

**PARENTAL INFLUENCES ON CHILD WEIGHT LOSS: PERCEPTION,
WILLINGNESS TO CHANGE, AND BARRIERS**

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Submitted to the Graduate Faculty of
the School of Education in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Exercise Physiology

University of Pittsburgh

2013

UNIVERSITY OF PITTSBURGH
SCHOOL OF EDUCATION

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University of Pittsburgh, 2013

Parents are a primary contributor to the development of obesegenic behavior in youth. However, many parents do not perceive their child's weight to be a problem, are not ready to make changes, and may be overwhelmed by obstacles to behavior change. **PURPOSE:** To examine relationships between parent perception of child weight, parental readiness to change weight control behaviors, and parental barriers to changing weight control behaviors. **METHODS:** Forty-eight parents of overweight ($\leq 85^{\text{th}}$ - 95^{th} percentile) and obese ($\geq 95^{\text{th}}$ percentile) 6-12 year old children were recruited to complete questionnaires on perception of their child's weight, their stage of readiness to change behaviors for their child's weight, barriers to engaging the child in weight control behaviors, and descriptive characteristics. Child height and weight were objectively measured and used to determine BMI percentile for age. **RESULTS:** Seventy-seven percent of parents misclassified their child's weight status and 54.2% perceived their child as normal weight. Parental perception was significantly associated with parent stage of readiness to change ($r=0.358$, $p=0.012$). There was no relationship between parent perception of child weight, and parent stage of readiness to change to the parental barriers to changing behavior. Older parents ($p=0.045$), and married parents ($p=0.025$) were more likely to perceive their child had a weight problem. **CONCLUSIONS:** Increasing a parent's awareness of their child's weight status may benefit progression through the stages of behavior change. Furthermore, older parents and parents who are married may be more conscious of weight related issues in the family.

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	HEALTH CONSEQUENCES OF OBESITY	1
1.2	WEIGHT LOSS INTERVENTIONS.....	2
1.3	PARENT INVOLVEMENT IN YOUTH WEIGHT MANAGEMENT	3
1.3.1	Parent Perception of Child Weight	6
1.3.2	Parents Perceived Barriers to Child Behavior Change.....	7
1.4	CLINICAL JUSTIFICATION	8
1.5	SPECIFIC AIMS	9
2.0	REVIEW OF THE LITERATURE	12
2.1	CHILDHOOD OBESITY PREVALENCE.....	13
2.2	CONSEQUENCES OF OBESITY	14
2.2.1	Psychological Consequences of Childhood Obesity	14
2.2.2	Physiological Consequences of Childhood Obesity	15
2.2.3	Obesity and Cognitive Function	16
2.3	CHILDHOOD OBESITY INTERVENTION STRATEGIES.....	17
2.3.1	Child and Parent Interventions	17
2.3.2	Parent Only Interventions.....	20
2.4	INFLUENCE OF PARENTS AND FAMILY	24

2.4.1	Family Related Obesity Models	24
2.4.2	Justification for Parents as the Primary Focus	25
2.5	PARENTAL PERCEPTION OF CHILD WEIGHT.....	28
2.5.1	Parental Perception, Concern, and Cultural Considerations of Childhood Obesity.....	31
2.5.2	Understanding the Childhood Obesity Perception Disconnect.....	32
2.6	PARENTAL READINESS TO CHANGE	33
2.6.1	The Transtheoretical Model of Behavior Change.....	35
2.7	PARENTAL BARRIERS FOR CHANGING CHILD WEIGHT	38
2.8	INFLUENCE OF PARENTING STYLE ON CHILD WEIGHT	41
2.9	CONCLUSION	44
3.0	METHODS	45
3.1	CHANGES TO METHODS SINCE INITIAL APPROVAL	45
3.2	SUBJECTS	47
3.3	RECRUITMENT AND SCREENING PROCEDURES	48
3.4	STUDY VISIT	49
3.4.1	Child Protocol.....	49
3.4.2	Parent Protocol.....	50
3.5	STATISTICS	57
3.6	POWER ANALYSIS	60
4.0	RESULTS	61
4.1	SUBJECTS	61
4.2	ANALYSIS OF DATA BY SPECIFIC AIM.....	66

4.2.1	Specific Aim 1	66
4.2.2	Specific Aim 2	68
4.2.3	Specific Aim 3	68
4.2.4	Specific Aim 4	68
4.2.5	Specific Aim 5	70
4.2.6	Specific Aim 6	70
4.2.7	Specific Aim 7	73
4.3	EXPLORATORY ANALYSIS	73
4.4	SUMMARY	76
5.0	DISCUSSION	78
5.1	INTRODUCTION.....	78
5.2	PARENTAL PERCEPTION OF CHILD WEIGHT.....	79
5.3	ASSOCIATIONS BETWEEN PARENTAL PERCEPTION, STAGE OF CHANGE AND BARRIERS.....	82
5.3.1	Parental Perception of Child Weight and Parental Stage of Readiness to Change.....	82
5.3.2	Parent Perception of Child Weight and Parental Barriers.....	83
5.3.3	Parental Stage of Readiness to Change and Parental Barriers	84
5.4	CHARACTERISTICS OF PARENTS	85
5.4.1	Parent Characteristics and Parental Perception.....	85
5.4.2	Parent Characteristics and Parent Readiness to Change.....	87
5.4.3	Parent Characteristics and Parental Barriers	88
5.5	PERCEPTION AND CONCERN FOR CHILD WEIGHT.....	91

5.6	LIMITATIONS AND FUTURE DIRECTIONS	93
5.6.1	Study Limitations	93
5.7	CONCLUSION	97
APPENDIX A	.....	99
APPENDIX B	.....	100
APPENDIX C	.....	105
APPENDIX D	.....	107
BIBLIOGRAPHY	.....	124

LIST OF TABLES

Table 1. Behavioral Changes Between Treatment Group	23
Table 2. Transtheoretical Model, Stages of Change	36
Table 3. Study Inclusion and Exclusion Criteria	47
Table 4. Parent Descriptive Characteristics	63
Table 5. Parent Descriptive Characteristics - Physical Activity	65
Table 6. Child Descriptive Statistics.....	65
Table 7. Child Descriptive Statistics.....	65
Table 8. Child – Age Distribution by Gender.....	66
Table 9. Parent Perception of Child Weight	67
Table 10. Parent Perception of Child Weight Grouped by Those who Perceive Child is Overweight.....	67
Table 11. Parent Characteristics and Parent Perception of Child Weight	71
Table 12. Parent Characteristics and Stage of Change	72
Table 13. Parent Characteristics and Barriers to Engaging in Weight Control Behaviors	74
Table 14. Exploratory Analysis - Expressed Concern for Child Weight.....	75
Table 15. Exploratory Analysis – Parent Concern for Future Weight.....	86

LIST OF FIGURES

Figure 1. Theoretical Model Depicting Parental Influence on Children's Weight Control Behaviors	9
Figure 2. Screening and Recruitment Flow Chart	62
Figure 3. Parent Perception of Child Weight and Barriers to Engaging their Child in Weight Control Behaviors	69
Figure 4. Barriers to Engaging their Child in Weight Control Behaviors and Stage of Readiness to Change	69

1.0 INTRODUCTION

Throughout the past 30 years, obesity in the United States has become a major public health concern and societal issue. Specifically, obesity in children and adolescents has come to be a focus of many foundations and prominent public figures. As epidemiological studies have been shedding light on the severity of the obesity problem in the United States, concern about children's weight problems has intensified, leading some to refer to pediatric obesity as a new "epidemic" [1, 2]. Ogden et al. reported that the percentage of children and adolescents who were obese has increased by approximately 23 percent between 1999 and 2004, and the percentage of youth who were overweight has increased more than 19 percent [3]. The financial cost for obesity health care was estimated at \$75 billion in 2003; with approximately one half of this expense being paid by taxpayer dollars through the Medicaid and Medicare programs, \$3 billion of which paid for overweight care of children in Medicaid funds [4, 5].

1.1 HEALTH CONSEQUENCES OF OBESITY

Although the burden of obesity-related morbidity and mortality may not be evident until adulthood, the health risk of obesity is evident during childhood and adolescence [6]. Specifically, the relative risk of an obese child becoming an obese adult is six to seven times greater than that of his/her non-obese peers [7-9]. Additionally, studies have found that

overweight children are at an elevated risk for hypertension, sleep apnea, arthritis, gallstones, and some types of cancer [5, 6, 10]. Furthermore, it is thought that obesity and sedentary lifestyle are the main contributing factors for the development of type 2-diabetes [6, 11, 12]. Significant long-term complications for type 2-diabetes include vascular disease that can lead to cardiovascular disease, strokes, kidney disease and failure, blindness, and other health problems. Furthermore, the hyperinsulinemia associated with type 2-diabetes has been shown as an independent risk factor for heart disease [6].

The impact of obesity on a child's wellbeing expands beyond the physiological into the psychological. Having a high, socially stigmatized condition (such as obesity) also places overweight children at an increased risk for various psychosocial problems such as poor body image, decreased self-esteem, peer victimization, and social isolation [13-16]. These detrimental psychosocial constructs may resonate into adulthood, affecting personal relationships, self-esteem, and professional success.

1.2 WEIGHT LOSS INTERVENTIONS

Reaching and maintaining a healthy weight is difficult and often times not accomplished in children, especially without parental support. Evidence suggests childhood obesity research interventions may produce better long term outcomes than treatment during adulthood [17]. Specifically, two research groups have shown successful long-term weight loss maintenance in children, during follow-up periods of five years [18], and ten years [19-21] in which almost one-third of treated preadolescent children were non-obese after ten years. Although long-term weight loss outcomes in children appear to be better than with adults, there is still a considerable

amount of relapse in treated children and adolescents [21]. A meta-analysis of childhood and adolescent obesity treatment literature found that treatments for childhood and adolescent obesity produce significantly better outcomes than control conditions both at post-test and follow-up, though treatments were found to produce medium-sized treatment effects, with many of the children remaining obese after the intervention, and many regaining weight [22, 23].

One hypothesis for this lack of intervention success may be the disproportionate amount of focus on the youth themselves, rather than the youth's support system, which may contribute to the child's unhealthy behaviors. Youth who are overweight or obese are unlikely to successfully accomplish the intensive diet, physical activity, and behavioral modifications without support from their parents. Unfortunately, not all parents are aware of the severity of their child's weight, and may not be motivated to make behavior changes in the home to support their child's weight loss.

1.3 PARENT INVOLVEMENT IN YOUTH WEIGHT MANAGEMENT

Family-based treatment programs demonstrate considerable success beyond child-only treatments for multiple reasons [19, 24, 25]. For example, if the child must eat differently and do different activities than the rest of the family, the child is likely to feel deprived, scapegoated, or resentful, and the likelihood that changes in obesogenic behavior will be maintained is diminished [26, 27]. Family-based treatment programs avoid the view of the child as "the patient" by treating the family as a whole [9]. Furthermore, Epstein and colleagues [20] reported ten-year follow up data from a behavioral, family-based treatment for obese children, which demonstrated that children who have parental support had greater decreases in percent

overweight after 5 and 10 years than children in a control group, and child-only intervention group. This suggests that, for the intervention to have the greatest success, the parent(s) should be ready and motivated to change their own behavior as well as the child's.

During obesity intervention, direct involvement of a parent can have a significant impact on the success or failure of the weight loss. Experimental research suggests that parent modeling can influence children's eating behaviors [28], and parental reinforcement can alter children's eating [29] and exercise behavior [30, 31]. Harper and Sanders showed that children ate 80% of the time after adults modeled eating [28]. With a proper parent focused intervention, clinicians may be able to alter the behaviors of the parents, which, through modeling, may affect the behaviors of the children. Thus, parent-only approaches to obesity treatment for would put less focus on the child themselves, and target the parent's perceptions, barriers, and beliefs child health behaviors.

The parent's influence on the child's eating and activity behaviors start at a very young age, and can last throughout adolescence, and into adulthood. Preschoolers are largely influenced by, and reliant on, their parents and other caregivers. Consequently, a parents' influence plays a large role in the development of health or obesegenic eating and activity patterns [32]. Even in school aged children, the parents' food preferences, the qualities and variety of foods in the home, the parents' eating behavior, and the parents' physical activity patterns work in concert to establish an emotional, social, and physical environment that may or may not encourage the development of obesity [20, 25, 33-35].

Although some literature attributes the development of obesity in children to genetic factors, it seems that environmental and behavioral factors may have an equivalent or greater role in the development of obesity. Garn [36] found that the relationship between fatness of

foster parents and their adopted children was comparable to that found in biological offspring. For both biological families, and adoptive families, the chance of a child being obese increased in a stepwise fashion from having two thin parents, through two normal weight parents, and on to two overweight parents [36, 37]. Obesity may be common within families because overweight parents provide an environment that is conducive to overeating and low levels of physical activity, selectively reinforce such behaviors, and/or serve as a model for these unhealthy behaviors [37].

Parental weight status has been identified as an independent risk factor for overweight in children [38, 39]. Specifically, parent overweight has been associated with early adiposity rebound after intervention [40], suggesting that addressing parents independent of children could be an important marker for early intervention and prevention efforts [41]. Furthermore, increased parental self-efficacy related to girls' physical activity has been associated with increased participation in physical activity, suggesting parental self-efficacy as another target for intervention [42]. Young adolescents who perceived strong parental support for physical activity, and whose parents engaged in physical activity with them, reported higher levels of physical activity. Parent transportation to physical activity was significantly related to adolescent participation in physical activity outside of school [43]. Lastly, the adolescent's perception of parental encouragement of physical activity was related to time spent in physical activity [44]. These and other potential parental behavior targets may strengthen intervention quality, and help youth improve their success with weight loss.

1.3.1 Parent Perception of Child Weight

Before the overweight child can be enrolled in an obesity treatment program, the child must be identified as having a weight problem. Often times, this is identified by the child's pediatrician, but many physicians are uncomfortable with, and fail to discuss obesity with the parents [45]. The parents themselves should be attentive to their child's weight in order to identify the need for behavior modification. However, several studies have cited an alarming discrepancy between the obvious physical appearance and the parental perception of their child's weight [46-49]. Parry and colleagues [50] published a review on parental perceptions of overweight status in children and determined that more than half of parents cannot recognize when their child is overweight. Furthermore, mothers and fathers seem to perceive their children's weights differently, with fathers more likely classifying girls as overweight than boys [51]. Jeffery et. al[52] found that more than half of the parents of obese children expressed some degree of concern about their child's weight, but only a quarter were even "a little worried" if their child was overweight. Moreover, 86% who were unaware that their child was overweight were also unconcerned about their child's weight. Additional factors for poor awareness might include denial, reluctance to admit a weight problem, or desensitization to excess weight because being overweight has become normal [52]. This underestimation and/or lack of awareness may have a detrimental effect of the parents ability to see the need for, and initiate lifestyle modifications to promote weight loss in their child. If parents do not recognize their child is at risk for overweight, or overweight already, they cannot intervene to diminish the risk factors for pediatric obesity and its related complications [49].

In contrast, if parents perceive that their child's weight is a problem, then they might be more likely to employ lifestyle changes [53]. Unfortunately, there is evidence that parents who

did accurately classify their child as overweight were no more likely to encourage healthy food choices or to encourage more physical activity than parents of overweight children who did not accurately classify their child as overweight [54]. This finding suggests that weight perception may not be the only obstacle to parental behavior change, and that there may be other factors influencing this parent based obesegenic behavior change construct.

1.3.2 Parents Perceived Barriers to Child Behavior Change

In many cases, the parent of an obese child accurately perceives the child's weight to be unhealthy, and, according to the transtheoretical model and stages of change, is ready to change familial health behaviors. Nevertheless, there may still be other barriers that impede healthy changes. Family support for physical activity and parental modeling of physical activity, as well as parents' perceptions of barriers to exercise have been found to be key predictors of physical activity levels in school aged children [27]. A review of qualitative studies published by Pocock [55] identifies many common barriers identified by parents to assisting their child to make lifestyle changes that include the following.

- Lack of time
- Media influences and pressure from child's peers
- Fear that addressing the child's weight may adversely effect the child's self-esteem
- New healthy foods may make the child unhappy and resentful toward parent
- Restricting fast foods or sweets may make parents feel like "spoilsports"
- Inconsistent handling of child's dietary habits by grandparents and other caregivers
- Television used as "babysitter" while parents handle other responsibilities

- Parents are too tired from the day's activities to prepare a healthy meal

Another barrier for parents is the child's own resistance to change. Preferences for certain foods, children disliking new foods, and being "picky eaters" have all been reported by parents as areas of resistance from children. Children's preference for sedentary activities, and fear of peer victimization [13] were seen as a barrier for physical activity, with some parents commenting that it was difficult getting children active when they were resistant [55]. Lerner et. al suggested that children often resist change and express this resistance by rebellion and acting oppositively when subjected to demands for change [56].

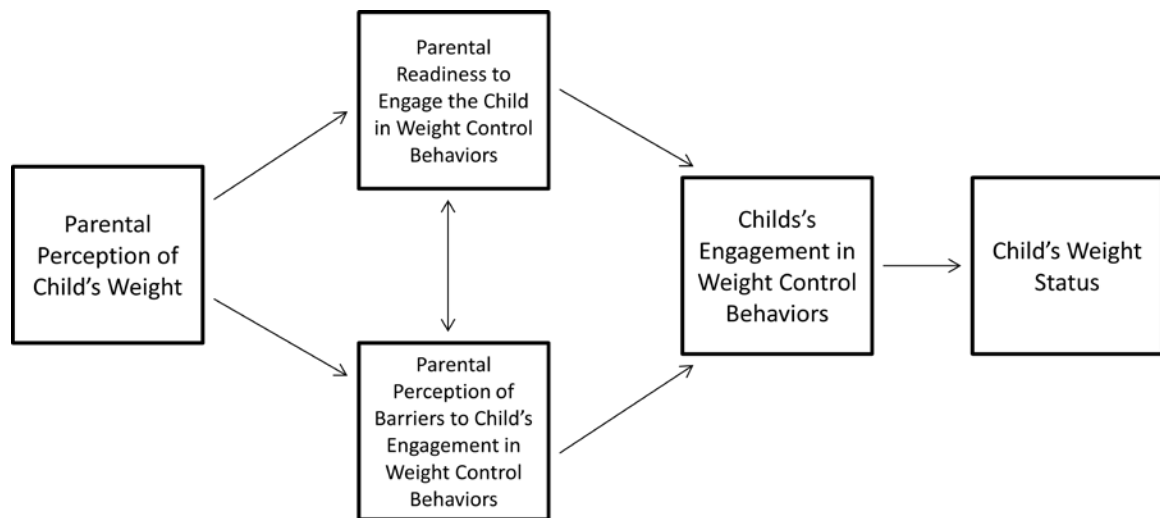
1.4 CLINICAL JUSTIFICATION

Although there have been many parent focused investigations that have analyzed perception of child weight, parent's readiness to change based on the transtheoretical model, and parent's perceived barriers to changing child/family behaviors, few studies have attempted to look at the interrelationships of these parent constructs and their impact on child weight control behaviors.

As shown in figure 1, this study was designed to examine three factors: (1) parental perception of child weight; (2) parental readiness to change the child's weight control behaviors; (3) parental preparedness to overcome barriers to their child's weight control behaviors, and how they may be associated with the child's engagement in weight control behaviors. This study also examined other characteristics of parents who self-identify into various responses related to these constructs. This information may be valuable for further development of obesity prevention and treatment programs for children. Identifying the characteristics of parents who are each level of

this model allow clinicians and researchers develop and modify interventions specifically for parents who are at different levels of the model presented in figure 1. Developing cohorts in a study intervention based upon the parents level in this model may lead to greater weight loss and/or weight maintenance in their child.

Figure 1.Theoretical Model Depicting Parental Influence on Children’s Weight Control Behaviors.



1.5 SPECIFIC AIMS

The specific aims and hypotheses of the study are:

1. To examine the accuracy of parental perception of their child’s weight (overweight, obese).
- It is hypothesized that 60% of parents will misclassify their child as less overweight than actuality.

2. To examine if parental perception of their child's weight is associated with parental readiness to change weight control behaviors for their child.
 - It is hypothesized that parents who accurately perceive their child as overweight will report a greater readiness to change behavior.
3. To examine if parental perception of their child's weight is associated with parental perception of barriers to engaging their child in weight control behaviors.
 - It is hypothesized that parents who accurately perceive their child as overweight will report greater presence of weight control barriers.
4. To examine the association between parental readiness to change weight control behaviors for their child and parental perception of barriers to engaging their child in weight control behaviors.
 - It is hypothesized that parents who report a greater readiness to change behavior will report less presence of weight control barriers.

Secondary aims of this study are:

5. To explore characteristics of parents who do and do not perceive their child's weight accurately.
 - It is hypothesized that parents who perceive their child's weight inaccurately will be more overweight themselves, report a lower socioeconomic status, participate in low amounts of physical activity, report a passive parenting style, and report minority ethnic origin.

6. To examine differences in parental characteristics by stage of readiness to change weight control behaviors of their child.
 - It is hypothesized that parents who report a greater readiness to change behavior will report a greater socioeconomic status, greater amounts of physical activity, authoritarian and authoritative parenting styles, and will be less overweight.
7. To examine parental characteristics associated with barriers to engaging the child in weight control behaviors.
 - It is hypothesized that parents who report less barriers to changing weight control behaviors will report less family members living in the home, greater socioeconomic status, greater amounts of physical activity, will be less overweight, and report authoritative and authoritarian parenting styles.

2.0 REVIEW OF THE LITERATURE

Parental behavior is a key component of effective pediatric obesity treatment [19, 31, 33, 57]. Obesity treatment programs that include the parents are among the most successful for pediatric obesity [51, 58]. Additionally, intervention programming that encourages parents to accept responsibility for implementing changes into their child's eating and exercise habits allow parents to become positive influences on their children's weight loss [33, 51, 53].

Parents serve important health-related roles for their children. These include serving as models of appropriate behavior, as gatekeepers to both opportunities and barriers, and as the major source of reinforcement in most children's lives [34]. Although the influence of parents on children's health behavior is well documented, the question of how to modify that influence to be more health-enhancing has not been adequately studied [34].

The Social-Ecological Model [59], developed based upon the Bronfenbrenner Ecological Systems Theory [60], illustrates how factors such as influences at the parent's individual level, interpersonal factors, community, organizational, and societal levels, influence health behaviors in relation to childhood overweight and obesity. At the individual parent's level, the model describes factors such as: recognizing the child's weight as a problem, parental motivation to prepare healthy foods and encourage exercise, parental beliefs regarding when healthy child diet and exercise habits should begin, and parental perceptions about lack of time for child exercise and health behavior.

The individual parent factors in this model are thought to have the greatest influence on the child's weight, and hold a strong parallel to the constructs in the model presented in figure 1. Although it has been identified that parental support of health promoting behaviors has a positive impact on child overweight and obesity [61], research shows that parents may not; perceive their child to be overweight [46-49], be willing to change behaviors to address the weight problem [48, 53], and even when they do appreciate the impact of obesity on their child's health, may be overwhelmed by what they see as barriers to changing family behaviors and feel confused by the plethora of messages about strategies for addressing the problem [55, 62].

2.1 CHILDHOOD OBESITY PREVALENCE

Ogden and colleagues have estimated that the percentage of children and adolescence who were obese have increased by approximately 23% between 1999 and 2004, and the percentage of children who were overweight increased by more than 19% in the same time frame [3]. Data from the United States Centers of Disease Control have observed a dramatic increase in obesity rates among American adults and children since the early 1970's. In 2006, the CDC detected the largest increase among children between the ages of 6-11 years, where the prevalence of children who were overweight went from 4% to 18.8% - an increase of 370% from 1970 [63]. Similar trends were noted among younger children (178% increase among children ages 2-5 years), and among adolescents (185% increase among youth aged 12-19 years) [63].

The current prevalence figures estimate that approximately 26% of 2-5-year-olds are overweight or obese. Among children ages 6-11-years-old, approximately 37% are overweight or

obese, and among adolescence 12-19-years-old, the combined overweight and obesity rate is estimated to exceed 34% [2, 3, 63].

2.2 CONSEQUENCES OF OBESITY

Although the health burdens of obesity-related morbidity and mortality may not be fully evident until adulthood, the deleterious effects of obesity are more often being diagnosed during childhood and adolescence [6]. Data from the National Hospital Discharge Survey documented health care costs of obesity related services, in youth aged 6-17 years, ranging from \$35 million dollars during 1979-1981 to \$127 million dollars from 1997-1999 [64]. Since 1999, the prevalence of childhood and adolescent obesity has increased, which may project health care costs of obesity related services to be much greater in 2013. Furthermore, childhood and adolescent obesity has a strong and well documented tracking into adulthood [39]. Obesity related metabolic and cardiovascular disease in adulthood has a much greater influence on overall health and well-being than in youth. Additionally, once an adult is obese, it may be more difficult for them to lose excess fat than as a youth.

2.2.1 Psychological Consequences of Childhood Obesity

In youth, having a high socially stigmatized condition such as obesity, places overweight children at an increased risk for various psychosocial problems such as poor body image, poor self-esteem, peer victimization, and social isolation [13]. In a systematic review of the health consequences of childhood obesity, Reilly et al. [65] concluded that “obese children *are* more

likely to experience psychological or psychiatric problems than non-obese children,” and that obese girls were at a greater risk (compared to boys) for psychological morbidity and that the risk increased with age [65]. The risk for developing serious psychosocial burdens related to being obese have also been documented by the Institute of Medicine [66].

Social stigmatization also has a very deleterious effect on the psychological well being of obese youth. Unfortunately, a number of investigations have demonstrated that children are less inclined to look favorably on obese peers [6, 67-71]. These negative perceptions of overweight peers may have origins very early in life with preschool children having negative views of overweight peers [68]. There is even evidence that some adults, including high-school teachers hold negative views of overweight children/students [72].

2.2.2 Physiological Consequences of Childhood Obesity

The negative consequences of obesity do not remain solely psychological; many health-related effects are evident even as a youth. Atherosclerotic changes can be detected in the aorta among children by age 3, with changes noted in the coronary arteries by ages 8-13 years [73]. Strong evidence for this advanced cardiac aging in children and adolescence, along with adults, comes from the Bogalusa Heart Study. The Bogalusa Heart Study was a long terms study of cardiovascular risk factors from birth through 38 years of age in Louisiana. Cardiovascular information were obtained from autopsy results for 204 deaths among young people. Results concluded that the extent of atherosclerotic lesions, hypertension, and dislipidemia correlated positively and significantly with BMI [74]. Additionally, the Minneapolis Children’s Blood Pressure Study [75] found that initial childhood BMI and increases in BMI during childhood were significantly related to systolic blood pressure in young adulthood. As with blood pressure,

dislipidemia is worsened when a youth is overweight [6]. Changes in blood lipid profiles throughout childhood raises concerns about cardiovascular health in both pediatrics and subsequently adulthood. Thankfully, the damaging hypertension and dislipidemia can be reversed with proper diet, exercise and weight loss [76, 77].

Although early onset cardiovascular disease risk can have serious impacts on future morbidity and mortality, perhaps the most damaging health impact if obesity is an increase in insulin resistance and type 2-diabetes. Type 2-diabetes mellitus is more commonly being diagnosed in childhood and adolescence, with type 2-diabetes becoming or already the most common form of diabetes among children or adolescents [6]. Although the exact mechanism of insulin resistance is unknown, it is thought that obesity, along with other diabetes risk factors such as lack of exercise, leads to insensitivity to insulin [11, 12]. Long-term complications of type 2-diabetes include vascular disease that can lead to heart attacks, strokes, kidney disease and failure, blindness, and other health problems [6]. It has been estimated that men diagnosed with type 2-diabetes at age 40 will lose 11.6 years of life and 18.6 quality-adjusted life years [78]. Women who are diagnosed with type 2-diabetes at the same age will lose 14.3 life years and 22 quality-adjusted life years [78]. With this disease now being diagnosed in childhood and adolescence, one can only postulate that the number of overall life years lost would be significant.

2.2.3 Obesity and Cognitive Function

Furthermore, evidence suggests obesity is related to the loss in cognitive function in adults [79], and recent research suggests that pediatric obesity may also set the stage for cognitive impairment and challenges executive function [80]. Executive function refers to self-

regulation and decision-making skills that depend in part upon a constellation of neuro-cognitive processes responsible for goal-directed behavior [81]. Riggs and colleagues found that children (9-11 years old) who had high sedentary behaviors, and reported high levels of high-fat and high-sugar snacks had greater problems with executive function than children who were active and ate healthy. Also, meta-analyses have determined there is a positive relation between physical activity and cognitive performance in school-aged children in seven measurement categories: perceptual skills, intelligence quotient, achievement, verbal tests, mathematics tests, memory, and developmental level/academic readiness [82, 83], with children having higher BMI's demonstrating lower academic achievement [84].

2.3 CHILDHOOD OBESITY INTERVENTION STRATEGIES

There are behavior-based treatments for childhood obesity that shows beneficial results. The most successful intervention strategies include parents as key a component of the behavior change.

2.3.1 Child and Parent Interventions

Family-based weight control, that targets the parent and child, may enhance treatment effectiveness compared with interventions where the parents are not involved [20, 31], and may also provide benefits for parental obesity resulting in improved cost-effectiveness of treatment compared to treating the child and parent separately [31]. Ultimately, treatments that target *only* the parent are associated with better childhood weight control than those treatments that target

only the child, which highlights the potential contributions of modifying parental behavior to treat problems that are shared within families [20, 31, 33]. Johnson and Katz examined parents as change agents for their children's behavioral disorders, and described the advantages as that the parents constitute an inexpensive, continuous treatment resource which is able to augment existing therapeutic manpower capabilities and work conveniently within the home [85]. This interventionist/parent team approach to child therapy should facilitate the generalization of treatment effects and enable parents to handle new problems better when and if they arise [85].

Epstein and Wing [86] found that overweight children with two non-overweight or obese parents showed almost twice the decrease in relative weight over a 1-year treatment period than children with one or two obese parents (-16.3% vs. -7.7%), suggesting more investigations on the influences of family variables including family size, family weight composition, and parental weight on child weight loss are needed [87]. There is a particular need for family focused obesity research in the newer "non-traditional" family dynamics found in society today [57, 87].

Most programs explicitly acknowledge that the treatment of childhood obesity requires changes in the parent's weight-related behaviors as well as the child's. The parent's weight-related behavior may influence the child's success by creating environments, which are more or less facilitative, by modeling, or by direct parental behavior influence. [25]. Some interventions incorporated the parents themselves in a weight loss program of his or her own that parallels that of the child [23, 25, 86, 88, 89]; or the parent changes his or her own behavior in ways that directly assist the child (without targeting parental weight loss)[23, 25]. Both approaches have shown similar, moderately successful results. It seems additional intervention strategies are needed to improve long-term outcomes, and possibly different parental roles may emerge.

Perry and colleagues in the Minnesota Home Team study compared the efficacy of a school-based (child only) program to an equivalent home-based program (with parent involvement) on 2,250 third graders on changes in dietary fat and sodium consumption [34]. The school-based program involved 15 sessions over 5 weeks in their classrooms. The home-based program involved a 5-week correspondence course, with parental involvement was necessary in order to complete the activities. Students in the school-based program had gained more knowledge at posttest than students in the home-based program or controls. However, students in the home based program reported more behavior change, had reduced the total fat, saturated fat, and monosaturated fat in their diets, and had more of the encouraged foods on their food shelves. The results of the study suggest that the parental involvement enhances outcomes of eating patterns in interventions with young children [34].

Epstein, Wing and colleagues investigated child weight loss in a family-based behavior modification program [90]. Overweight preadolescents and parents from 76 families were assigned to one of three behavioral treatment groups: parent and child target, child only target, or non-specific target. Results indicated that percent overweight changes at the end of the 8-month treatment and 21-month follow-up were equivalent for children in the three treatment groups. Though there were no significant differences between groups initially, children in the child and parent group showed significantly greater decreases in percent overweight after 5 and 10 years (-11.2% and -7.5% respectively) than children in the nonspecific control group [19, 20], which supports the notion that children and parents treated together will produce more beneficial outcomes than children treated alone. Another interesting observation was that at the 10-year follow-up, there was no correlation with parental weight loss and child weight loss in the child and parent group. The authors proposed that parental behavior and parent involvement with

obesity intervention may be important during the acquisition of skills, but failure of parents to maintain eating and exercise changes do not adversely influence child behavior if new controlling variables such as peer influences and attraction to the opposite sex, are operative (often associated with older youth/adolescents) [20]. Brownell and colleagues suggest that parent involvement has the strongest influence on obesity treatment effectiveness for children 10 years of age and under [91], while Golan and colleagues suggest parent involvement is most important for children under the age of 13 [33, 92, 93].

With parental/familial behaviors having such a strong influence on obesogenic behavior in children and the rising cost of health care, it is possible that an intervention that targets the parent only for childhood obesity is the optimum strategy. This may be especially true in younger preadolescent children, common strategies used in obesity interventions such as self-monitoring and planning physical activity may be too difficult and unrealistic for a younger child. Parent-only focused interventions may be the most beneficial and cost effective strategy for this population.

2.3.2 Parent Only Interventions

The current knowledge regarding the obesogenic factors in a child's environment and the key role that parental behaviors play in the child's exposure to factors that foster energy imbalance suggest that suitable interventions should address parental knowledge and practices [94]. Parents begin to teach their children about appropriate eating (what, when, how much, rituals of eating, etc) when the child starts to consume adult food [95, 96]. Parents influence their children's eating patterns not only through foods that they make available, but also through their child-feeding strategies (instructing the child on what to eat, how much, finish the plate, etc),

which are intended to ensure adequate, well balanced food intake, but can be coercive and controlling by the use of bribes, threats and food rewards [23]. Parents influence children in a similar manner with physical activity. Parents who encourage and model physical activities have children who are more likely to adopt an active lifestyle [97]. With these obvious relationships between parental teaching and child behavior, focusing on the parents exclusively may be the most beneficial strategy for childhood obesity intervention.

Studies that intervene with the parents but do not simultaneously treat the children have clearly shown that when treatment is able to change parental behavior toward children in specific ways, the behavior of the children changes correspondingly [85, 94, 98, 99]. Additionally, developing an intervention that targets parents only also has a number of advantages over parents and children together. The first possible benefit is that parents may be forced to take greater responsibility for learning and explaining strategies to adopt healthier lifestyle habits, as well as implementing those changes in the family environment [100, 101]. Secondly, attending weight management interventions may be stigmatizing for some children, thereby diminishing their motivation for active participation and increasing their resistance to healthy lifestyle changes [101, 102]. Third, parent-only sessions may be easier for parents to attend and provide some cost-benefit of less individual interaction, need for supplies, and personnel [100, 101, 103, 104]. Lastly, parent-only interventions may allow parents more time for problem solving, receive support from other parents, and perceive the group time as “break from the family” [101].

Golan compared the efficacy of a family-based approach for the treatment of childhood obesity in which parents served as the exclusive agents of change, with a conventional approach where the children serve as the primary change agents [33]. In this one-year, longitudinal prospective study, sixty 6-11 year old obese children were randomized into the parent only

(experimental group) or child only (control group) intervention groups. One-hour long support/educational sessions were conducted by a clinical dietitian (14 sessions for the parent group, and 30 for the child group). At the end of the intervention, 79% of the children in the experimental group lost >10% of their excess weight and 35% reached non-obese status. Whereas in the control group, only 38% lost >10% of their excess weight and 14% reached non-obese status.

Weight reduction in children of the control group in the first 3-months of the program was similar to that of the children in the experimental group. Thereafter, however, weight reduction was greater in the children of the experimental group than in the children of the control group: 14.6% and 8.1% at the end of the study [33]. Golan states that the treatment of childhood obesity with a family-based approach in which the parents are the sole agents of change has several advantages over the conventional approach in which children are the agents of change: a lower dropout rate, increased weight loss, and better maintenance of weight loss in the children; potential weight loss in the parents; cost effectiveness; and possible avoidance of some of the adverse effects of dieting [33].

Golan also examined the reduction in overweight and changes in eating-related behaviors in obese children treated with a family-based approach, in which the parents were the exclusive agents of change using the same cohort of subjects and design as described for the previous study [9]. Weight loss, behavior changes and energy intake results are displayed in table 1. The author's results support the argument that parents play an important role in the weight status of their children, intervention for obesity should be family-based and focus on modifying eating habits rather than on dietary restriction. Authors suggest that the responsibility for behavioral change in the obese young child should lie exclusively with the parent, and this approach

induced a greater reduction in energy intake, improved eating habits in the home, reduced temptations in the home, and resulted in more weight loss than when the children were given the responsibility for changing alone [9].

Seven years after the conclusion of the intervention, Golan re-contacted the same subjects to report the long-term change in children's overweight following family-based intervention described above [102]. Fifty of the original sixty children who participated in the original study underwent assessment of weight and height. Although both treatment conditions demonstrated substantial weight loss, the mean reduction in overweight was 29% in children in the parent-only group, and 20.2% in those who participated in the child-only group. At this follow-up period, 60% of the youth in the parent-only group maintained non-obese status, while only 31% of the youth in the child-only group maintained non-obese status.

Table 1. Behavioral Changes Between Treatment Group

* = Significant difference between groups

	Weight Loss	Behavioral Changes					Energy Intake
		Activity	Television	Stimulus exposure	Eating - Hunger	Eating Style	
Parent Only	-14.6% *	+0.77 hr/week	-0.38 hr/day	Reduction in all 4 *	33% ate *	Reduction in all 4 *	-25% RDA *
Child Only	-8.4%	+0.1 hr/week	-0.11 hr/day	Reduction in only 1	61% ate	Reduction in only 1	-11% RDA

-hr/week - refers to hours per week spent in activity

-hr/day - refers to hours per day spent watching television

-stimulus exposure - refers to exposure to four categories including: snacks, sweets, cakes, and ice cream

-eating – hunger - refers to still ate without feeling hungry at family meal times

-eating style - refers to four categories of eating style. Eating while standing, between meals, with another action, and following stress

-energy intake – refers to caloric intake below the recommended daily allowance (RDA)

In 2006, Golan compared the differences between targeting parents exclusively, or parents and children together [100]. Thirty-two families with obese children (aged 6-11 years)

were randomized into groups, in which participants were provided an educational and behavioral program for 6-months. In both groups, parents were encouraged to foster authoritative parenting styles (parenting styles described section 2.8). At the end of the intervention, children in the parent-only group lost significantly more weight than the parent-child group. Two children reached non-obese status at termination from the parents-only group, and only one child from the parent-child group. Furthermore, a statistically significant difference between the groups was found only in respect to the exposure of children to the presence of food stimulus at home ($p=0.03$). The parent-only group reported less use of snacks, sweets, and ice cream. A 22% reduction in the overall obesegenic habits in the house was found after the intervention in the parents-only group, while only a 15% reduction was found in the parent-child group ($p=0.02$).

2.4 INFLUENCE OF PARENTS AND FAMILY

Researchers have developed several models similar to the one presented in figure 1 to address the relationship between parental behaviors and child weight.

2.4.1 Family Related Obesity Models

Constanzo and Woody [105] introduced the concept of domain-specific parenting, arguing that parenting is tailored to the child, based not only on phenotypic differences among children, but also parental concerns and perceptions of the child's risk for developing a problem in that particular domain of development. Using obesity proneness to illustrate their model, the authors reviewed research showing that parents modulate their child-feeding practices depending

on the child's current weight status, parental investment in weight and appearance, and parents' perceptions of child's risk for overweight [105, 106]. Cases in which parents were highly invested in weight-related issues, and perceived their child to be at risk for overweight, they controlled and regulated their child's food intake and activity in an attempt to alleviate the obesity proneness. However, parents' attempts at food control limited opportunities for the child to develop self-control, thereby promoting the overweight status that the parent is trying to avoid. The Costanzo and Woody model [105], depicting familial factors hypothesized to promote familial patterns of adiposity and childhood obesity related weight gain, does address the direct genetic link between parent and child weight status, with the main focus on a set of mediating behavioral patterns within the family that promote childhood overweight. Costanzo and Woody's model [105] illustrates how parents' weight status is linked to parents' own eating patterns and their child-feeding practices, which, in turn, influence children's eating behaviors and, thus, children's weight status. Specifically, parent eating styles (such as parents' food preferences), the foods parents consume and make available to their children, and parents' restrained/disinhibited eating, influence and are influenced by parents' weight status. In turn, parent eating behaviors shape children's eating behaviors directly as a result of social modeling and by the choice of foods that are available to children, and indirectly by their association with parents' child-feeding practices. Child-feeding practices, such as restricting children's access to food and pressuring children to eat certain foods are driven largely by parents' own eating behaviors, children's current weight status, and parents' concern about future risk for overweight among their children, as discussed by the authors. Finally, parent eating styles and child-feeding practices shape children's eating behaviors, such as children's food preferences and food-selection patterns; in

turn, children's eating patterns influence, and are influenced by, children's weight status [105, 106].

Costanzo and Woody's model is limited because it only addresses parent and child interactions and is focused only on the energy intake component of energy balance. The model's focus on parenting does not imply that these are the only aspects of the family environment that may promote family resemblances in overweight, but illustrates that efforts to delineate environmental variables and behavioral mediators can enhance understanding of the modifiable factors involved in the development of childhood overweight and to point to areas where additional research is needed [105, 106]

Dietz and Gortmaker [97], introduced a model developed for family-based approaches to prevent obesity. This model is based on what is known, or can logically be assumed, regarding potentially modifiable family factors that affect food intake and physical activity patterns that may promote obesity development. Age and gender, ethnicity, social norms, socioeconomic class, and family composition, as well as parents' knowledge, attitudes and beliefs, and children's knowledge, attitude and beliefs are characteristics that affect both food intake and physical activity. The model displays family related energy intake, and energy expenditure behaviors associated with obesity.

This model [97] demonstrates family practices related to food consumption can affect child food choice, food preparation, and food consumption. Fortunately, family practices and proximal decision-making points (such as parental knowledge, attitudes, or beliefs) can potentially be modifiable through intervention. The model also presents the behavior patterns associated with physical activity and sedentary behavior. Television and videogame time, as well as avoidance of typical daily physical activities (being driven to school rather than walking, etc)

are modifiable behaviors that could encourage weight loss in children. Efforts to change parents' knowledge, attitudes, beliefs, and practices with regard to feeding children and regulating the time spend watching television would theoretically affect both energy intake and expenditure, and therefore represent logical targets for prevention [97].

2.4.2 Justification for Parents as the Primary Focus

As been previously stated, home environmental influences and parents play large role in the development of their children's food intake and physical-activity-related behaviors. Because parents serve as models for their children's eating behaviors, it is important that they are educated on what constitutes healthy eating patterns [107-109]. Additionally, the educational level of parents has been associated with their own eating and activity behaviors, which are in turn related to their children's eating and activity behaviors, such that parents with a lower occupational status consume fewer fruits and vegetables, more soft drinks and are less active than parents with a higher occupational status [108]. This justifies a need for parents to be educated, through interventions in their homes or their children's schools, about appropriate food choices, portions, and behaviors to teach and model for themselves and their children [32, 110, 111].

With parent-only interventions resulting in significantly greater weight reduction for obese children[23, 33, 100, 102], and the great influence of parental behaviors on energy intake and physical activity, it is possible that future childhood obesity interventions should address the parent's habits primarily. Changing parents' habits will in turn change the obesogenic environment of the home, thus changing the children's behaviors and promoting a beneficial change to the energy balance equation.

2.5 PARENTAL PERCEPTION OF CHILD WEIGHT

Previous findings have demonstrated that parents often times do not perceive their child's weight accurately. Most parents underestimate how overweight their child is compared to a normal weight child. Several studies have cited the dramatic discrepancy that exists between the obvious physical appearance and the parental perception of their child's weight [46-49] and how this lack of perception can be associated with a lack of perceived importance for weight change in obese children. The following review of (mostly quantitative) literature regarding parental perceptions of child weight is not comprehensive, but the studies chosen for review were strong in design and have application to this investigation.

Parkinson, Jones, and colleagues [112, 113] aimed to quantify how overweight children have to be for their mothers to classify them as overweight, and to express concern about future overweight. A sample of 531 children (6-8 years old) and their mothers from the Gateshead Millennium Study were recruited. Mothers were asked to respond to two questionnaires concerning the child's adiposity, height, weight, parents' education level, and economic status. The child's height, weight, waist circumference, skinfold thickness, bioelectrical impedance, and bone frame was also measured. Mothers classified 492 (93%) of children in the 'not overweight' category, and 39 (7%) in the 'overweight' category. The results of this investigation found that, overall, parents underestimated how overweight their child was. Those who were normal weight were perceived as underweight, and those who were overweight were perceived to be normal weight [113]. A BMI of 21.3 is the point at which 50% of mothers classify their child as overweight (21.3 corresponds to the 99th percentile for both males and females on the UK 1990 growth reference, well above the obesity marker for these children). A child's BMI of 17.1 was the threshold at which half of the parents were concerned that their child will become

underweight. Waist circumference and skinfolds had the greatest association to mother's responses (the most visible manifestation of fat abundance) opposed to BMI and fat scores. Mothers with higher BMIs were less likely to classify their child as overweight, but were more likely to be concerned about future overweight. This was one of the first investigations to quantify mothers' thresholds for attributing overweight to their children, and the extent to which they differ from standard BMI-based thresholds [112].

Rudolph and colleagues [114] investigated differences in weight perception and self-concept of obese and lean children, and examined parents' awareness of overweight in themselves and their children. Fifty-nine obese 7-17 year olds and 49 of their parents were recruited for this case-control designed study from a pediatric obesity outpatient clinic. The obese subjects were compared to 96 normal weight patients and 81 of their parents. Children's and parent's self-perception of weight, desire for weight change and weight concerns, children's belief that their desired weight can be achieved, and parents' perception of their child's weight were assessed using single questionnaire items. Obese children were found to have a greater desire to change their weight, had more concerns about their weight, and had a significantly more negative self-concept. Parents of obese children were found to be more frequently overweight or obese themselves. Thirty-five of the 49 (71%) parents of obese children, and 73 of the 81 (90%) parents of normal weight children perceived their own weight realistically. Of the parents with overweight children, only 69.4% perceived their child to be overweight, and 28.6% as very overweight, where as 83% were actually obese. Parents underestimated the degree of their child's obesity, though overweight parents reported greater weight concerns for their child [114]. A weakness of Rudolph's investigation is the recruitment of overweight/obese youth from a pediatric obesity outpatient care clinic. These children and families are more sensitized to

weight-related issues, have a greater perception of overweight due to participation in the outpatient clinic, and are more aware of the health concerns associated with obesity. A strength of this investigation is the avoidance of a convenience cohort from an already established obesity clinic. Recruitment from the general population avoided any possible bias the children or parents may have toward obesity perception.

A similar study by Jeffery and Voss [52] explored parental awareness of overweight and obesity in themselves and their children, and their degree of concern about weight. A cohort of 277 randomly recruited, healthy children (mean age 7.4 years old) and parents were recruited. For this investigation, overweight and obesity were defined as body mass index of at least 25 and 30 respectively in adults, and at least 91st and 98th percentiles respectively in children. Among overweight parents, 40% of mothers and 45% of fathers judged their own weight as “about right” and 27% of mothers and 61% of fathers were not concerned about their weight. Only 25% of parents recognized overweight in their child. Even when the child was considered obese, 33% of mothers and 57% of fathers saw their child’s weight as “about right.” Parents were less likely to identify overweight in sons than overweight in daughters. Another interesting observation is that maternal weight status did not significantly affects the mother’s perception of their child’s weight, but paternal weight status had a significant impact on the father’s perception of their child’s weight. More than half of the parents of obese children expressed some concern about their child’s weight, but only 25% were even “a little worried” if their child was overweight. Approximately 86% of the parents who did not accurately perceive their child to be overweight were also unconcerned with their child’s weight [52].

Baughcum and colleagues found that 79% of mother of overweight children (23-60 months) did not perceive their child as overweight [115]. A study by Jackson in 1990, reported

that 16 of 17 mothers of overweight children (35-70 months) rated them as ‘average weight’ [116]. In 2005, Adams and colleagues supported that only 15.1% of overweight children (4.5-8.5 years old) were recognized as overweight by their caregivers [117]. Lastly, in 2000, Young-Hyman found that, although parents of obese and superobese children described their child as ‘overweight’ or ‘very overweight,’ only 46% of these parents described their children as ‘very overweight’ [118].

Various other investigations have found similar conclusions to the studies mentioned above.

2.5.1 Parental Perception, Concern, and Cultural Considerations of Childhood Obesity

Genovesi and colleagues found that 57% of mothers who perceived their overweight or obese child accurately were not concerned about the problem [119]. Approximately 70% of a sample of children (5-10 years old) studied by Young-Hymann and colleagues were obese; however, only 44% of the caregivers perceived their child’s weight as a future health risk [118]. Carnell found that 62.5% of the parents of overweight children, 75.6% of the parents of obese children, and approximately 40% of the parents of normal-weight children were worried about child overweight as a future health problem. If the parent was overweight or obese themselves, the odds of being concerned about their child being overweight in the future was higher [120]. A survey of caregivers by Adams regarding the risks of diabetes, heart disease, and overweight found that most caregivers did not associate increased weight in childhood with increased risk of diabetes or heart disease [117].

A study by Myers and Vargas [121] was reviewed that surveyed 200 parents of 2-5 year old children who participate in a Women, Infants, and Children (WIC) community program.

Approximately 95% of participants were Hispanic and the other 5% were Caucasian, African American, or Asian. Forty-three percent were overweight, but only 7% of parents accurately recognized their child as overweight; the other 36% did not. The researchers believed that the cultural acceptance of larger body size contributed to failure to recognize their child's current body status as a potential health problem [118, 121]. One explanation given by the research team for underestimating overweight children was the culturally held value that heavier children were 'cuter and healthier' [117]. Furthermore, for these minority populations who have higher obesity prevalence throughout the community, it can be hypothesized that misperceptions regarding weight status will increase as populations get fatter [50]. A presumption exists that "what is common is alright," and therefore heavier weights may become more culturally acceptable [50, 122]. Studies have found that lower parental education and lower household income were significantly correlated with misclassification of perceived child weight [49], and parents did not favor 'official' methods of identifying overweight and believed they were irrelevant for their child, and the child's weight is something they will 'grow out of' describing it as 'baby weight' [113].

2.5.2 Understanding the Childhood Obesity Perception Disconnect

Data from qualitative studies, mostly through parent discussions in focus groups, reported that parents had a limited understanding of how childhood overweight is actually defined and their comprehension of the measures, which guide the clinical and scientific community, was vague [113]. Parents, therefore, reported using a range of alternative approaches to objective measures when determining overweight in children, which relied on extreme and exceptional cases as a reference point [113]. These media driven extremes appear to have skewed the parents

perception of what overweight is, and may promote misclassification of their own children. Additionally, culturally based misrepresentations about proper child weight status means reliance on parents to seek weight-reduction interventions is likely to be increasingly ineffective.

Several review studies investigating parental perceptions of their child's overweight have found similar results to the studies mentioned previously. Parents of overweight children underestimate their child's weight status or are mostly not concerned about the risks associated with being overweight [49-52].

The parent's perception of their child's weight status is designated into the first level of the model presented in Figure 1 which hypothesized that the accuracy of the parent's perception of their child's weight has an association with the parent's readiness to change behavior, and the parent's perceived barriers to adopting a weight conscious lifestyle. Once the parent is made aware that their child is overweight/obese through intervention techniques (motivational interviewing as an example) may show greater readiness to change health behavior.

2.6 PARENTAL READINESS TO CHANGE

Measuring the parent's readiness to change behavior has only recently been investigated as a predictor of childhood obesity treatment effectiveness, although it has always been associated with successful treatment. The concept of 'readiness to change' was first described by Prochaska and colleagues in the transtheoretical model of behavior change (described in section 2.8.1) [53, 123]. When all members of the family are motivated to make changes to the family's eating and exercise habits, the treatment program is more likely to be successful [27, 124]. Conversely, if parents, siblings, or other family members do not make changes with the family,

they may undermine the effectiveness of the treatment program [26, 27]. Unfortunately, more often than not, the parents of obese children are uncooperative in changing their own behaviors, with some parents (mainly obese parents) stating that their personal freedom was being threatened [102]. Johnson and Katz described the lack of parental readiness and motivation to change behavior in a review examining the use of parents as change agents for children who have various psychological disorders. The authors note that even in cases where children have severely disruptive behaviors, parents' need extrinsic reinforcers such as fee reductions, individual consultation, group praise, experimenter praise, and monetary rewards in order to insure active parent participation in at home treatment [85].

Rhee [53] performed original data collection describing demographic factors and parental perceptions associated with parents' readiness to make weight-reducing lifestyle changes for their overweight and at-risk-for-overweight children. Rhee and colleagues recruited 151 parents of children who were 2 and 12 years of age and had BMIs $\geq 85^{\text{th}}$ percentile for age and gender. Parents completed a 43-item self-administered questionnaire measuring current parental practices and future intentions, which was entered into an algorithm. Rhee's algorithm was the first of its kind to place parents into one of the five stages of the transtheoretical model of behavior change based upon their readiness to change behavior for their child's weight loss. Parents in the preparation/action stage were considered to be ready to make behavior changes to help their child lose weight [53].

Results indicate that of the 151 parents, 58 (38%) were in the preparation/action stage of change, 26 (17%) were in the contemplation stage, and 67 (44%) were in the precontemplation stage. Factors associated with being in the preparation/action stage of change were having overweight or older (>8 years) children, believing that their own weight or child's weight was

above average, and perceiving that their child's weight was a health problem. After controlling for multiple factors, such as having an older child, believing that they themselves were overweight, parents who perceive that their child's weight was a health problem were 16 times more likely to be in the preparation/action stage than parents who did not believe their child's weight was a health problem. Also, when parents reported that the child's physician made a comment about their weight, the odds that the parent would be ready to make a change increased to 10.8. Furthermore, the results showed that the parent's age, and marital status were both predictors of being in the preparation or action stages, which is consistent with the hypothesis of this investigation. The parent's educational level had no influence on stage of change placement.

Further studies are needed to explore ways to enhance parent compliance and partnership in implementing the changes needed in the home for successful child weight loss [102]. This investigation was unique, as it provided more information on the influence of parental perceptions and characteristics of parents who fit into different stages of the readiness to change (transtheoretical model).

2.6.1 The Transtheoretical Model of Behavior Change

Stages of Change

In the past, behavior change often was constructed as a discrete event, such as quitting smoking, drinking, or overeating [125]. The transtheoretical model posits change as a process that unfolds over time, with progress through a series of six stages. The stages of change are the central organizing construct of the transtheoretical model, representing the temporal and readiness dimension. As people make a behavior change, they progress through a series of stages described in table 2.

The transtheoretical model and stages of change construct are arguably the most used behavioral change models in obesity/weight management research. Information acquired from transtheoretical model and stages of change measurement tools can be extremely valuable with developing obesity interventions. The transtheoretical model offers theoretical framework to guide the design, content, implementation, and evaluation of population-based interventions for exercise and physical activity [126, 127]. The first step in developing an intervention is to assess the participant's stage of change, which is an indicator of readiness to change health related behavior.

The stage determines the content of the intervention material and the timing of their delivery [126]. In addition, the stages can be used as both a primary outcome variable to evaluate the impact of the intervention (i.e. assessing the proportion of the sample that reached the 'action' stage, and an indication of whether the intervention increased ones readiness to change) [126].

In this investigation, the transtheoretical model and stages of change are used as the primary measure of parental readiness to change behavior for child weight loss.

Table 2.Transtheoretical Model, Stages of Change

<i>Construct - Stages of Change</i>	<i>Description</i>
Precontemplation	No intention to take action within the next 6 months
Contemplation	Intends to take action within the next 6 months
Preparation	Intends to take action within the next 30 days and has taken some behavioral steps in this direction
Action	Changed overt behavior for less than 6 months
Maintenance	Changed overt behavior for more than 6 months
Termination	No temptation to relapse and 100% confidence

The Use of the Transtheoretical Model in Obesity Research

Since the development of the theory, many different transtheoretical model/stages of change measurements have been developed and validated for obese individuals with the aim of changing obesogenic behaviors. A few of the more notable measurement tools have been selected for review.

Sarkin, Johnson, and Prochaska [126] developed a study to assess the concurrent and construct validity of a stage of change measure that assesses regular moderate exercise in an overweight population for the purposes of health weight management. A sample of 670 healthy, overweight/obese adults completed a 16 page questionnaire of demographic variables and transtheoretical model constructs; including stages of change, decisional balance, situational confidence or temptation, process of change, and behavioral indicators for four different health related behaviors (regular moderate exercise, calorie reduction, dietary fat reduction, and emotional distress management).

Two aspects of concurrent validity were examined: 1) assessing whether those in the ‘action’ and ‘maintenance’ reported greater amounts of exercise than those in the ‘precontemplation,’ ‘contemplation,’ and ‘preparation’ stages; and 2) examining whether the frequency, intensity, and duration criteria were met only by those in the ‘action’ and ‘maintenance’ stages. Construct validity of the staging algorithm was demonstrated using measures that capture the constructs of decisional balance and self-efficacy for regular moderate exercise. The results indicated that the measure demonstrated good concurrent and construct validity for the stages of change, and the pattern found across the stages of change were consistent with the theoretical predictions of the transtheoretical model and replicated the patterns observed in previous studies [126].

Jakubowski and Rofey [128] investigated readiness to change in adolescents and parents of girl with polycystic ovary syndrome. The authors found that, although the adolescent's change in total stage of change was not predictive of change in BMI, the parent's change in total stage of change from baseline to treatment completion was predictive of adolescent change in BMI [128].

This was one of the few studies to investigate parenting beliefs and the transtheoretical model of behavior change. This investigation also assessed parent's thoughts and beliefs on their child's weight management, which will provide clinicians with vital information on factors that improve readiness for behavior change.

2.7 PARENTAL BARRIERS FOR CHANGING CHILD WEIGHT

Reciprocally reinforcing relationships between family members is important for acquiring and maintaining new behaviors, and that the family provides an ideal environment in which parents and children can mutually reinforce healthier behaviors among all family members [31, 129]. Changing the weight of the family members may influence child weight through the modification of shared family environment [31]. However, changing the entire family's habits may be a daunting task for parents, and there may be many potential barriers for new behavior adoption. Lerner [56] suggest that children often resist change and express this resistance by rebellion and acting appositively when subjected to demands for change, especially when the change is initiated by the parents. Thus, parents may perceive barriers and resistance to change as a significant factor that could prevent adoption of healthy behaviors.

Several studies have investigated parents' perceived barriers to changing family/child health behaviors. Slater and colleagues [130] examined parents' concerns and attitudes towards

children's diets, activity habits, and weight statuses. The authors randomly selected 1202 parents of children aged 2-16 years old, which was broadly representative of the Australian population. Approximately 14% of the parents reported concern about their children's nutrition, and 3% reported concern about their child's fitness/exercise habits. However, 89% of parents reported child resistance as the most significant factor in making a healthy diet difficult to achieve. Furthermore, parents also reported availability of healthy foods (72%), busy lifestyle (67%), and influence of food advertising (63%) as barriers for the adoption of healthy behaviors. Ninety-two percent of parents thought it was realistic for their child to be active for at least 1 hour per day, with 75% of parents feeling that it was realistic for their child to have less than 2 hours per day of recreational screen time. Despite this, parents reported common barriers toward physical activity as lack of time, weather, and keeping the child occupied during activity times.

Pocock and colleagues [55] reviewed qualitative research concerning parental perceptions regarding behaviors for preventing overweight and obesity in young children. Common themes regarding parental barriers to healthy eating and physical activity were similar to those in the previously described study. The authors described a child's preference for certain foods, disliking new foods, cost of healthy foods, and the child being a 'picky eater' as barriers parents reported that may prevent behavior change. Some parents were described as relying on 'fast foods' because they were concerned their child would not eat anything else. Lastly, many mothers were reluctant to upset their children over food because they perceived their would make them unhappy, or they simply wanted a quiet life and constantly having to monitor a child's diet was seen to be too stressful [55].

In terms of physical activity, children's preference for sedentary behaviors, resistant children, and parent's preference for home-based activities were reported as barriers to adopting

a physically active lifestyle. Reconciling different child preferences within a family was also seen as problematic, where one child likes physical activity and another preferred sedentary activities. Lastly, some parents acknowledged that prolonged television viewing might encourage sedentary behaviors and said they wanted ideas for alternative physical activities to occupy children at home [55].

Sonneville and colleagues [131] explored barriers to and facilitators of parental decisions to adopt obesity prevention recommendations through 4 focus groups among a total of 19 parents of overweight children aged 5-17 years. Parents were asked to discuss what factors would make obesity prevention recommendations more difficult (barriers) or easier (facilitators). Similar to the afore mentioned study, parents described concerns such as monitoring/time cost to watch the children, difficulty changing habits, safety, child preference, assistance from family members, lack of information/transportation, and dollar cost as barriers to obesity prevention recommendations.

Many of these facilitators presented in this study are topics often taught in behavioral weight management interventions. For example, the parents requested more information about dollar costs regarding healthy eating behaviors, and acceptable alternatives to sedentary television watching.

Parental skills training may also provide parents with helpful tools for avoiding and handling child resistance and perceived barriers. Graves [132] found that including structured parental problem-solving training in family-based children's programs facilitated child weight loss both immediately after the program and at the 6-month follow-up, compared to the parent-child behavioral or instruction-only group.

Perceived parental barriers are also included in figure 1. Parental barriers to changing child and family behaviors may have an association with the parent's perception of child weight, and/or the parent's readiness to change child health behaviors. Investigating the associations between these behavioral constructs will help interventionists tailor treatment so parents have the best chance of successfully overcoming and knowing how to handle barriers.

2.8 INFLUENCE OF PARENTING STYLE ON CHILD WEIGHT

Many childhood obesity interventions have begun to measure parenting style. Parenting skills were mentioned as the foundation for successful intervention that includes gradual targeted increases in activity, and targeted reductions in high-fat, high-calorie foods [26]. There are three primary parenting styles that have all been associated with successful or unsuccessful weight management in youth. Baumrind [133, 134] studied 103 children and 95 families. Through interviews, testing, and home studies, she measured how children were functioning, and identified parenting styles as described below.

- ***Authoritarian Parenting*** – Value control and unquestioning obedience. They try to make children conform to a set standard of conduct and punish them arbitrarily and forcefully for violating it. They are more detached and less warm than other parents. Their children tend to be more discontented, withdrawn, and distrustful.
- ***Permissive Parenting*** – Value self-expression and self-regulation. They make few demands and allow children to monitor their own activities as much as possible. When they do have to make rules, they explain the reasons for them. They consult with children about policy decisions and rarely punish. They are warm, non-

controlling, and undemanding. Their preschool children tend to be immature, the least self-controlled and the least exploratory.

- ***Authoritative Parenting*** – Value a child's individuality but also stress social constraints. They have confidence in their ability to guide children, but they also respect children's independent decisions, interests, opinions, and personalities. They are loving and accepting, but also demand good behavior, are firm in maintaining standards, and are willing to impose limited, judicious punishment when necessary, within the context of a warm, supportive relationship. They explain the reasoning behind their stands and encourage verbal give-and-take. Their children apparently feel secure in knowing both that they are loved and what is expected of them. These preschoolers then to be the more self-reliant, self-controlled, self-assertive, exploratory, and content.

In addition to the above parenting styles, Maccoby and Martin [135] have suggested a fourth style:

- ***Disengaged Parent*** – Low in both responsiveness and demandingness, low in affective expression, and low in control.

Golan, in an investigation studying parental intervention exclusively v. parents and children together [100], measured parenting style in both groups after the intervention and found that in both groups, parenting style did not change significantly after the intervention. However, a statistically significant negative correlation was shown between permissive parenting style and changes in BMI in both groups (-0.6 , $p < 0.01$ for parent-only group; -0.58 , $p < 0.03$ for the parent and child group). The more permissive the mother, the less change occurred in the child's BMI. Furthermore, a trend was shown in the correlation coefficient between the changes in

authoritative style and child weight loss. Results show that improvement in parental authoritative style tended to be associated with more weight reduction in children [100].

Other studies have suggested strategies that emphasize parental control over the quality and pattern of the food environment should be encouraged, whereas strict parental control over a child's food intake should be discouraged [102, 106, 136]. Authoritative parenting (rather than authoritarian parenting style) was found to be the most effective parental child-feeding modality for weight loss [137-139]. Authoritarian parents attempt to control their child's food intake, which can be counterproductive to the development of the child's ability to self-regulate. For example, when a parent instructs a child to finish everything on their plate, the child will learn to ignore their self-satiety cues. Evers and colleagues [140] claim that by allowing children to make decisions about what and how much to eat, parents empower children to self-regulate their eating (example of permissive parenting style). However, Golan and colleagues [9] maintain that it is the parent's role to offer a variety of healthy foods, oversee the planning and assembly of meals, and set the schedule for meals and snacks (example of authoritarian parenting style). When parental control in child-feeding and activity practices is applied in a general atmosphere of involvement and parental warmth, it might lead to positive effects [94]. The study of parental style and strategies to teach parents authoritative style (the expression of warmth and emotional support, and using clear, bi-directional communication) is imperative in the future of parent involved weight management for children. Overall, research shows that authoritative parents take responsibility and enforce a healthy environment in the house, set limits on the time spent by the child in regard to sedentary activities, and avoid insensitivity and/or unresponsiveness to feeding cues from the child [100]. However, no study has investigated the relationships between

parenting style and parental perception of their child's obesity or the parent's readiness to change behavior based on the transtheoretical model.

With parent-only strategies for pediatric weight management being equivocally or more successful than parent-child or child-only approaches, further knowledge regarding parental perceptions, parental readiness to change behavior, and parental barriers are needed. An advantage of this investigation is that it provided further knowledge and insight into parenting style and parental perspectives regarding child weight management, for the purpose of designing parent-only or parent-child interventions that directly address parental barriers to proper child weight control.

2.9 CONCLUSION

Addressing parenting practice is thought to be an inexpensive and effective approach in the treatment of childhood obesity. Numerous investigators have examined parent's beliefs in regards to their child's weight management, and contributed valuable information that has increased treatment effectiveness. Though there have been many investigations that explored parent's perception of obesity in their child, parent's readiness to change behavior based on the transtheoretical model of behavior change, and parents barriers to change health behaviors of their child, very few have analyzed if there are associations between each of these constructs. Investigating how each construct effects the other(s) may help clinicians better understand how to help parents see the need for intervention, adopt healthy behaviors, and overcome barriers, while studying each construct individually may not.

3.0 METHODS

The percentage of children and adolescents who are obese has increased by approximately 23 percent between 1999 and 2004, and the percentage of youth who are overweight has increased more than 19 percent [3]. Targeting parents and parenting behavior has become a less expensive and highly effective treatment strategy for overweight and obese children. Although, there is research exploring parental perception of their child's weight, parental readiness to change weight control behaviors for their child, and parental perception of barriers to engaging their child in weight control behaviors on an individual basis, this study examined the relationships between each of these constructs. Furthermore, few studies have explored characteristics of parents who do and do not perceive their child's weight accurately, differences in parental characteristics by stage of readiness to change weight control behaviors of their child, and parental characteristics associated with barriers to engaging the child in weight control behaviors.

3.1 CHANGES TO METHODS SINCE INITIAL APPROVAL

Since the dissertation committee approved the original proposal, a few changes to the methods were made to allow for completion of this project. The changes made to the original

protocol, and the rationale for each change, are described below. These changes are also incorporated throughout the document as necessary.

- A. Inclusion in the original protocol was for the child to be 7-12 years of age. Based on the committee's recommendation, this was altered to be 6-8 years of age prior to study implementation. However, due to difficulty in recruitment, this was modified to 6-12 years of age, which was the final age range for eligibility at the point of study completion.
- B. The original methods included direct measurement of height and weight to compute the body mass index (BMI) of the parent. However, due to difficulty in recruitment the decision was made to reduce the burden on the parent but not requiring this measurement. This is recognized as a limitation of this study.
- C. The original protocol proposed to recruit subjects through the use of fliers that would be posted in community centers, parks, and high traffic areas in the community, and with online postings. However, this resulted in very few inquiries about this study. Therefore, recruitment efforts were expanded to include recruitment from programs offered within the University of Pittsburgh's School of Education and the Department of Health and Physical Activity, and additional organizations outside of the University of Pittsburgh. A letter was provided by the Principal Investigator, which was sent by the program or organization to the parent via email, standard mail, or other methods announcing the study. Interested parents were instructed to contact the study through a telephone number that was provided in the letter. This recruitment method limited the study generalizability of the study results as mentioned in section 5.6.1.

3.2 SUBJECTS

The subjects for this study were forty-eight parent/child dyads recruited from the Greater Pittsburgh community. Children were between 6-12 years of age, overweight or obese (minimum of the 85th percentile for body mass index (BMI)), and were accompanied by one parent (the primary meal provider for the child). The primary meal provider is defined as the parent who is responsible for >50% of the food decisions for the child. The children were normally healthy (without any significant psychological or physiological health complication that would hinder normal diet, physical activity behaviors or weight for the child's age). The inclusion and exclusion criteria used for the study are displayed in Table 3.

Table 3. Study Inclusion and Exclusion Criteria

<p>Inclusion Criteria: (child)</p> <ul style="list-style-type: none">• Male or Female• 6-12 years of age• Overweight or obese ($\geq 85^{\text{th}}$ percentile for BMI)• Residing in the Greater Pittsburgh Community• Ability to provide assent <p>Inclusion Criteria: (parent)</p> <ul style="list-style-type: none">• Male or Female• Primary meal provider for the child being studied (responsible for >50% of the food decisions for the child)• Ability to provide informed consent• Greater than 18 years of age
<p>Exclusion Criteria: (child)</p> <ul style="list-style-type: none">• Presence of any psychological or physiological condition that may hinder normal diet and physical activity for the child's age• Participation in any other research study that may impact the outcome of the current study in the previous 12 months• Report current treatment for any cardiovascular, orthopedic, psychological, neurological, or metabolic disorder or any other medical condition that could impact body weight• Currently taking any medications and/or supplements that could affect metabolism and/or weight loss

Exclusion Criteria: (parent)

- Participation in any other research study that may impact the outcome of the current study
- Participation in a research project involving weight loss or physical activity in the previous 12 months

3.3 RECRUITMENT AND SCREENING PROCEDURES

Participants for this study were recruited using flyers (posted in community centers, schools, parks, and high-traffic areas in the community), letters sent home to families who participated in University of Pittsburgh community programming, letters sent home to families participating in school-age afterschool programming, and online postings (Appendix A). The flyers and letters stated that the study was interested in surveying parents for information regarding ‘family nutrition and physical activity health behaviors.’ A telephone or in person screening was used to identify whether the child was at the appropriate weight status for the study. The parents were not informed that children must be in the 85th percentile until after their data were collected to avoid confounding persuasion of parent perception of their child’s weight. Interested subjects (parents only) were instructed to contact a phone number, whereby they were given a brief description of the study objectives, study protocol, and the risks of participating in the phone screening. To ensure eligibility, the parents were required to give verbal consent to complete a brief telephone screening interview, subjects were asked to provide their child’s age, an estimate of their child’s height and weight, if the individual calling was at least 18 years old, and if the caller was the legal guardian of the child. The child’s height and weight was calculated to determine if they meet the 85th percentile and were eligible for the study. If the subjects were

deemed ineligible, they were informed that they did not fit the criteria for the study and no further screening was performed. If the subjects meet all inclusion criteria, they continued with the screening process. All subject information was recorded on the Contact Tracking Form (Appendix B), and initial eligibility was determined when all fields on the form were satisfied. The subject's contact information was recorded on the Contact Tracking Form. Lastly, the subject was informed of the study compensation and the principle investigator answered any questions the parents had regarding participation in the study.

Participants that were deemed eligible were scheduled for a study visit, or notified when the study team was going to be present at the partnering afterschool facility.

3.4 STUDY VISIT

The potential subjects (one parent and one child) were greeted by a research staff member, and escorted to a room to review and complete the informed consent for participation in the study, complete the study questionnaire, and child data collection. The subjects were reminded of the study protocol before any data collection began. Each parent/child dyad was assigned a subject number that was placed at the top of the parent questionnaire packet and child data-recording sheet (Appendix D). Neither the parent name, nor child name was placed on any data recording form. The subjects were notified of the confidentiality procedures.

3.4.1 Child Protocol

Height: Child subjects were instructed to remove their shoes, socks, and any unnecessary clothing accessories (i.e. cell phone, purse, hat, jacket, etc). A calibrated stadiometer was used to measure height. Child subjects were instructed to stand upright with the back of their heels against the wall for the measurement. Height was measured to the nearest 0.1cm.

Body Weight: The child's weight was measured using a Tanita TBF 300A Body Composition Analyzer (Tanita Corporation, Arlington Heights, Illinois). The scale was calibrated at the beginning of data collection. Subject information was entered into the system, and the "standard" mode was selected. The child was instructed to step onto the scale and to stand upright and still with one foot on each of the metallic portions of the scale. The child remained on the scale in this position until a weight, expressed in kilograms, appeared on the display.

Body Mass Index (BMI): Height (kg) and weight (cm) were used to calculate BMI, which was placed into a percentile score using the 2000 CDC growth charts for boys and girls aged 2-20 years.

3.4.2 Parent Protocol

The parent who served as the subject for this study completed a series of questionnaires. These questionnaires are described below.

Parent Perception of Child Weight: Parental perception of their child's weight was measured with one questionnaire item using a 5-point Likert scale in Appendix D (questions 1-2). Specifically, parents were queried with the question of "how would you describe your child's

weight at the moment?” Response options were: 1) very underweight, 2) underweight, 3) normal weight, 4) overweight, 5) very overweight. Parent’s concern for their child becoming overweight in the future was also evaluated using a single item question (See Appendix D). Response options included 1) no weight concern, 2) little weight concerns, 3) some weight concerns, 4) many weight concerns.

Although data on validity and reliability for the question on parental perception of weight status used for this study are not available, similar single-item methods for assessing parental perception and parental concern for child weight were reported in previous child weight perception research [53, 112, 114, 130, 141]. The Child Feeding Questionnaire (CFQ) [141] measured parent perception of child weight and parent concern for future weight in an identical manner to this investigation (with the exception of the CFQ using the word ‘markedly’ and this investigation using the word ‘very.’ Example: ‘markedly overweight’ versus ‘very overweight’). Data have been published on the validity and reliability of the parent perception of child weight measure (validity: $r = 0.90$; reliability: $r = 0.83$) and parent concern for future weight measure (validity: $r = 0.78$; reliability: $r = 0.75$) [141]. Although the measures were very similar, the exact questions used to measure parent perception of child weight and parent concern for future weight was not disclosed by previous investigations.

Parental Readiness to Change Weight Control Behaviors for their Child: Parental readiness to change was assessed using the algorithm by Rhee et al. [53] and originally developed by Kristal et al. [142]. Specific questions are displayed in the parent questionnaire in Appendix D (questions 12, 13, 15). As part of the readiness algorithm, parents were asked if they were thinking about making lifestyle changes to help their child lose weight. If parents responded with ‘no’, they were placed in the precontemplation stage, and if parents responded

‘yes’ they were referred question 15. Question 15 asked how likely parents were to make lifestyle changes in the next 6 months: a response of ‘not likely’ placed parents in the precontemplation stage, a response of ‘likely’ places parents in the contemplation stage, and a response of ‘very likely’ refers the algorithm to the answer of question 12. Question 12 asks parents if they are currently making changes to their child’s diet and activity behavior more than 50% of the time: a ‘yes’ response places parents in the action stage, and a response of ‘no’ places parents in the preparation stage. Although this algorithm has been used in many investigations [53, 142-144] the psychometric properties of this method for measuring stage of change has not been reported.

Questions regarding specific behavior changes (i.e. decreased fruit juice consumption, changing to low-fat or skim milk, increasing fruit and vegetable consumption, increased physical activity levels, and decreasing the amount of time spent watching TV or playing on the computer) were used to determine which parents were actively making changes (questions 3-10, Appendix D)[53]. Parents who were consistently making behavior changes, defined as >50% of the time, in any of the behaviors listed above were categorized as being in the action stage of change [53]. Parents who were in the preparation stage of change are considered in the ‘ready stage’ [53].

Parental Perception of Barriers to Engaging their Child in Weight Control Behaviors: Parental perception of barriers to engaging their child in weight control behaviors was assessed with a questionnaire (see Appendix D, questions 16-29). The investigator developed the questionnaire items used in this investigation and no psychometric properties are available on these single item questions. The parent responded to each question with one of the following responses: 1) barrier does not exist, 2) small barrier, 3) medium barrier, or 4) large barrier. Each

barrier was individually scored, and scores were added together to make an overall ‘barriers score.’ Low barriers score represents low or no perception of barriers to changing weight control behaviors in the home. A high barriers score represents large barriers to changing weight control behaviors in the home. The questions are grouped under three general areas (food choice, physical activity, psychosocial). Specific topics evaluated within each of these areas are listed below.

Food Choice

- Child resistance to change in food choice
- Whole family resistance to change in food choice
- Time cost of preparing healthy food options
- Access to healthy food options
- Cost of healthy food options
- Lack of knowledge in regarding healthy food choices

Physical Activity

- Child resistance to change in physical activity level
- Whole family resistance to change in physical activity level
- Time cost of increasing physical activity participation
- Access to physical activity facilities
- Cost of physical activity participation
- Lack of knowledge in proper exercise behaviors

Psychosocial

- Modifying parent controlled home environment (i.e. changing household rules to be more conducive to a healthy lifestyle)

- Influence of peers

Parent/Family Characteristics

Parents answered descriptive questions regarding basic characteristics of themselves and their family on the following topics (see Appendix D, questionnaire pages 13-15). These questions were developed by the investigator, and no psychometric properties are available.

1. Gender of the parent: The parent self-reported their gender as either male or female.
2. Age of the parent: Age was divided into 6 categories, with the parent selecting the category that corresponded to their self-reported age. The age categories were: a) less than 20 year, b) 20 to 24 years, c) 25 to 29 years, d) 30 to 39 years, e) 40 to 49 years, f) 50 or older.
3. Ethnicity/Race of the parent: The parent selected their self-reported ethnicity/race from the following categories: a) White, non-Latino, b) Latino heritage, c) African-American, d) Caribbean, e) African, f) Native American, g) Asian, h) Pacific Islander, i) other.
4. Marital status of the parent: The parent self-reported their marital status as either single, married, divorced, separated, or widowed.
5. Household members: The parent reported other individuals who lived in their household beside themselves and their child who was participating in this study. The parent selected from the following responses and indicated all that apply: a) your partner, b) other children and how many other children, c) your mother or father, d) your

grandparents, e) other family members, f) no one else, g) other with specifying this response.

6. Education level of the parent: The parent reported their highest level of education that was completed. The parent selected from the following responses: a) elementary school, b) middle school [up to 8th grade], c) some high school [9th to 11th grade], d) high school graduate or GED, e) some college, f) college graduate, g) post-graduate work.
7. Household income: The parent reported their household income as one of the following responses: a) less than \$10,000, b) \$10,000 to \$19,999, c) \$20,000 to \$29,999, d) \$30,000 to \$39,999, e) \$40,000 to \$49,999, f) \$50,000 to \$59,999, g) \$60,000 to \$69,999, h) \$70,000 to \$79,999, i) \$80,000 to \$89,999, j) \$90,000 to \$99,999, k) \$100,000 to \$149,999, l) \$150,000 or more, m) no response.
8. Self-perceived weight status of the parent: The parent self-reported their perceived weight status by selecting from one of the following responses: a) very underweight, b) underweight, c) normal weight, d) overweight, e) very overweight.

Parenting Style

Self-reported parenting style was also be assessed using the revised Parental Authority Questionnaire (PAQ-R) [145-147]. The PAQ-R assesses measures Baumrind's permissive, authoritarian, and authoritative parental authority prototypes [133]. Parenting style was measured by questionnaire (see Appendix D, Page 8, Questions 1-30). Each parenting style construct was measured with 10 questions assorted throughout the questionnaire. Each parenting style construct was measured with its own separate psychometric properties. Question numbers for each construct, and the validity and reliability results are displayed below.

Authoritarian parenting style was assessed using questions 2, 3, 7, 9, 12, 16, 18, 25, 26, 29 on the PAQ-R (validity: $r = 0.57$; reliability $r = 0.87$). Authoritative parenting style was assessed using questions 4, 5, 8, 11, 15, 20, 22, 23, 27, 30 (validity: $r = 0.55$; reliability: $r = 0.61$). Permissive parenting style was assessed using questions 1, 6, 10, 13, 14, 17, 19, 21, 24, 28 (validity: $r = 0.51$; reliability: $r = 0.67$).

Physical Activity of the Parent

Self-reported physical activity of the parent was assessed using an abbreviated version of the Modifiable Activity Questionnaire (MAQ) for adults [148]. This questionnaire asks subjects to report household, occupational, and recreational forms of physical activity. Data from this questionnaire were used to estimate time spent in these forms of physical activity (hours per week) and total volume of physical activity (MET-hr/week) as previously described [148]. The MAQ has been shown to be a valid and reliable measure of physical activity (reliability: past year leisure time physical activity 21-36 year olds, $r = 0.63$; validity: compared to objective measure, $r = 0.69$).

Additional Questions Completed by Parents

Parents provided information on other individuals who may have expressed concern for their child's weight status with a question developed by the Principal Investigator for use in this study (see Debriefing Question #3 in Appendix D). Parents selected from the following response options: a) pediatrician, b) teacher, c) grandparents, d) spouse/other parent, e) other parents, f) other family members, g) child's coach, h) school nurse/psychologist, i) other with response specified by the parent who has mentioned or expressed concern for their child's weight.

Parents were also asked to indicate if their child is participating in any program to manage their weight, using a question developed by the Principal Investigator for use in this

study (see Debriefing Question #3 in Appendix D). If the parent indicated that their child was participating in this type of program, the parent was asked to provide specific information on the program.

3.5 STATISTICS

This was a cross-sectional, observational study, exploring dyads of one overweight child and one of their parents. Data were analyzed using SPSS version 21 Premium. Descriptive characteristics analyses were examined on the entire sample. The study sample characteristics were defined by parental age, physical activity in hr/week and MET-hr/week. Parent gender, race, household income, parental highest education level achieved, and marriage status were computed as frequencies for each category presented in the questionnaire. Child descriptive data (gender, age, BMI, and BMI percentile) was also computed. A Fisher's exact test was applied used to measure the distribution of child age and gender.

Each primary and secondary aim was analyzed using the statistical approach described below. Statistical significance was defined as $p \leq 0.05$.

1. To examine the accuracy of parental perception of their child's weight.
 - a. Measured BMI was categorized as normal weight ($< 85^{\text{th}}$ percentile), overweight (85^{th} to $< 95^{\text{th}}$ percentile) or very overweight ($\geq 95^{\text{th}}$ percentile) based on the CDC expert committee recommendations for child weight status category [149]. The parent's perceived weight status of their child was reduced to four categories according to the following: 1) very underweight and underweight were collapsed into "underweight," 2)

normal weight remained as “normal weight,” 3) overweight remained as “overweight,” 4) very overweight remained as “very overweight”. The category of objectively measured BMI was compared to the category of the parent’s perceived weight status of their child using the raw percent of total agreement.

- b. The measured and perceived weight was re-categorized for additional analysis. The measured BMI were re-categorized as normal weight and overweight, which combined the overweight and very overweight categories. The parent’s perceived weight status of their child was re-categorized as underweight, normal weight, and overweight, which was the combination of overweight and very overweight categories. The categories of measured BMI were compared to the category of the parent’s perceived weight status of their child using the raw percent of total agreement.
2. To examine if parental perception of their child’s weight is associated with parental readiness to change weight control behaviors for their child.
 - a. A spearman rho, non-parametric, rank-order correlation was used to determine associations between the parents who perceived their child’s weight accurately and the determined stage of change, and whether the correlation is positive or negative.
 3. To examine if parental perception of their child’s weight is associated with parental perception of barriers to engaging their child in weight control behaviors.
 - a. A spearman rho, non-parametric, rank-order correlation was used to determine associations between parental perception of child weight (by weight category) and the each subject’s barriers score, and whether the correlation is positive or negative.

4. To examine the association between parental readiness to change weight control behaviors for their child and parental perception of barriers to engaging their child in weight control behaviors.
 - a. A spearman rho, non-parametric, rank-order correlation was used to determine associations between determined stage of change and each subject's barriers score, and whether the correlation is positive or negative.

Secondary Aims

5. To explore characteristics of parents who do and do not perceive their child's weight accurately.
 - a. A Fisher's exact test was used to analyze descriptive characteristics between parents who do and do not perceive that their child is overweight (at any category).
6. To examine differences in parental characteristics by stage of readiness to change weight control behaviors of their child.
 - a. A Fisher's exact test was used to analyze descriptive characteristics between parents who are 'ready' to change behavior (determined by parents who were scored in the preparation or action stages of change) and those who are not ready to change behavior (precontemplation and contemplation stages of change).
7. To examine parental characteristics associated with barriers to engaging the child in weight control behaviors.
 - a. A Kruskal-Wallis analysis was used to examine differences in barrier score by parent descriptive characteristic. Results for each descriptive characteristic was displayed as mean \pm standard deviation.

Exploratory Analyses

A Fisher's exact test was used to examine the relationship between those who have expressed concern for their child's weight and parent's perception of child weight. Also, spearman rank-order correlations were used to examine relationships between parental concern for future child weight and parent readiness to change, parent barriers to behavior change.

3.6 POWER ANALYSIS

A power analysis was performed to determine the appropriate sample size to assess the associations between variables for this study as proposed in the specific aims. Assumptions used to conduct this power analysis included was an anticipated correlation of $r = 0.40$, which is similar to the correlations observed in prior studies when examining similar constructs [114, 150]. Thus, with alpha set at 0.05, the sample size needed to detect a correlation of 0.40 would be 50, 43, and 37 with power of 90%, 85%, and 80% respectively. Therefore, this study proposed to have 43 children and their parent provide data for this study. However, the decision was made to recruit 48 parent and child dyads to all for the potential for 10% dropout or missing data for analysis of the primary outcomes.

The study did not plan for recruitment of parents with specific characteristics for analysis of the secondary aims. For example, this study did not plan for recruitment of parents into equal categories for age, gender, race/ethnicity, body weight, socioeconomic status, personal amount of physical activity, or parenting style. Thus, it is recognized that this study has limited statistical power to examine these secondary aims, and this is also recognized as a limitation in Chapter 5.

Thus, the results of analysis of the secondary aims should be interpreted with caution, as there is the potential for a type II error to be made when interpreting these findings.

4.0 RESULTS

4.1 SUBJECTS

Screenings were conducted on 116 individuals. Of these individuals, 53 were deemed eligible, and 65 were deemed ineligible based on the screening criteria. Of the ineligible participants, 51 parents reported their child's height and weight below the 85th percentile for age, 2 parents reported their child having a physiological condition that hindered normal diet and physical activity, 1 parent reported that their child was above the age limitations for the study, and 11 parents failed to report their child's height and weight. Of the 53 eligible participants, 5 were excluded at the time of data collection due to the parent's inaccurate reporting of the child's height and weight (child was found to be below the 85th percentile for age), with the remaining 48 participating in data collection. The recruitment and screening flow is displayed in figure 2.

Recruitment efforts resulted in data being collected from 48 parent/child dyads. Parents were primarily female (n=40, 83.3%), 30-39 years old (n=29, 60.4%), and reported to be of African-American decent (n=35, 72.9%). A similar number of parent subjects described their weight as average (n=15, 31.3%) or a little overweight (n=15, 31.3%), while 14 parents (29.2%) reported themselves as very overweight (table 4). The majority of parents self-reported authoritative parenting style (n=33, 68.8%), while the remaining self-reported an authoritarian parenting style (n=15, 31.3%). No parents reported a permissive parenting style. The sample

was primarily single parents (n=32, 66.7%), with 25% of the sample reported being married (n=12) and the remaining either divorced, separated, or widowed. The majority of parents had a minimum of a high school education (n=16, 33.3%) or reported some college education (n=14), 29.2%, and 18.8% were college graduates (n=9) (table 4).

Figure 2. Screening and recruitment flow chart

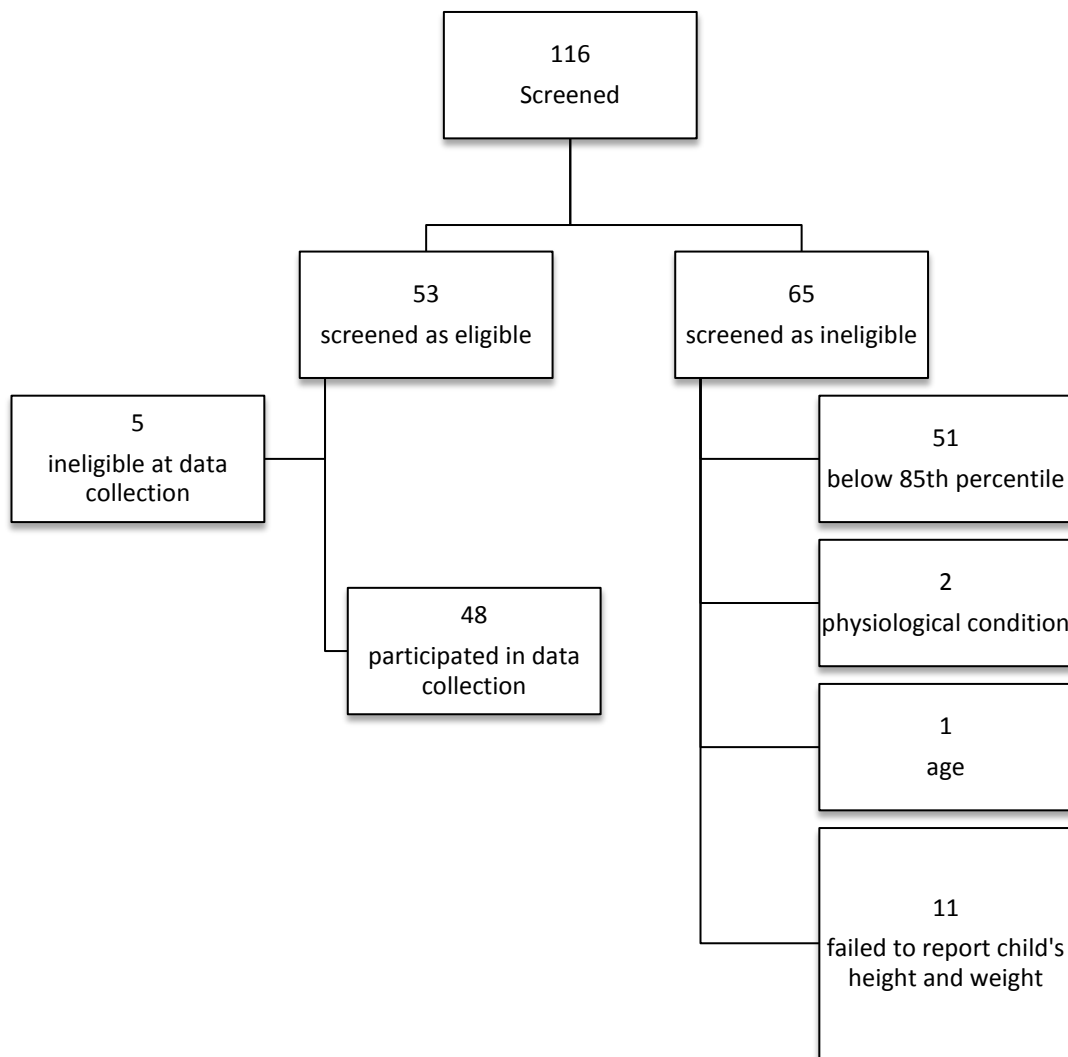


Table 4. Parent Descriptive Characteristics (N = 48)		
Descriptive Variable	N	Percentage
Gender		
Female	40	83.3
Age (years)		
Less than 20	1	2.1
20 to 24	4	8.3
25 to 29	4	8.3
30 to 39	29	60.4
40 to 49	8	16.7
50 or older	1	2.1
Ethnicity		
White, non-Latino	5	10.4
Latino heritage	3	6.3
African-American	35	72.9
Caribbean	0	0
African	2	4.2
Native American	2	4.2
Asian	1	2.1
Pacific Islander	0	0
Other	0	0
Self-Described Weight		
Very underweight	1	2.1
A little underweight	2	4.2
Average	15	31.3
A little overweight	15	31.3
Very Overweight	14	29.2
Parenting Style		
Authoritative	33	68.8
Authoritarian	15	31.3
Permissive	0	0
Marital Status		
Single	32	66.7
Married	12	25.0
Divorced	1	2.1
Separated	1	2.1
Widowed	1	2.1
Highest Education		
Elementary School	0	0
Middle School (up to 8 th grade)	1	2.1
Some High School (9 th to 11 th grade)	3	6.3
High School Graduate	16	33.3
Some college	14	29.2
College graduate	9	18.8
Post-graduate work	4	8.3

...Table 4 continued		<i>N</i>	<i>Percentage</i>
Total Household Income			
	Less than \$10,000	19	39.6
	\$10,000 – 19,000	6	12.5
	\$20,000 – 29,000	4	8.3
	\$30,000 – 39,000	3	6.3
	\$40,000 – 49,000	2	4.2
	\$50,000 – 59,000	1	2.1
	\$60,000 – 69,000	0	0
	\$70,000 – 79,000	2	4.2
	\$80,000 – 89,000	3	6.3
	\$90,000 – 99,000	0	0
	\$100,000 – 149,000	2	4.2
	\$150,000 – more	2	4.2
	No response	4	8.3
People Living in Household			
	Partner	17	35.4
	Other Children	31	64.6
	Parent's Mother and Father	1	2.1
	Parent's Grandparents	0	0
	Other Family Members	3	6.3
	No One Else	11	22.9
	Other	0	0

The sample was predominantly lower-income with the largest percentage of the sample reporting less than \$10,000 income per-year (n=19, 39.6%), with 12.5% (n=6) reporting \$10,000 - \$19,000 income per-year, 18.8% (n=9) reported \$20,000 to <\$50,000 per year, and 20.8% reporting ≥\$50,000 per year. Four parents did not report annual income. Only 22.9% of parents (n=11) reported that only themselves and their one child lived in their home. Seventeen parents (35.4%) reported living with a partner, 31 parents (64.6%) reported other children living in the home (3.31 ± 1.3). Parental physical activity (PA) habits and leisure screen time habits are presented in table 5 (5.45 ± 5.60 hr/week PA; 26.36 ± 28.51 MET-hrs/week PA; 4.02 ± 3.01 hr/day screen time) (table 5).

The child subjects were both males (n=26, 54.2%) and females (n=22, 45.8%), and were overweight (85th–95th percentile, n=21, 43.8%), or obese (>95th percentile, n=27, 56.3%) as

determined by the height and weight measured by the investigators for this study(table 6).

Children were 6-12 years old (mean age 9.29 ± 1.99), had an average BMI of 23.51 ± 4.98 , and an average BMI percentile of 93.91 ± 5.08 (table 7). Child age was analyzed by gender using a chi-square analysis. The sample was relatively evenly distributed by child age, with 12.5% of the sample was 6 years old, 12.5% of the sample was 7 years old, 8.3% of the sample was 8 years old, 14.6% of the sample was 9 years old, 20.8% of the sample was 10 years old, 14.6% of the sample was 11 years old, and 16.7% of the sample was 12 years old (table 8).

Table 5. Parent descriptive characteristics for physical activity (N=48)	
Physical Activity (PA) / Sedentary Time	Mean \pm Standard Deviation
MET-hours / week	26.36 ± 28.51
Hours / week	5.45 ± 5.60
Leisure Screen Time (hr/day)	4.02 ± 3.01

Table 6. Child descriptive characteristics (N=48)	
Descriptive Variable	Mean \pm Standard Deviation
Age (years)	9.29 ± 1.99
BMI	23.51 ± 4.98
Percentile	93.91 ± 5.08

Table 7. Child descriptive characteristics (N=48)			
Descriptive Variable	N	Percentage	
Gender			
Male	26		54.2
Female	22		45.8
Percentile Category			
Overweight	21		43.8
Very Overweight	27		56.3

Table 8. Child age distribution by gender (N=48)							
Child Age (years)	Male		Female		Total Sample		P value Fisher's Exact
	N	%	N	%	N	%	
6	3	11.5	3	13.6	6	12.5	0.999
7	3	11.5	3	13.6	6	12.5	
8	2	7.7	2	9.1	4	8.3	
9	4	15.4	3	13.6	7	14.6	
10	6	23.1	4	18.2	10	20.8	
11	4	15.4	3	13.6	7	14.6	
12	4	15.4	4	18.2	8	16.7	
Total	26	100	22	100	48	100	

4.2 ANALYSIS OF DATA BY SPECIFIC AIM

4.2.1 Specific Aim 1: To examine the accuracy of parental perception of their child's weight (overweight, obese)

Child participants were coded as either overweight ($\geq 85^{\text{th}}$ – $< 95^{\text{th}}$ percentile) or very overweight ($\geq 95^{\text{th}}$ percentile) based on their objectively measured BMI percentile based on age and gender. This was compared to their parent's perception of their weight reported on the questionnaire. When the data were examined, only 11 of the 48 parent participants perceived their child's weight accurately (22.9% of the sample) leaving 77.1% inaccurate (table 9). An accurate perception is determined if the parent perceives their child's weight in the correct category for their objectively measured weight, with these categories described in Section 3.5.

The data were re-coded to analyze parents who perceived their child to be overweight (at any category), and parents who perceived their child to be normal weight. The raw values showed that 22 of the 48 parent participants accurately perceived that their child was not normal weight (45.8% of the sample) leaving 54.2% inaccurate (table 10).

Table 9. Accuracy of the parent's perception of the child's weight			
Parent Perception of Child's Weight	Objectively Measured Child Weight		Total
	Overweight (85 th – 95 th percentile)	Very Overweight ≥95 th percentile	
Normal Weight			
Count	15	11	26
Expected	11.4	14.6	26
Percent of total sample (N=48)	31.3	22.9	54.2
Overweight			
Count	6	11	17
Expected	7.4	9.6	17
Percent of total sample (N=48)	12.5	22.9	35.4
Very Overweight			
Count	0	5	5
Expected	2.2	2.8	5
Percent of total sample (N=48)	0	10.4	10.4
Total			
Count	21	27	48
Expected	21	27	48
Percent of total sample (N=48)	43.8	56.2	100
Accurate = 22.9% (12.5% overweight + 10.4% very overweight)			
Inaccurate = 77.1%			

Table 10. Accuracy of the parent's perception of the child's weight – overweight at any category		
Parent Perception of Child's Weight	Objectively Measured Child Weight	
	Overweight (≥85 th percentile)	
Normal Weight		
Count	26	
Expected	25.5	
Percent of total sample (N=48)	54.2	
Overweight		
Count	22	
Expected	21.5	
Percent of total sample (N=48)	45.8	
Total		
Count	48	
Expected	48	
Percent of total sample (N=48)	100	
Accurate = 45.8%		
Inaccurate = 54.2%		

4.2.2 Specific Aim 2: To examine if parental perception of their child's weight is associated with parental readiness to change weight control behaviors for their child.

Spearman rank-order correlations were used to examine associations between parent perception of child weight and stage of readiness to change. A significant positive correlation was found between parent perception and stage of change ($r = 0.358$, $p = 0.012$).

4.2.3 Specific Aim 3: To examine if parental perception of their child's weight is associated with parental perception of barriers to engaging their child in weight control behaviors.

Spearman rank-order correlations were used to examine associations between parent perception of child weight and perceived barriers to changing health behavior in the home. There was no relationship found between parental perception of child weight and barriers score ($r = 0.117$, $p = 0.430$) (figure 3).

4.2.4 Specific Aim 4: To examine the association between parental readiness to change weight control behaviors for their child and perception of barriers to engage their child in weight control behaviors.

Spearman rank-order correlations were used to examine associations between parental stage of readiness to change behaviors, and perceived barriers to changing health behaviors in the home. The previously described barriers score had no significant association with the parent's stage of readiness to change ($r = 0.032$, $p = 0.829$) (figure 4).

Figure 3. Barriers to engaging their child in weight control behaviors and parent perception of child weight.

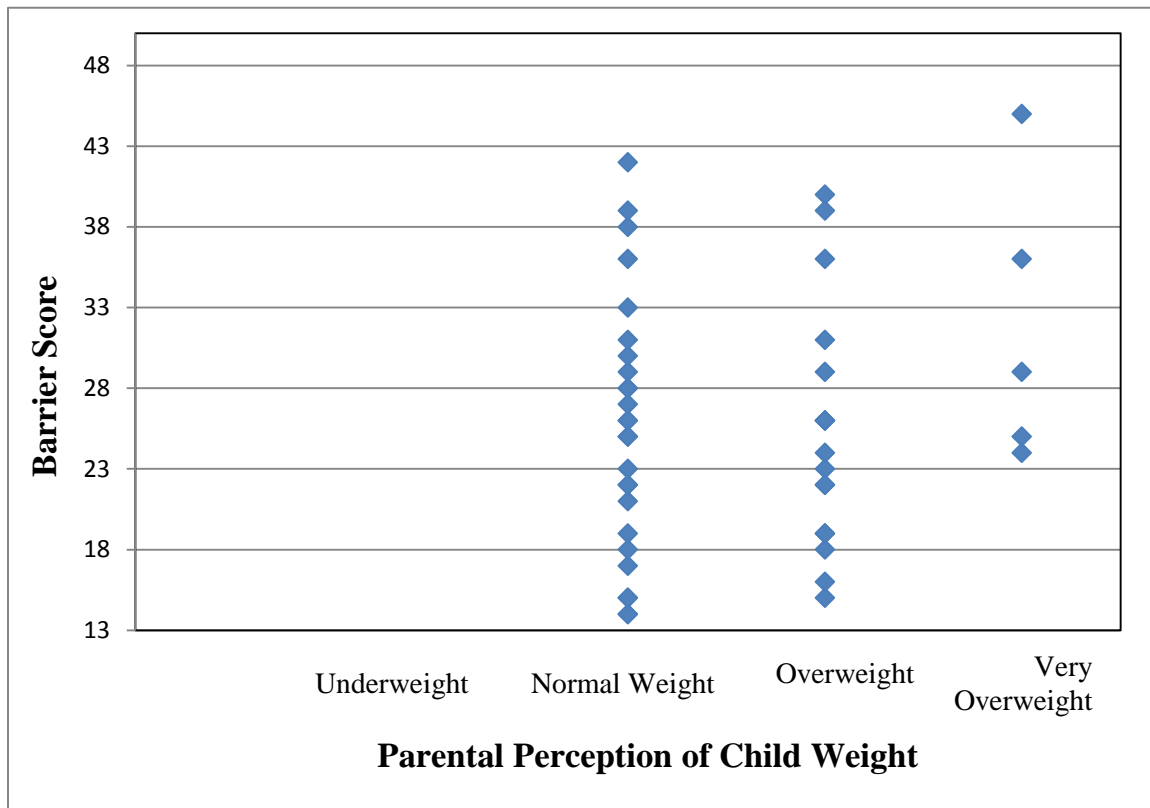
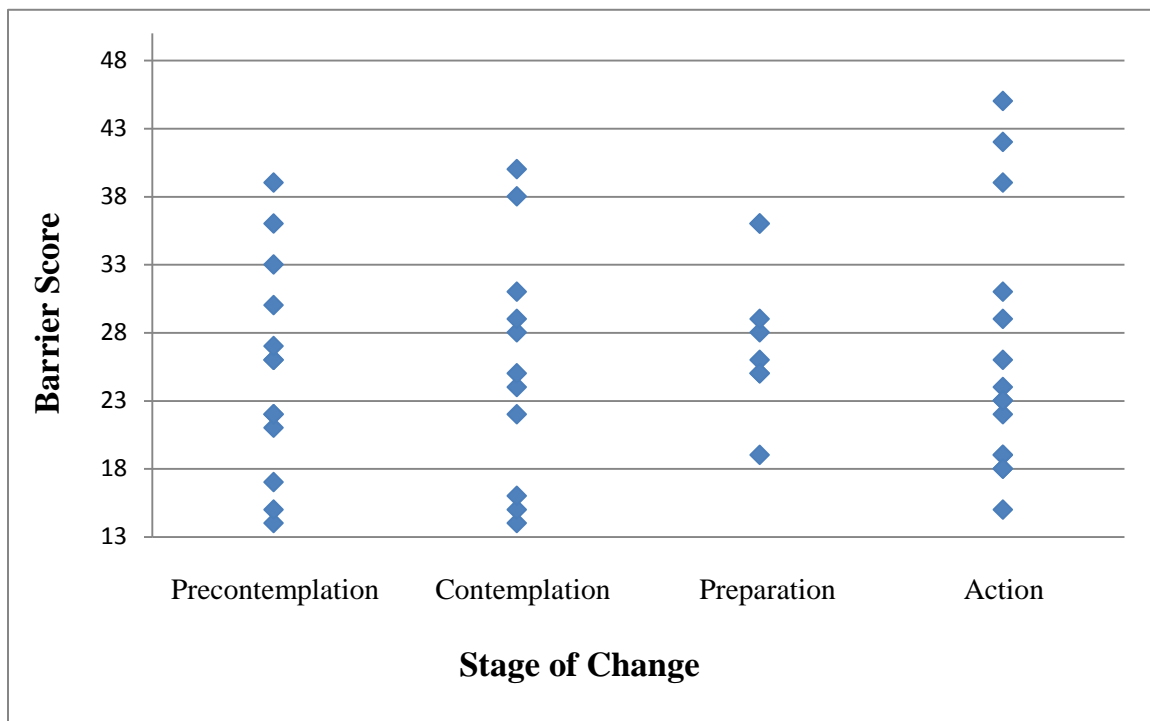


Figure 4. Barriers to engaging their child in weight control behaviors and stage of readiness to change



4.2.5 Specific Aim 5: To explore characteristics of parents who do and do not perceive their child's weight accurately.

A Fisher's exact test was used to examine descriptive characteristics of parents who perceived their children as normal weight and those who perceived their child as overweight. Results are displayed in table 11. Parents were grouped by those who perceived their child to be overweight in any category (n=22), and those who perceived their child to be normal weight (n=26). Descriptive variables were collapsed into 3 categories of age, ethnicity, marital status, education, and household income. Parent perception of self-weight was collapsed into 'underweight/average' and 'overweight.' Physical activity (MET-hr/week, hr/week, and screen time hr/day) was split by the median value into dichotomous (high and low) variables.

Parental age and marital status appear to influence perception of the child's weight (age: $p=0.039$; marital status $p=0.017$). The parent's gender, ethnicity, self-described weight, parenting style, education level, household income, physical activity (MET-hr/week and hr/week, hr/day screen time) had no relationship with parental perception of child weight (table 11).

4.2.6 Specific Aim 6: To examine differences in parental characteristics by stage of readiness to change weight control behaviors of their child.

A Fisher's exact test was used to examine descriptive characteristics of parents who in the precontemplation/contemplation stages, and parents in the preparation/action stages of change. Results are displayed in table 12. Parents were grouped by those who are in the precontemplation and contemplation stages (n=25) and those who are in the preparation and action stages (n=23).

Table 11. Parental Characteristics and Perception of Child Weight			
Descriptive Variable	Perceived child to be overweight n(%) (n = 22)	Did not perceive child to be overweight n(%) (n = 26)	Fisher's Exact P value
Gender			0.195
Female	22 (90.9)	20 (76.9)	
Male	2 (9.1)	6 (23.1)	
Age (years)			*0.045
Less than 24	4 (13.6)	2 (7.7)	
25 to 39	11 (50.0)	22 (84.6)	
40 or older	7 (31.8)	2 (7.7)	
Ethnicity			0.236
White, non-Latino	4 (18.2)	1 (3.8)	
African-American	14 (63.6)	21 (80.8)	
Other	4 (18.2)	4 (15.4)	
Self-Described Weight			0.763
Underweight/Average	9 (40.9)	9 (34.6)	
Overweight	13 (59.1)	17 (65.4)	
Parenting Style			0.584
Authoritative	16 (72.1)	17 (65.4)	
Authoritarian	6 (27.3)	7 (34.6)	
Permissive	0 (0)	0 (0)	
Marital Status			*0.025
Single	11 (45.5)	22 (84.6)	
Married	9 (40.9)	3 (11.5)	
Other	2 (9.1)	1 (3.8)	
Highest Education			0.214
Did not complete high school	1 (4.5)	3 (11.5)	
Completed high school	5 (22.7)	11 (42.3)	
Some college to post graduate work	16 (68.2)	12 (46.2)	
Total Household Income			0.316
Less than \$29,000	12 (54.5)	17 (65.4)	
\$30,000 – 79,000	3 (13.6)	5 (19.2)	
\$80,000 and above	5 (22.7)	2 (7.7)	
No response	2 (9.1)	2 (7.7)	
PA - MET-hours / week			0.454
Low (< 27 MET-h/day)	15 (68.2)	15 (57.7)	
High (> 27 MET-h/day)	7 (31.8)	11 (42.3)	
PA - Hours / week			0.654
Low (< 5.5 hr/wk)	13 (59.1)	17 (65.4)	
High (> 5.5 hr/wk)	9 (40.9)	7 (34.6)	
Leisure Screen Time (hours/day)			0.256
Low (< 3 hr/day)	12 (54.5)	13 (50.0)	
High (> 3 hr/day)	10 (45.5)	10 (38.5)	
No response	0 (0.0)	3 (11.5)	

Table 12. Parental Characteristics and Stage of Readiness to Change			
Descriptive Variable	Precontemplation / Contemplation Stages n(%) (n = 25)	Preparation / Action Stages n (%) (n = 23)	Fisher's Exact P value
Gender			0.366
Female	22 (88.0)	18 (78.3)	
Male	3 (12.0)	5 (21.7)	
Age (years)			0.235
Less than 24	4 (16.0)	1 (4.3)	
25 to 39	18 (72.0)	15 (65.2)	
40 or older	3 (12.0)	7 (26.1)	
Ethnicity			0.829
White, non-Latino	2 (8.0)	3 (13.0)	
African-American	19 (76.0)	16 (69.6)	
Other	4 (16.0)	4 (17.4)	
Self-Described Weight			0.771
Underweight/Average	9 (36.0)	9 (39.1)	
Overweight	16 (64.0)	14 (60.9)	
Parenting Style			0.259
Authoritative	19 (76.0)	14 (60.9)	
Authoritarian	6 (24.0)	9 (39.1)	
Permissive	0 (0)	0 (0)	
Marital Status			0.875
Single	17 (68.0)	15 (65.0)	
Married	6 (24.0)	6 (26.1)	
Other	2 (8.0)	2 (4.3)	
Highest Education			0.654
Did not complete high school	2 (8.0)	3 (8.7)	
Completed high school	10 (40.0)	6 (26.1)	
Some college to post graduate work	13 (52.0)	14 (60.9)	
Total Household Income			0.198
Less than \$29,000	15 (60.0)	14 (60.9)	
\$30,000 – 79,000	6 (24.0)	2 (8.7)	
\$80,000 and above	2 (8.0)	5 (21.7)	
No response	2 (8.0)	2 (8.7)	
PA - MET-hours / week			0.823
Low (< 27 MET-h/day)	16 (64.0)	14 (60.9)	
High (> 27 MET-h/day)	9 (36.0)	9 (39.1)	
PA - Hours / week			0.709
Low (< 5.5 hr/wk)	15 (60.0)	15 (65.2)	
High (> 5.5 hr/wk)	10 (40.0)	8 (34.8)	
Leisure Screen Time (hours/day)			0.175
Low (< 3 hr/day)	11 (44.0)	14 (60.9)	
High (> 3 hr/day)	11 (44.0)	9 (39.1)	
No response	3 (12.0)	0 (0.0)	

Descriptive variables were split into 3 categories and PA was split into dichotomous (high and low) variables as described above in Section 4.2.5. Parent perception of self-weight was collapsed into ‘underweight/average’ and ‘overweight.’ Stage of readiness to change was not related to parent’s gender, age, ethnicity, self-described weight, parenting style, marital status, education level, household income, PA (MET-hr/week or hr/week), or hr/day screen time (table 12).

4.2.7 Specific Aim 7: To examine parental characteristics associated with barriers to engaging the child in weight control behaviors.

A Kruskal-Wallis analysis was used to examine differences in barrier score by parent descriptive characteristic. The parent’s perceived barriers to engaging the child in weight control behaviors were ranked on a 4-point likert scale, and scored as previously described. Results are displayed in table 13 as mean \pm standard deviation. There were no differences in barrier score by parent’s gender, age, ethnicity, self-described weight, parenting style, marital status, household income, PA (MET-hr/week or hr/week), or hr/day screen time (table 13). However, the parent’s education level and barrier score approached, but did not reach significance ($X^2=5.997$, $p=0.05$) with a-priori significance set < 0.05 .

4.3 EXPLORATORY ANALYSIS

Follow up questions were asked to parents after completion of the study questionnaire. Follow-up questions required the parents to report individuals who have expressed concern for their

Table 13. Parental Characteristics and Barriers to Engaging Weight Control Behaviors			
Descriptive Variable		Barrier Score (mean \pm standard deviation)	P value
Gender			0.471
	Female	26.62 \pm 8.14	
	Male	23.50 \pm 6.71	
Age (years)			0.697
	Less than 24	27.60 \pm 10.26	
	25 to 39	25.61 \pm 8.01	
	40 or older	27.88 \pm 6.77	
Ethnicity			0.902
	White, non-Latino	27.20 \pm 7.56	
	African-American	25.85 \pm 7.84	
	Other	26.50 \pm 9.57	
Self-Described Weight			0.254
	Underweight/Average	25.55 \pm 8.57	
	Overweight	26.68 \pm 7.68	
Parenting Style			0.680
	Authoritative	25.93 \pm 7.92	
	Authoritarian	26.46 \pm 8.26	
	Permissive		
Marital Status			0.641
	Single	25.65 \pm 8.77	
	Married	28.08 \pm 6.43	
	Other	25.33 \pm 3.21	
Highest Education			0.050
	Did not complete high school	32.50 \pm 5.06	
	Completed high school	23.12 \pm 7.93	
	Some college to post graduate work	27.18 \pm 7.75	
Total Household Income			0.332
	Less than \$29,000	24.75 \pm 7.89	
	\$30,000 – 79,000	30.00 \pm 8.65	
	\$80,000 and above	28.00 \pm 7.25	
	No response	24.75 \pm 7.67	
PA - MET-hours / week			0.418
	Low (< 27 MET-h/day)	25.33 \pm 8.28	
	High (> 27 MET-h/day)	27.38 \pm 7.41	
PA - Hours / week			0.685
	Low (< 5.5 hr/wk)	25.56 \pm 7.41	
	High (> 5.5 hr/wk)	27.00 \pm 8.92	
Leisure Screen Time (hours/day)			0.723
	Low (< 3 hr/day)	26.36 \pm 7.18	
	High (> 3 hr/day)	25.95 \pm 9.46	
	No response	25.00 \pm 3.61	
People Living in the Home			0.358
	\leq 3 people in the home	25.00 \pm 7.56	
	> 3 people in the home	27.20 \pm 8.33	

child's weight. A Fishers Exact test was used to examine the relationship between those who have expressed concern for their child's weight and parent's accurate perception of child weight. Results are displayed in table 14. Parents who have been notified by a pediatrician ($p=0.0001$), family member ($p=0.013$), grandparent ($p=0.042$), or spouse/other parent ($p=0.013$) were more likely to perceive their child as overweight. There was no relationship between parents who were notified by a school nurse, teacher, or the child's coach and perception of child weight (table 14).

Additional exploratory analyses examined the relationship between parental concern for future weight, and parent perception of child weight, stage of readiness to change, and barriers to behavior change. A spearman-rho non-parametric rank order correlation was used to analyze the relationship between parent concern for future overweight in their child, and perception of

Table 14. Exploratory Analysis – Expressed Concern for Child Weight					
Expressed Concern	Perceived child to be overweight (n = 22)		Did not perceive child to be overweight (n = 26)		Fisher's Exact P value
	(n)	(%)	(n)	(%)	
School Nurse					0.302
Expressed Concern	7	31.8	4	15.4	
Did not Express Concern	15	68.2	22	84.6	
Pediatrician					*0.0001
Expressed Concern	17	77.3	5	19.2	
Did not Express Concern	5	22.7	21	80.8	
Family Member					*0.013
Expressed Concern	13	40.9	2	7.7	
Did not Express Concern	9	59.1	24	92.3	
Grandparent					*0.042
Expressed Concern	9	40.9	3	11.5	
Did not Express Concern	13	59.1	23	88.5	
Spouse / Child's other parent					*0.013
Expressed Concern	9	40.9	2	7.7	
Did not Express Concern	13	59.1	24	92.3	
Child's Coach					0.392
Expressed Concern	4	18.2	2	7.7	
Did not Express Concern	18	81.8	24	92.3	
Teacher					0.165
Expressed Concern	4	18.2	1	3.8	
Did not Express Concern	18	81.8	25	96.2	

overweight in their child, parent stage of readiness to change, and barriers score. The results in table 15 show there was no relationship between parent perception of child weight ($p=0.190$), and parent stage of readiness to change ($p=0.403$), or parental perceived barriers to behavior change ($p=0.393$) and parent concern for future weight in their child.

Table 15. Exploratory Analysis – Parent Concern for Future Weight		
Behavioral Construct	Correlation Coefficient	P value
Perception of Child Weight	$r = 0.193$	0.190
Readiness to Change Behavior	$r = -0.124$	0.403
Barriers to Behavior Change	$r = -0.126$	0.393

4.4 SUMMARY

The study found that parents did not perceive their child's weight accurately. There was a significant positive relationship between parents who perceived their child's weight accurately and stage of readiness to change. However, there was no significant relationship between parent perception of child weight and barriers to engage the child in weight control behaviors. Furthermore, there was no significant relationship between stage of readiness to change and barriers to engage the child in weight control behaviors. When parental descriptive characteristics were analyzed to determine characteristics of parents who accurately perceived their child as overweight, only parental age (older parents) and marital status (parents who were

married) was associated with the parent perceiving their child as overweight. However, none of these parental descriptive characteristics were associated with parents' stage of readiness to change or perceived barriers. Exploratory aims found that parents, who were notified that their child was overweight by a pediatrician, family member, grandparent, or spouse/other parent, were significantly more likely to perceive their child's weight accurately.

5.0 DISCUSSION

5.1 INTRODUCTION

The primary aims of this investigation examined parental perception of child weight, parental readiness to change for their child's weight, and parents' perceived barriers to engage their child in weight control behaviors. Specifically, this investigation sought to determine: 1) accuracy of parental perception of child weight; 2) relationships between parental perception, parental readiness to change, and perceived barriers; 3) characteristics of parents who score differently on perception of weight, readiness to change, and perceived barriers.

Parents were found to misperceive their child as less overweight than objectively measured (table 9 and 10). Additionally, parental perception of child weight was positively associated with readiness to change weight control behaviors in the home. Specifically, parents who accurately classified their child as overweight were also at a higher stage of readiness to change behavior. However, contrary to the study hypothesis, parental perception of child weight (figure 3) and parental readiness to change weight control behaviors (figure 4) were not associated with the parent's perceived barriers to engage their child in weight control behaviors. Furthermore, significant predictors of the parent's perception of their child's weight were their age and marital status (table 11). The study did not find any defining characteristics of parents

who were at higher stage of readiness to change (table 12) or parents who perceived greater barriers to engage their child in weight control behaviors (table 13).

The following sections will discuss the interpretation and practical significance of these findings, as well as the strengths, limitations, and future directions. However, the results and interpretation of these findings should be done so with caution for a number of reasons. First, the recruitment methods used for this study may have resulted in a sample of participants that are not representative of the general population, which may limit the generalizability of these findings. Moreover, this study did not plan for recruitment of parents with specific characteristics for analysis of the secondary aims. For example, this study did not plan for recruitment of parents into equal categories for age, gender, race/ethnicity, body weight, socioeconomic status, personal amount of physical activity, or parenting style. Thus, it is recognized that this study has limited statistical power to examine these secondary aims, which is a limitation of this study.

5.2 PARENTAL PERCEPTION OF CHILD WEIGHT

Approximately 77.1% of parents in this sample perceived their child were less overweight than they were found to be (table 9). The reported misperception was 17.1% higher than the hypothesized 60% misclassification. When these data were dichotomized into parents who perceived their child as overweight at any category, versus parents who perceived their child as normal weight; the results showed that 54.2% of the sample misrepresented their child's weight status (table 10).

These results are in agreement with previous investigations measuring parental perception of child weight. Parry and colleagues published a review on parental perceptions of overweight status in children and determined that more than 50% of parents cannot recognize when their child is overweight [50]. Furthermore, Rudolph and colleagues investigated parental awareness of overweight in themselves and their children. Of the parents with overweight children, only 69.4% perceived their child to be overweight, and 28.6% as very overweight, where as 83% of Rudolph's sample were actually obese [114]. Additional studies found that 79% of mothers of overweight children did not perceive their child as overweight [115], Adams found that 84.9% of caregivers of overweight children did not recognize their child as overweight [117], and Young-Hyman found that only 64% of parents of obese and 'superobese' children did not describe their child as 'very overweight' [118].

Several factors may explain the childhood obesity perception disconnect. Qualitative studies have reported that parents had a limited understanding of how childhood overweight and obesity is actually defined. Parents reported that they struggle with comprehension of the measures that are typically reported [113]. Therefore, parents reported using a range of alternative approaches to determine if their child is overweight including: comparing their child to extreme cases of obesity (as seen in the media) as a reference point, comparing their child to peers, and reliance on feedback from family members [113].

The severity of the perceptual disconnect in this study may be partially explained through the demographics of the sample. The sample was primarily composed of individuals who reported lower income, lower education level, and minority ethnic background who have a documented higher prevalence of obesity in youth and adulthood [151]. As a weight status comparison, the child's peers (of similar socioeconomic status) are presumed to be more

overweight themselves and further skew the parent's perception of what is normal. A presumption exists that "what is common is alright" and therefore heavier weights may become more culturally acceptable [50, 122].

Furthermore, many studies examining the parent's perception of the child's weight have recruit participants from an established weight management clinic, which would influence the parent's perception of their child's weight [53, 114]. This sample was recruited from the general population, thus potentially leading to greater misperception than reported in other studies. Additionally, a potential weakness of this investigation is the manner in which parents were recruited. Letters were sent to parents of children participating in a University of Pittsburgh community program that promotes physical activity and health, which may have skewed the parent's views of their child's weight.

It may be necessary for clinicians to inform parents about how severe their child's weight is and/or anchor parents with pictorial or video descriptors, to what is normal, and what is abnormal weight in youth. Providing parents with accurate reference points may increase the parent's perception accuracy in their own child. Once a parent perceives their child to be overweight, they may be more likely to express concern about their child's weight, and possibly act to initiate weight control behaviors [52, 53].

5.3 ASSOCIATIONS BETWEEN PARENTAL PERCEPTION, STAGE OF CHANGE AND BARRIERS

5.3.1 Parental Perception of Child Weight and Parental Stage of Readiness to Change

Parental perception of child weight was significantly associated with parental stage of readiness to change behaviors for their child's weight. Specifically, as parents more accurately perceived their child as overweight, they were more likely to be in the preparation and action stages of change.

Similar to the present study, Rhee and colleagues investigated parents of overweight 2-12 year olds. Rhee reported a positive relationship between parental perception of child weight and the parent's stage of change [53]. The previous investigations reported that parents who perceived their child to be overweight were 16 times more likely to be in the preparation and action stages than parents who did not perceive their child to be overweight. Furthermore, a study by Howard [152] investigating parental perceptions and readiness for change proposed that parents at the precontemplation stage were: 1) unaware that their child is overweight; 2) unaware of the health risks associated with overweight; 3) and unaware of their contribution to their child's health behaviors. Howard also proposes that increasing a parent's awareness of their child's weight should be a primary purpose of intervention for a parent in the precontemplation stage, and awareness of the severity of the weight problem will help facilitate movement through the other stages of change [152].

Although the association between parental perception of child weight and stage of readiness to change was significant, the correlation was weak ($r=0.35$). This suggests that there may be some parents who perceive their child's weight accurately but are uncooperative in changing their own behaviors. The lack of parental motivation to change behavior has been

reported previously by Golan and colleagues, stating that some parents believe that changing food and activity in the home threatens the parent's personal freedom [102]. Thus, two key factors related to motivation for changing behavior, importance of the behavior and confidence to make changes to the targeted behavior, may need to be the focus of interventions for parents to implement effective approaches to prevent and treat childhood obesity.

5.3.2 Parental Perception of Child Weight and Parental Barriers

Parental perception of child weight was not associated with the parent's perceived barriers. This was contrary to the study hypothesis that parents who accurately perceive their child as overweight will report greater presence of weight control barriers (figure 3).

This is one of the first investigations to examine the relationship between parent perception of child weight and perceived barriers to behavior change. The previous evidence suggests that, even when a parent accurately perceives their child as overweight and appreciates the impact of obesity on their child's health, the parent may still be overwhelmed by what they see as barriers to changing family behaviors, may feel confused by the plethora of messages about strategies for addressing the problem, and may have low confidence in their ability to overcome the barriers [55, 62, 128]. It was hypothesized that parents who perceive their child's weight accurately, and also perceive large barriers to weight loss, may be more conscious of health, and the cognizant of the inherent difficulty to change behavior.

The parents who perceived their child as normal weight are not aware their child has a weight control problem, likely have never attempted to change weight control behaviors, and, thus, have no experience with barriers to weight control, as similarly reported in a study by Myers and Vargas [121]. However, once a parent perceives their child to be overweight, barriers to them making then necessary changes to address the weight status of their child may become

more apparent. For example, qualitative investigations have described that parents of children who are currently participating in a weight management program reported large obstacles to behavior change including child resistance, time costs, financial burden, and resistance from other family members [131]. Thus, it may be important to first address the parent's ability to accurately identify that their child is overweight, which should then be followed by identifying strategies to assist parents to overcome barriers that they experience related to eating and physical activity behaviors that influence the weight of their child.

5.3.3 Parental Stage of Readiness to Change and Parental Barriers

The hypothesis that parents who report a greater readiness to change behavior will report less presence of weight control barriers was not supported. The parent's stage of readiness to change was not associated with perceived barriers to engaging their child in weight control behaviors (figure 4).

Though barriers to weight control make behavior change difficult [131], the intensity of the barrier may not be related to the parent's perceived importance and confidence in overcoming barrier [153]. Parents who did not perceive their child is overweight, and are at lower stages of change are unaware that their child has a weight control problem, and, thus, may have never tried to change behaviors in the home. Therefore, those parents may have no experience with overcoming weight control barriers for behavior change. The parents who report higher stages of change may be motivated to change behavior, but may vary largely in their perception of barrier severity. Furthermore, parents in higher stages of change may differ in regards to what behaviors they are actively attempting to change [131]. For example, a study by Jakubowski and Rofey reported that at the completion of a weight management treatment program, parents were in the action stage of change for some weight control behaviors, but not others [128]. The investigators

proposed that some weight control behaviors (such as increasing fruit and vegetable intake) are easy to change because it involves a specific dietary behavior, while other weight control behaviors (such as increasing portion control) may be difficult for parents as it is a more comprehensive and daunting change that affects most dietary choices [128, 154]. It is possible that this investigation did not measure broad weight control barriers that draw a definitive conclusion regarding parental confidence to change behaviors.

5.4 CHARACTERISTICS OF PARENTS: PERCEPTION, STAGE OF CHANGE, BARRIERS

5.4.1 Parent Characteristics and Parent Perception

It was hypothesized that parents who perceive their child's weight inaccurately will be more overweight themselves, report a lower socioeconomic status, participate in low amounts of physical activity, report a passive parenting style, and report minority ethnic origin. The results of this investigation did not support those descriptive characteristics, with only parental age and parental marital status found to be significant characteristics of parents who perceive their child is overweight (table 11).

Previous investigations have found that parents who misperceive their child's were more likely to be mothers, have lower education, and lower household income [49, 50, 112]. Additionally, many studies have found that parents of a minority ethnic origin were more likely to misperceive their child's weight [34, 49, 50, 112, 121]. Investigators have reported that parents of a minority ethnic origin often misperceive their child's weight because of a cultural acceptance of larger body size, skepticism of official measure of child obesity, and a culturally

held value that overweight children are ‘cuter and healthier’ [50, 112, 113, 122]. These factors may have influenced the results of the current study, which may have biased the results and limited the generalizability of these findings. For example, within the current study, a high percentage of the parents were the mothers of the children (83.3%), African-American (72.9%), having a high school education or less (41.7%), and having a household income of <\$20,000 (52.1%).

This is one of the first investigations to report on the relationship between parenting style and parental physical activity habits on parental perception of child weight. Although it was hypothesized that a passive parenting style will have a significant relationship with parental perception, no subjects in this sample self-reported a permissive parenting style. The lack of any parents self-reporting a permissive parenting style limited the ability to examine this hypothesis, and this is identified as a limitation of this study. Furthermore, it was speculated that a physically active parent would be more cognizant of weight and health related issues compared to an inactive parent. When physical activity was dichotomized into high and low categories based on volume of exercise (hours/week) and intensity of exercise (MET-hours/week) no relationship to parenting perception was found. It is recognized that a self-reported measures of total physical activity was used in this study, which may have biased the data, and this is recognized as a limitation in this study.

Contrary to many other studies on parent perception, parent age was found to be a significant predictor of parental perception of child weight, with older parents having a more accurate perception of overweight or obesity (table 11). Although Brown and Ogden found that older parents expressed more control snacks in the home [155], overall, studies on the influence of parental age on child health have not yielded conclusive results.

Parent marital status was also found to be a significant predictor of parental perception of child weight. Parents who are married were more likely to perceive their child as overweight than single parents. Although parent marital status is not often reported in perception studies, marital status has been found to be a significant predictor of obesity prevalence in families [156]. The misperception in single parent households is explained by these parents often being under more stress [157], single mothers in particular have less income [158], education, and occupational prestige [159], and more frequently suffer from major depressive episodes [160] that could affect level of priority a parent places on child weight.

The lack of association between parental weight and perception of the child's weight should be interpreted with caution. A limitation of this investigation was that weight of the parent was based on self-report rather than on an objective measurement. Thus, while it was hypothesized that parent weight would be associated with the perceived weight of the child, this study is unable to conclusively determine when this association is present.

5.4.2 Parent Characteristics and Parental Readiness to Change

The investigation found no significant characteristics of parents who are preparation and action stages of change (table 12). This was contrary to the study hypothesis that parents who report a greater readiness to change behavior will report a greater socioeconomic status, greater amounts of physical activity, authoritarian and authoritative parenting styles, and will be less overweight.

Rhee and colleagues investigated factors associated with parental readiness to make changes for overweight children [53] and found that parent age, parent education, parent marital status, parent weight status, parent perception of child weight, and parent perception of self weight were all significant predictors of placement in the preparation and action stages of

change. The authors suggest that parents with lower education and lower income believe that the child's weight is something they will grow out of and that the child is not in need of change [53, 161]. Additionally, parents who are overweight themselves and perceive themselves as overweight may have a greater influence of personal factors, such as previously failed diet and exercise programs which may detracted the parents' confidence and prevented them from moving to a more active stage of change for their children. Furthermore, it is possible that these parents believe that their child's weight has a genetic cause that is not controllable through behavior change [53]. Other studies suggest similar demographic factors affect adoption of weight control behaviors [85, 102, 162, 163]. However, due to the lack of objective assessment of the parent's weight, this study is unable to examine whether these finding would be present in this sample of parents.

This is one of the first investigations to analyze the effects of parenting style on parental readiness to change behavior. Unfortunately, this sample yielded no parents who self-reported a permissive parenting style, thus making this relationship impossible to measure, which is recognized as a limitation in this study. Furthermore, this sample is relatively homogeneous with most parents having similar income, education, ethnic background, parenting style, marital status, and gender. Lastly, parent weight was not objectively measured. A larger and more heterogeneous sample with measures of parent weight, such as in the Rhee study [53], may have elicited significant differences between parents in the precontemplation/contemplation and preparation/action stages of change.

5.4.3 Parental Characteristics and Parental Barriers

Similar to the aforementioned stage of change results, there were no significant differences in characteristics of parents who perceived differing high versus low barriers to engaging their child in weight control behaviors (table 13). This did not support the hypothesis that parents who report fewer barriers to changing weight control behaviors will report less family members living in the home, greater socioeconomic status, greater amounts of physical activity, will be less overweight, and report authoritative and authoritarian parenting styles. Previous research suggest that when the parents presented a general atmosphere of involvement and parent warmth, children were more likely to obey parent direction and adopt healthy behaviors without much resistance [94, 164]. The hypothesis that a non-overweight parent would report less barriers was not able to be examined appropriately in this study due to the lack of an objective measurement of parent weight.

The most common barriers reported in previous investigations involve time cost of preparing healthy foods and supervising physical activity, financial costs of purchasing healthy foods and participating in physical activity, and child resistance to change [55, 130-132]. Typically, single parents report more difficulty overcoming these barriers than families with two parents in the home [131]. Two adults in the home allow for sharing of time for physical activity and food preparation. Furthermore, families with a higher household income may have more discretionary income that can be allotted to physical activity and fresh fruits and vegetables.

There was no association between barrier score and physical activity participation (hours/week or MET-hours/week) of the parent. Thus, it is possible that there is no translation between the parent's physical activity behavior and the barriers to increasing their child's physical activity behavior. The parent's motivation to do the behavior for himself or herself versus motivating the child to appreciate the same intrinsic motivation may be very different

behavioral constructs. However, the lack of an association between parental physical activity and perceived barriers to changing their child's behaviors related to weight control may also be a result of limitations identified for this study that include: 1) lack of objectively measured physical activity, 2) parents who do not perceive their child as overweight may also not perceive there to be barriers, 3) the possibility that this study did not assess the appropriate barriers that parents would be more likely to report.

There was no association found between perceived barriers to behavior change and number of people in the home. Studies have reported that having multiple family members in the home make it difficult to change one child's health behavior [93, 131, 165]. If one child must eat differently and do different activities than the rest of the family, the child is likely to feel deprived, scapegoated, or resentful, become resistant to the behavior change, and place further barriers on the parent [26, 27].

This investigation was not able to report significant associations between characteristics of parents and reported barriers to behavior change. Many of the previous investigations studying barriers to behavior change have large sample sizes with a generalizable sample of the population. As mentioned previously, the sample being studied was relatively homogeneous and was not a generalizable sample of the population, which potentially minimizes any potential differences in characteristics of parents who report a high barriers score. Moreover, as indicated above, parents who do not perceive their child as overweight may also not perceive the presence of barriers to changing their child's behaviors, and it is possible that this study did not assess the appropriate barriers that parents would be more likely to report.

5.5 PERCEPTION AND CONCERN FOR CHILD WEIGHT

Exploratory analyses were performed to examine if parent perception of child weight is influenced when another individual expresses concern for the child's weight. The results found that when a pediatrician, a family member, a grandparent, or the other parent/spouse expressed concern for the child's weight, the parent was more likely to perceive the child as overweight (table 14). The school nurse, coach, or teacher had no influence on parent perception of child weight after expressing concern.

Understanding what influences a parent's perception of their child's weight and the parent's approach to weight related issues is of primary importance in the treatment of obesity. Before the overweight child can be enrolled in an obesity treatment program, the child must be identified as having a weight problem. Often times, the child's pediatrician first identifies obesity, and as the results demonstrate, the influence of the pediatrician on the parent's perception of child weight is substantial. Furthermore, previous investigations have shown that when a parent reported that the child's physician made a comment about their weight, the odds that the parent would be at a higher stage of readiness to change increased to 10.8 [53]. Unfortunately, many pediatricians are uncomfortable with and fail to discuss obesity with parents, especially when the child's weight is not the parent's primary objective at that physician visit [45, 50, 166]. Understanding whether a parent is ready for this discussion can be key to creating a nonthreatening and productive interaction between parents and physicians. In addition, understanding which factors are associated with parental behavior change may help physicians feel more confident when trying to motivate parents [53, 167].

The results of this investigation are supported by the findings of Hernandez and colleagues who investigated parents' healthy weight perceptions and preferences regarding

obesity counseling in preschoolers [168]. The authors found that parents reported the child's pediatrician as the most valued advisor on child weight, with misclassification of child body image being strongly associated with absence of pediatrician comment on child weight. After the pediatrician, the most valued advisors on child weight was in order sequentially by the child's grandparents, other parent/spouse, and family members [168].

Surprisingly, expressed concern by the school nurse had no influence on parent perception of child weight. It is common for a school nurse to measure all children's height and weight at the beginning of each school year. If a child is found to be overweight or obese, many school nurses notify the parent by sending a letter home with the child describing their placement on a BMI growth chart [152]. Unfortunately, many parents do not favor 'official' methods of identifying overweight, showed limited understanding of how overweight is defined for children, had limited comprehension of the measures, and felt that they were irrelevant for their child [113].

It is possible that personal interaction, as would happen at a visit to the pediatrician or discussion with a family member, help influence a parent's perception of their child's weight. Furthermore, a pediatrician would be able to verbally explain the official methods for defining obesity and discuss obesity implications with the parents. Future investigations are needed to determine the appropriate approach and influence of healthcare professionals on parent perception of child weight.

Lastly, the exploratory analyses were performed to investigate if the parent's concerns for future child weight problems had a relationship with the parent's perception of child weight, parental readiness to change behavior, and the parents perception of barriers to engaging their child in weight control behaviors. Contrary to previous investigations [50, 53] the parents'

concern for future weight problems had no relationship with readiness to change behaviors or perception of child weight. This investigation had many weaknesses with the subject population that may have accounted for the lack of a significant finding.

5.6 LIMITATIONS AND FUTURE DIRECTIONS

This study had a number of strengths that included: 1) recruitment from the general population rather than from a weight management clinic, 2) examination of broad array of relationships that included parent perception of child weight, parent readiness to change, and barriers to engaging the child in behavior change in the same investigation. Thus, the assessment of these constructs outside of the weight management clinic may allow this study to understand some parents who have overweight or obese children in the general population. However, it is recognized that this study also had a number of limitations that may influence the findings and interpretation of the data from this study. These limitations are identified below.

5.6.1 Study limitations

This investigation was limited in several factors: 1) The sample was fairly homogeneous; 2) Many of the parents have never tried to change behavior; 3) Parent weight was not measured; 4) Parenting style was self-reported; 5) The degree of a barrier in the family may have been difficult for parents to report; 6) Study recruitment.

- 1) The sample used for this study was a relatively homogeneous. The majority of the subjects had similar ethnic background, income level, education, and marital status,

which may limit the generalizability of these findings beyond individuals with these similar characteristics. A more heterogeneous sample may have allowed for differences to be detected in the characteristics of parents who differ in their perception of their child's weight, stage of readiness to change behaviors for child weight, and perception of barriers to engaging their child in weight control behaviors. This limitation may partially explain the lack of hypothesized associations in this study.

Future Directions: Based on this limitation, future studies should implement a recruitment plan to allow for a more heterogeneous sample, which may improve the generalizability of the findings.

- 2) More than half of the parents in this sample did not perceive their child to be overweight at any level. This may have limited the ability of this study to fully examine barriers that parents encounter when attempting to change their child's weight or change behaviors associated with body weight. Moreover, previous investigations that reported parent barriers to engaging the child in weight control behaviors have recruited from weight management programs where the parents are actively trying to make changes, have confronted barriers, and were able to report on them. Thus, because the current study did not recruit from a clinical weight management clinic, direct comparison to these prior studies cannot be conducted.

Future Directions: Based on this limitation, future studies should compare barriers reported by parents recruited through pediatric clinical weight management programs to parents recruited from the general population whose child is not engaged in a pediatric clinical weight management program.

- 3) The parent's weight was not objectively measured in this study. Although a measure of parent weight was initially included in the study protocol, many parents expressed discomfort and stated they may not want to participate if their weight is measured. Thus, the need to rely on the self-reported weight the parent is recognized as a significant limitation in this study, because objective measures of parent weight have been found to be a significant predictor of parenting behavior regarding child health in prior studies. Thus, the lack of this finding in the current study may be due to the lack of an objective measurement of the parent's weight.

Future Directions: Based on this limitation, future studies should include an objective measurement of the parent's weight and body mass index.

- 4) The revised Parental Authority Questionnaire (PAQ-R) was used to measure parenting style. The PAQ-R is a validated questionnaire for parents that will provide a score that places the parent as either authoritative, authoritarian, or permissive [145, 147]. However, this is a self-reported measurement, and it is possible that perceived parenting style is different than actual parenting style. Moreover, all parents self-reported as either authoritative or authoritarian with no parents self-reporting a permissive parenting style. This limited the analysis of parenting style as a characteristic of parents who misperceive their child's weight, are at different stages of readiness to change, and perceive greater barriers to engaging their child in weight control behaviors.

Future Directions: Based on this limitation, future studies should implement methods to allow for objective assessment of parenting style.

- 5) Barriers were measured on a 4-point likert scale as described in section 3.4.2. Each question asked parents to rate the degree of the barrier to engaging the child in weight

control behaviors from non-existent, to small barrier, medium barrier, and large barrier. It may have been difficult for parents to differentiate if a barrier is considered 'small' or 'medium' in severity. Moreover, it is possible that the list of barriers did not include all potential barriers, which may have created response bias and influenced the interpretation of these findings.

Future Directions: Based on this limitation, future studies should first develop and validate a measurement of these barriers prior to implementation in a study to examine parental associations with the perceived barriers to addressing the weight status and behaviors of their child.

- 6) Subjects were recruited for this investigation using letters sent to parents who participate in a University of Pittsburgh community physical activity program. This convenience sample may have had a significant bias in regards to participation in physical activity and overall health behaviors. Thus, this sample was not a generalizable sample of parents in the Greater Pittsburgh Community.

Future Directions: Based on this limitation, future studies should implement a recruitment plan to allow for a more heterogeneous sample, which may improve the generalizability of the findings.

- 7) This study recruited 48 parent and children dyads, with this sample based on a power analysis prior to study initiation. However, the lack of heterogeneity was unexpected, which may have resulted in this study not having sufficient statistical power to examine the proposed hypotheses. Moreover, this study did not plan for recruitment of parents with specific characteristics for analysis of the secondary aims. For example, this study did not plan for recruitment of parents into equal categories for age, gender,

race/ethnicity, body weight, socioeconomic status, personal amount of physical activity, or parenting style. Thus, it is recognized that this study has limited statistical power to examine these secondary aims.

Future Directions: Based on this limitation, future studies should be conducted that have adequate statistical power to examine the primary, secondary, and exploratory aims that were originally proposed for this study. The results of this current study may provide pilot data to facilitate the calculation of appropriate sample sizes for these future studies.

- 8) The age range of the children in this study was 6-12 years of age. Thus, the conclusions from this study may not translate to children <6 or >12 years of age. Moreover, due to the relatively small sample size, secondary analysis to determine if the pattern of findings in this study might differ by the age of the child were not able to be conducted. This is recognized as a limitation to this study.

Future Directions: Based on this limitation, future studies should be adequately powered to allow for examination of how the age of the child influences the findings, and should also recruit children of a wider age range to determine if the results are consistent across a broad age range of children.

5.7 CONCLUSION

Although there have been many parent focused investigations that have analyzed perception of child weight, parent's readiness to change based on the transtheoretical model, and parent's perceived barriers to changing child/family behaviors, few studies have attempted to examine the interrelationships of these parent constructs and their impact on child weight control

behaviors. There is an alarming discrepancy between child weight and the parent's perception of the child's weight. Without accurate parent perception, the overweight child may not receive the treatment necessary to maintain healthy weight. Furthermore, many studies have determined parent readiness to change and perceived barriers to behavior change has a significant influence change in child weight and maintenance. The findings from this study suggest that parents may misperceive their child's weight, with many parents reporting that their overweight or obese child is normal weight. This may have implications for engaging these children and parents in appropriate interventions focused on childhood obesity. Furthermore, this study suggests that a relationship exists between the parent's perception of their child's weight and their readiness to change behaviors. Future studies are needed to further investigate these relationships in parents of overweight and obese children to establish and implement effective treatment programs.

APPENDIX A

ADVERTISEMENT

Needed: Parents and their Children for an Important Family Health Research Study



Participation Requires:

- Child must be 6 to 12 years old
- Filling out a Study Questionnaire
- A 45 minute in-person visit
- Height & Weight measurements will be taken and participants will be compensated for their time and effort

**To Participate or for more information,
contact Dave White at 412-648-8252.**



University of Pittsburgh

APPENDIX B

CONTACT TRACKING FORM

RECRUITMENT FORM:

1. *"Thank you for calling to find out more about our research study. My name is _____ and I would briefly like to tell you about this research study."*

2. Procedure for Describing the Study and Obtaining Verbal Consent to Conduct the Phone Screen: A description of the study will be read to participants, and this description includes important components of the informed consent process (see script below). Individuals who express an interest in participating in this study will be told the following to obtain verbal consent:

Investigators Component of Informed Consent: *"This study is being conducted by David White and Dr. John M. Jakicic from the University of Pittsburgh."*

Description Component of Informed Consent: *"The purpose of this research study is to examine parent and child health behaviors in families. Specifically, we are studying how different parents manage their child's food and activity habits. We are looking to recruit 48 parent/child pairs, with children ranging from 6-12 years old. As part of our study, we will be asking parents to complete questionnaires about their view of their child's health, the food and activity habits in the home, and parenting style. We will also collect you and your child's height and weight. This study does involve a visit to Pitt or partnering organization outside of the University of Pittsburgh that should last no longer than 45 minutes and there will be a \$50 compensation for participating. However, if we find at the appointment time that you or your child is not eligible, you will only be compensated \$15. All of the information we collect will be coded and any identifying information will be kept in a separate locked location away from the collected study data."*

Before enrolling you in this study, we need to determine if you are eligible. So, what I would now like to do is to ask you a few questions about your demographic background and questions about you and your child's physical health and medical history to determine if you appear to be eligible to participate in this study. It will take approximately 5 minutes to ask you all of the questions. If we complete the interview, I will ask you for your name, address, and telephone number so that we can contact you regarding your participation in this study. I will then schedule your study visit."

"Do you have any questions on related to any of the information that I have provided to you?"

Staff member will answer any questions or will defer these questions to the Principal Investigator or Co-Investigator when appropriate prior to proceeding. If the individual would like to think about their participation prior to proceeding with the Phone Screen, they will be provided with the telephone number that they can call if they decide to participate in the future.

Voluntary Consent Component of Informed Consent: *"Do you agree that the procedures that will be used to conduct this phone screen have been answered, and*

do you give me permission to ask you questions now as part of the initial Phone Screen?"

If the caller response is “*YES*”, indicate the participant’s agreement with this statement on the top of the next page, sign your name and date the form, and then complete the Phone Screen.

If the caller response is “*NO*”, thank the individual for calling and DO NOT complete the Phone Screen.

CONTACT TRACKING FORM

Phone Screening Consent:

The caller gives verbal permission to conduct the Phone Screening: YES NO

Staff Member Signature: _____ Date consent was given ____/____/____

Eligibility:

CHILD

"What is your child's height?": ____ft ____in BMI: _____

"What is your child's weight?": _____lbs BMI Percentile: _____
(must be $\geq 85^{\text{th}}$ percentile)

If the caller response is unsure of the child's height and weight, indicate that the child's height and weight is an important factor in determining the eligibility for this study. Ask the caller if it would be possible for them to measure their child's height and weight and call back when this can be reported accurately.

CHILD ASSENT: Communicate to the caller that they must gain verbal permission from their child to measure their body weight and height and report it back to the investigators. Remind the caller that this is research and these precautions must be taken with all participants.

"Do you feel comfortable measuring your child's height and weight? If so, do you give me verbal consent to ask you to obtain these measurements from your child in order to ensure eligibility in this study?"

YES NO

**If the caller responds with "no" thank them for calling and do not continue with the phone screen.

If the caller reports the child's height and weight, continue with the phone screen.

"What is your child's gender?": MALE / FEMALE

"How old is your child?": _____
(Must be between 6-12 years old)

"What is your child's date of birth?": ____/____/____

"Does your child have the presence of any psychological or physiological condition that may hinder normal diet and physical activity?"

YES NO

Ineligible

"Is your child participating in any other research study?"

YES NO

Ineligible Specify: _____

(Any study that would affect normal diet and/or physical activity habits would be exclusion)

"Is your child currently receiving treatment for any cardiovascular, orthopedic, psychological, neurological, or metabolic disorder or any other medical condition that could impact body weight?"

YES NO

Ineligible

“Is your child currently taking any medications and/or supplements that could affect metabolism and/or weight?”

YES NO

Ineligible

ALL BELOW CRITERIA MUST BE “YES” TO BE ELIGIBLE TO PARTICIPATE

Child is 6-12 years old: YES NO

Child is $\geq 85^{\text{th}}$ percentile for weight: YES NO

All above responses were “NO” YES NO

CHILD ELIGIBLE: YES NO

If child is deemed INELEGIBLE, thank the parent for calling and inquiring about the study. DO NOT CONTINUE THE PHONE SCREEN.

If the child is deemed ELIGIBLE, continue to the parent portion of the phone screen.

PARENT

“Thank you for providing information about your child. Now I have a few questions about you.”

“What is your gender?”: MALE / FEMALE

“Are you at least 18 years old and the primary guardian for the child?”

YES NO
Ineligible

**** NOTE:** If the adult calling is the primary guardian, but not the parent, they will need to provide the proper paper work to the PI prior to data collection prove guardianship.

“Are you the primary meal provider for your child? This is defined as the parent that is responsible for greater than 50% of the food decisions for the child.”

YES NO
Ineligible

If caller responds “NO” indicate that for the purpose of this study, it is necessary to have the child’s primary meal provider to produce the most accurate picture of the child’s health habits. State to the individual calling that the primary meal provider is welcome to call in and participate in the study. Thank the caller for inquiring about the study and discontinue the phone screen.

If caller responds “YES” continue with phone screen

“Are you currently, or did you previously participate in any other research study within the last 6 months?”

YES NO

Ineligible Specify: _____

(Any study that would affect normal diet and/or physical activity habits would be exclusion)

ALL BELOW CRITERIA MUST BE “YES” TO BE ELIGIBLE TO PARTICIPATE

Parent Male or Female: YES NO

Parent is primary meal provider: YES NO

Parent NOT participating in any research YES NO

that would affect outcome.

PARENT ELIGIBLE: YES NO

If parent is deemed INELEGIBLE, thank the parent for calling and inquiring about the study. DO NOT CONTINUE THE PHONE SCREEN.

If the parent is deemed ELIGIBLE, continue to collect contact information and schedule appointment date/time.

OR

If the caller is from a partnering organization: indicate the time and date that the research team will be at that site for data collection. The caller will be instructed as to the location of the data collection within the facility at that time. Remind the caller that their data collection will take approximately 45 minutes and they should schedule accordingly.

“All of the information you provided meets our study criteria and we can proceed to schedule an appointment date and time.”

Appointment date: ____/____/____ Appointment time: _____

“We will send you a letter with all of the information you will need for the appointment.”

CONTACT INFORMATION

Parent first name: _____

Phone number: ____ - ____ - ____

Child first name: _____

Address: _____

City _____ State _____ Zip _____

APPENDIX C

CHILD DATA RECORDING FORM

Title: *Parental Influences on Child Weight Loss: Perception, Willingness to Change, and Barriers*

PI: White, David A.

IRB: PRO13010070

CHILD DATA RECORDING FORM

ID: _____

Child Height (cm): _____

Child Weight (kg): _____

Child BMI (kg/m^2): _____

Child Birthday (month/day/year): ____/____/____

Child Age (years.months): _____

CDC Growth Chart

Child BMI Percentile: _____

Child Stature Percentile: _____

Child Weight Percentile: _____

APPENDIX D

PARENT QUESTIONNAIRE

PI: White, David A.

ID: _____
IRB: PRO13010070

Parent Health Behavior Questionnaire

Directions: Please fill out the questionnaire to the best of your ability. Mark your answer by placing an 'X' in the space provided by each question. Place only one response per question. If you have any questions, please ask the research staff.

ALL INFORMATION WILL BE CONFIDENTIAL

**** Please be as honest as possible! Your responses will help us learn what we can do to help other parents with their children's eating and physical activity!**

1) How would you describe your child's weight at the moment?

1	2	3	4	5
very underweight	underweight	normal weight	overweight	very overweight
_____	_____	_____	_____	_____

2) How concerned are you about your child becoming overweight in the future?

1	2	3	4
no weight concern	little weight concerns	some weight concerns	many weight concerns
_____	_____	_____	_____

TURN TO THE NEXT PAGE TO CONTINUE

**The following questions review what you are currently doing or have done in the past to help your child with his or her weight.

3) Have you ever cut down on the amount of juice/soft drinks that he or she drinks?

☐ Yes

☐ No

If you answered 'yes:'

How often within the last month did you enforce this change?

☐ All the time

☐ Most of the time

☐ Half of the time

☐ Some of the time

☐ Rarely

4) Have you ever cut down on the amount of snacks or candy that he or she eats?

☐ Yes

☐ No

If you answered 'yes:'

How often within the last month did you enforce this change?

☐ All the time

☐ Most of the time

☐ Half of the time

☐ Some of the time

☐ Rarely

5) Have you switched to lower fat milk?

☐ Yes

☐ No

If you answered 'yes:'

How often within the last month did you enforce this change?

☐ All the time

☐ Most of the time

☐ Half of the time

☐ Some of the time

☐ Rarely

6) Have you given your child more fruits and vegetables per day?

- ☐ Yes
☐ No

If you answered 'yes:'

How often within the last month did you enforce this change?

- ☐ All the time
☐ Most of the time
☐ Half of the time
☐ Some of the time
☐ Rarely

7) Have you helped your child exercise more (walk, run, ride a bike)?

- ☐ Yes
☐ No, he or she exercises the same amount
☐ No, he or she exercises less

If you answered 'yes:'

How often within the last month did you enforce this change?

- ☐ All the time
☐ Most of the time
☐ Half of the time
☐ Some of the time
☐ Rarely

8) Have you cut down on the amount of TV your child watches?

- ☐ Yes
☐ No, he or she watches the same amount
☐ No, he or she watches more

If you answered 'yes:'

How often within the last month did you enforce this change?

- ☐ All the time
☐ Most of the time
☐ Half of the time
☐ Some of the time
☐ Rarely

9) Have you cut down on the amount of time he or she can play on the computer or play video games?

- ☐ Yes
☐ No, he or she plays the same amount
☐ No, he or she plays more

If you answered 'yes:'

How often within the last month did you enforce this change?

- ☐ All the time
☐ Most of the time
☐ Half of the time
☐ Some of the time
☐ Rarely

10) Have you done anything else to help your child lose weight?

- ☐ Yes
☐ No

If you answered 'yes:'

Please describe what you have done: _____

How often within the last month did you enforce this change?

- ☐ All the time
☐ Most of the time
☐ Half of the time
☐ Some of the time
☐ Rarely

11) Was it hard to make these changes?

- ☐ Yes
☐ No
☐ Not sure

12) Are you currently making changes in your child's dietary behaviors or physical activity level more than 50% of the time?

- ☐ Yes
☐ No
☐ Not Sure

13) Are you thinking about making lifestyle changes to help your child lose weight?

- ☐ Yes
☐ No

If you answered "no", please skip the next two questions and go to question #16.

14) How ready are you to make these changes? (please circle a number on the scale)

Not ready to change

Ready to change

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

15) How likely are you to try to make changes in the next 6 months?

___ Not likely

___ Somewhat likely

___ Very likely

TURN TO THE NEXT PAGE TO CONTINUE

****Please rate if the following topics are barriers to adopting healthy behaviors in your family**

Barrier – an obstacle that prevents progress or successful diet and physical activity in your family

16) My child is resistant to change in foods

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

17) My whole family will be resistant to change in food choice

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

18) Preparing healthy foods takes too much time

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

19) I have little access to healthy food options

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

20) Healthy foods cost too much money

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

21) I am not knowledgeable of what healthy foods my child should or should not eat

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

22) My child resistant to change in physical activity level

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

23) My whole family will be resistant to change in physical activity

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

24) Participating in physical activity with my child takes too much time

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

25) I have little access to physical activity facilities

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

26) Participating in physical activities cost too much money

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

27) I am not knowledgeable of proper exercises for my child

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

28) It is too difficult changing the home environment (i.e. changing household rules to be more supporting of a healthy lifestyle)

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

29) My child's friends are a bad influence on their health behavior

1	2	3	4
Barrier does not exist	Small barrier	Medium barrier	Large barrier
_____	_____	_____	_____

TURN TO THE NEXT PAGE TO CONTINUE

PAQ-R

Instructions: For each statement below circle the answer that best describes your beliefs about parenting your child. There are no right or wrong answers. We are looking for your overall impression regarding each statement. In the row below the question, please CIRCLE your answer for each item:

1. In a well-run home, children should have their way as often as parents do.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

2. It is for my childrens' own good to require them to do what I think is right, even if they don't agree.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

3. When I ask my children to do something, I expect it to be done immediately without questions.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

4. Once family rules have been made, I discuss the reasons for the rules with my children.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

5. I always encourage discussion with my children feel family rules and restrictions are unfair.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

6. Children need to be free to make their own decisions about activities, even if this disagrees with what a parent might want to do.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

7. I do not allow my children to question the decisions I make.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

8. I direct the activities and decisions of my children by talking with them and using rewards and punishments.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

9. Other parents should use more force to get their children to behave.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

10. My children do not need to obey rules simply because people in authority have told them to.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

11. My children know what I expect from them, but feel free to talk with me if they feel my expectations are unfair.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

12. Smart parents should teach their children early exactly who is the boss in the family.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

13. I usually don't set firm guidelines for my children's' behavior.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

14. Most of the time I do what my children want when making family decisions.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

15. I tell my children what they should do, but I explain why I want them to do it.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

16. I get very upset if my children try to disagree with me.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

17. Most problems in society would be solved if parents would let their children choose their activities, make their own decisions, and follow their own desires when growing up.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

18. I let my children know what behavior is expected and if they don't follow the rules they get punished.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

19. I allow my children to decide most things for themselves without a lot of help from me.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

20. I listen to my children when making decisions, but I do not decide something simply because my children want it.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

21. I do not think of myself as responsible for telling my children what to do.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

22. I have clear standards of behavior for my children, but I am willing to change these standards to meet the needs of my child.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

23. I expect my children to follow my directions, but I am always willing to listen to their concerns and discuss the rules with them.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

24. I allow my children to form their own opinions about family matters and let them make their own decisions about these matters.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

25. Most problems in society could be solved if parents were stricter when their children disobey.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

26. I often tell my children exactly what I want them to do and how I expect them to do it.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

27. I set firm guidelines for my children but I'm understanding when they disagree with me.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

28. I do not direct the behaviors, activities or desires of my children.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

29. My children know what I expect of them and do what is asked simply out of respect for my authority.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

30. If I make a decision that hurts my children, I am willing to admit that I made a mistake.

Strongly Agree Agree Neither Agree nor Disagree Disagree Strongly Disagree

****Last Section. We just have a few questions about you!**

Gender: Male or Female (Circle One)

What is your age?

- ☐ less than 20 years
- ☐ 20 to 24 years
- ☐ 25 to 29 years
- ☐ 30 to 39 years
- ☐ 40 to 49 years
- ☐ 50 or older

How would you best describe your ethnic background?

- ☐ White, non-Latino
- ☐ Latino heritage
- ☐ African-American
- ☐ Caribbean
- ☐ African
- ☐ Native American
- ☐ Asian
- ☐ Pacific Islander
- ☐ Other, please specify _____

How do you describe your weight? (please check one)

- ☐ Very underweight
- ☐ A little underweight
- ☐ Average
- ☐ A little overweight
- ☐ Very overweight

What is your current marital status? (please check one)

- ☐ Single
- ☐ Married
- ☐ Divorced
- ☐ Separated
- ☐ Widowed

Besides you and your child, who lives in your house? (please check all that apply)

- ☐ Your partner
- ☐ Other children
- (How many children live in the household: _____)
- ☐ Your mother or father
- ☐ Your grandparents
- ☐ Other family members
- ☐ No one else
- ☐ Other _____

What was the highest grade in school you finished?

- ☐ Elementary school
- ☐ Middle school (up to 8th grade)
- ☐ Some high school (9th to 11th grade)
- ☐ High school graduate or GED
- ☐ Some college
- ☐ College graduate
- ☐ Post-graduate work

What is your total household income?

- ☐ Less than \$10,000
- ☐ \$10,000 to \$19,999
- ☐ \$20,000 to \$29,999
- ☐ \$30,000 to \$39,999
- ☐ \$40,000 to \$49,999
- ☐ \$50,000 to \$59,999
- ☐ \$60,000 to \$69,999
- ☐ \$70,000 to \$79,999
- ☐ \$80,000 to \$89,999
- ☐ \$90,000 to \$99,999
- ☐ \$100,000 to \$149,999
- ☐ \$150,000 or more
- ☐ No Response

THE RESEARCH ASSISTANT WILL HELP YOU WITH THE FINAL QUESTIONS!

**REMAINDER OF QUESTIONNAIRE

ADMINISTERED BY RESEARCH STAFF**

Modifiable Activity Questionnaire

1. Please circle all activities listed below that you have done more than 10 times in the past year from January 2011 to January 2012:

Jogging (outdoor, treadmill)	1	Football/Soccer	14	Stair Master	27
Swimming (laps, snorkeling)	2	Racquetball/Squash	15	Fencing	28
Bicycling (indoor, outdoor)	3	Horseback Riding	16	Hiking	29
Softball/Baseball	4	Hunting	17	Tennis	30
Volleyball	5	Fishing	18	Golf	31
Bowling	6	Aerobic Dance/Step Aerobic	19	Canoeing/Rowing/Kayaking	32
Basketball	7	Water Aerobics	20	Water Skiing	33
Skating (roller, ice, blading)	8	Dancing (square, line, ballroom)	21	Jumping Rope	34
Martial Arts (karate, judo, kendo)	9	Gardening or Yardwork	22	Snow Skiing (X-country, Nordic trk)	35
Tai Chi	10	Badminton	23	Snow Skiing (downhill)	36
Calisthenics/Toning Exercises	11	Strength/Weight Training	24	Snow Shoeing	37
Wood Chopping	12	Rock Climbing	25	Yoga	38
Water/Coal Hauling	13	Scuba Diving	26	Other	39
Walking for exercise (outdoor, indoor at a mall or fitness center, treadmill)					

List each activity that you circled in the "Activity" box below, check the months that you did each activity over the past year and then estimate the average amount of time spent in that activity. If participant did not participate in any activities, please check "X" the box below marked none.

ACTIVITY	None <input type="checkbox"/>												Average # of Times Per Month	Average # of Minutes Each Time	
	A C T #	J A N	F E B	M A R	A P R	M A Y	J U N	J U L	A U G	S E P	O C T	N O V			D E C

2. Excluding time at work, in general, how many HOURS per DAY do you usually spend watching television or working on the computer?
 _____ hrs

DEBRIEFING QUESTIONS

3. Have any of the following people ever mentioned or expressed concern for your child's weight?

<input type="checkbox"/> Pediatrician	<input type="checkbox"/> Teacher
<input type="checkbox"/> Grandparents	<input type="checkbox"/> Spouse/other parent
<input type="checkbox"/> Other parents	<input type="checkbox"/> Other family members
<input type="checkbox"/> Child's coach	<input type="checkbox"/> School nurse/psychologist
<input type="checkbox"/> OTHER: _____	

4. Is your child participating in any activity program or other program to manage body weight?

☐ Yes
☐ No

If yes, please tell us more about it: _____

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