them think of a name for their chili. Write the name on a card and tape it to the chili.
    - One at a time, have the kids choose which vegetable they will put in the pot (do not let them void any cans!)
    - Once they've all had a turn, go through the line again and let them each add some spices and stir it up. *monitor the chili powder!
    - Add cilantro if wanted.

        - Let one person taste-test to see if anything else needs to be added.
    - LEADERS: while these stations are going make sure:
        - the slideshow is done
        - cornbread is picked up at 4:00pm
        - salad and veggies tray and fresh fruits are all prepared
        - tables and tablecloths are put on for Family Night!

**2:30-3:00** Change into swim clothing

**3:00-4:10** Swim (**Med students**)

**4:10-4:35** Change out of swim clothes into dry clothes

- **4:35-4:55** Snack – Frozen grapes and frozen yogurt dollops **(Team 1)**
    - Have **Nutr Student** already have grapes cut/grouped into proper serving sizes, and frozen
    - Have **Nutr Student** get frozen dollops out of freezer
    - Wearing gloves, **Team 1** will put:
        - 1 cup frozen grapes
        - ½ cup frozen yogurt dollops
        - Into bowls, and set out on tables

**4:55-5:00** Daily Quiz and set up for Family Night

**5pm: FAMILY DINNER NIGHT!!!**

**APPENDIX B**

**EXAMPLE DAILY SCHEDULE**


**WEDNESDAY**

- 8:00-8:30 Check in
- 8:30-9:00 Stretching
- 9:00-10:30 Exercise Stations (Jump Ropes, Sit-Ups, Jumping Jacks, Hula Hoops)
- 10:30-10:45 Snack
- 10:45-11:00 Food Records
- 11:00-11:30 Family Feud Nutrition Game
- 11:30-12:00 Food Label Lesson
- 12:00-12:20 Food Label Game
- 12:20-12:50 Lunch
- 12:50-1:00 Break
- 1:00-2:00 Scavenger Hunt
- 2:00-3:45 Field Day (Relay Race, Sack Race, Tug of War)
- 3:45-4:00 Walk back to the gym
- 4:00-4:15 Snack
- 4:15-4:30 Daily Quiz
- 4:30-5pm: Free Time & Check-Out @ Main Entrance of Gym

## APPENDIX C

## PROCEDURE CHANGES ACROSS COHORTS

| **Cohort 1** | **Cohort 2** |
|---|---|
| **Recruitment** | **Recruitment** |
| Phone screen conducted with parent; behavior problems screened with 3 yes/no questions (e.g., "Does your child frequently display aggression towards other children or adults?") | Phone screen conducted with parent; behavior problems screened with questions about specific behaviors ranked on 0-3 scale (e.g., "Aggressive to other children or adults (verbally or physically?" and "Temper tantrums/outbursts") |
| | Pre-treatment assessment to screen for intellectual functioning using the KBIT |
| | |
| **Registration** | **Registration** |
| One date: Sunday before camp | Two dates: Friday and Sunday before camp; specific times assigned |
| | |
| **Monday** | **Monday** |
| Journals and food records | Removed for second cohort |
| | |
| **Tuesday** | **Tuesday** |
| Portion distortion game to show difference between amount typically eaten and actual portion with pinto beans, brown rice, pasta, cereal, and water | Portion distortion game simplified to include only cereal and pasta |
| | |
| **Wednesday** | **Wednesday** |
| Lesson on nutrition labels including calories, fat, protein, carbohydrates, and sodium | Simplified to only fat and calories |
| | Added tomato planting activity |
| | |
| **Thursday** | **Thursday** |
| Fast food activity – examining fast food menus to learn about calories and healthier choices | Removed for second cohort |
| Hike up hill to Nichol Hall and have scavenger hunt and lunch on hill | Hike to Nichol Hall and have scavenger hunt and snack on hill |
| | |