

PARENT AND OTHER ADULT PRACTICES TO PROMOTE HEALTHY EATING AND  
PHYSICAL ACTIVITY IN CHILDREN

by

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B.S., University of Nebraska at Omaha, 2006  
M.P.H., Kansas State University, 2008

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Human Nutrition  
College of Human Ecology

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

2011

## **Abstract**

Insufficient physical activity, excessive sedentary behavior and insufficient fruit and vegetable consumption may contribute to childhood obesity. Parents and other adults provide social and physical environments, and build children's skills for these healthful behaviors. The purpose of this dissertation was to examine parent and adult practices that contribute to the prevention of obesity in children.

Chapter one reviewed the literature examining the influence of parent and adult practices on the development of young children's eating and activity self-regulation skills. Recently, studies have provided evidence that children who lack self-regulation skills are more likely to be overweight. However, there is a gap in the literature addressing practices necessary to foster young children's self-regulation. Thus, a need exists to identify parent and adult practices that foster the development of children's eating and activity self-regulation skills.

Chapter two described the development, validity and reliability of a self-report measure of parenting practices that may foster children's self-regulation skills. Parents of overweight/obese children use less parenting practices that foster self-reflection of screen time than parents of normal weight children.

Chapter three described the development and evaluation of an intervention designed to develop children's self-regulation skills to ask parents for healthful home environments. The 12-week intervention was delivered to children and their parents through training child care providers. Children's self-regulation for asking for healthy foods and activities increased after intervention, as well as increases in child eating and physical activity behaviors.

In addition to parents, other adults can impact children's environments to increase energy expenditure. Chapter four examined the influence of adult leader participation compared to no leader participation among children participating in active games. Results showed no effect of leader participation on children's physical activity. It may be that adult participation could not increase physical activity because the children were already exhibiting high levels of moderate-to-vigorous physical activity.

This dissertation provides preliminary evidence that parent/adult practices play a key role in the development of healthy eating and physical activity in children. Future research is

necessary to identify the most important parent/adult practices that can be targeted by interventions to provide healthful options and build children's skills to promote healthful behavior to prevent obesity.

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Approved by:

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## **Dedication**

*I dedicate this Dissertation in loving memory of my late uncle,  
John Henry Heinrichs.*

## Dissertation Introduction

The prevalence of childhood obesity has increased dramatically in the past 30 years,<sup>15</sup> and is an important public health concern requiring immediate attention. Additionally, children who are overweight and obese are more likely to become overweight adults.<sup>19,22</sup> From an energy balance point-of-view, childhood obesity can be prevented by increasing caloric expenditure through increased physical activity and/or decreased sedentary behavior and/or decreasing caloric consumption. Children's decisions to be physically active or sedentary, and their eating behaviors are made in the context of the choices parents and adults provide for them.<sup>7,17</sup> Additionally, young children (3-5 years) depend more on their parents and other adults for guidance and building their skills for making healthy choices compared to older children.<sup>21</sup> To make sustainable health behavior changes in children, parents and adults should be targeted to provide healthful options and build children's skills to promote healthful behavior to prevent obesity.

The physical (e.g., availability and accessibility of foods and activities) and social (e.g., parenting practices such as monitoring and limit setting) home environment influence children's eating and activity behaviors.<sup>6,11</sup> As such, parents should be targeted by interventions to provide parental practices that positively influence children's healthful behaviors. The obesity treatment literature provides evidence that intensive, parent-focused interventions can have a positive impact on childhood obesity.<sup>8</sup> Although parent-focused interventions have been successful, they may not be able to reach parents that need intervention the most. Thus, innovative strategies to reach parents are necessary to prevent childhood obesity.

To develop effective interventions, it is necessary to target the individual and environmental mediators or influences on health behavior change.<sup>2</sup> A review of individual and environmental mediators for nutrition behavior discussed that behavioral (individual) influences may be more important than environmental influences for healthful eating.<sup>4</sup> One possible individual-level (process) influence is self-regulation for eating and activity. A recent review of experimental studies of adult interventions promoting physical activity documented that self-regulation was the most influential process of behavior change.<sup>16</sup> Research on children has shown that lower levels of self-regulation leads to weight gain at a higher rate than children with



higher self-regulation.<sup>7</sup> A shift from primarily environmental (external) influences determining individual behavior to a greater contribution of individual (internal) psychological influences occurs with increasing child development.<sup>13</sup> Thus, parents and home environments need to be targeted to provide healthy options for young children, but also parents need to develop strategies to promote child self-regulation skills. When children are outside of the home and faced with eating and activity decisions, they either respond blindly to environmental influences or need to rely on their self-regulation skills to make healthy eating and physical activity choices. Given that the food and activity environments of developed countries are obesity promoting,<sup>20</sup> self-regulation is a necessary competency for healthful behavior. In addition to parents fostering these self-regulation skills, other adults such as teachers, may be able to teach self-regulation in children. There is considerable evidence to show that teachers and schools can develop self-regulation skills for academic learning<sup>3</sup> and there is evidence that teachers and schools can provide supportive environments for children's healthy eating and physical activity to prevent obesity.<sup>5,9,12,14,18</sup> Perhaps, adults other than parents can also be targeted to foster child self-regulation skills.

The primary focus of this dissertation was to examine parent and adult practices that contribute to the prevention of obesity in children. More specifically, the current dissertation is comprised of four chapters that examine the influence of parents and other adults on children's eating and physical activity behaviors, and self-regulation. Although these chapters are interrelated, each chapter proposes a specific hypothesis to understand the role parents and adults play in the prevention of childhood obesity.

The purpose of chapter one was to investigate parent and adult practices associated with the development of self-regulation and to examine existing measures of parent/adult practices to foster or discourage the development of child self-regulation skills. This chapter provides a model for examining hypotheses regarding how parents/adults foster the development of children's healthy eating and physical activity self-regulation skills.

The primary aim of chapter two was to develop a self-report measure of parenting practices that may foster children's self-regulation skills. Specifically, an exploratory factor analysis was conducted to explore new parenting practice constructs that may promote children's self-regulation. To establish criterion validity of the measure, we examined whether parenting practices promoting self-regulation were different for normal and overweight children, as well as

between children of different race/ethnicity and socioeconomic status. For predictive validity, we examined whether parental practices promoting self-regulation predicted children's fruit and vegetable intake, physical activity and screen time behavior.

Chapter three described the development and evaluation of the Healthy Opportunities for Physical Activity and Nutrition (HOP'N) Home intervention. The primary aim of the HOP'N Home intervention was to link child care settings to home environments by developing children's self-regulation skills to ask their parents for healthful home food and activity options. The 12-week HOP'N Home intervention was designed to combat the effects of advertising that prompts children to influence parents to purchase unhealthful food and activity options.

Lastly, chapter four examined whether other adults can improve children's environments to promote physical activity. According to Social Cognitive Theory,<sup>1</sup> adults organizing physical activity sessions can provide direct reinforcement and vicarious experiences to increase learning and motivation for healthful behaviors. As such, the purpose of this study was to examine the effects of adult participation in active games versus no adult participation among children playing organized active games on children's sedentary behavior and physical activity. We hypothesized that children would be more active with adult participation compared to no adult participation.

## References

1. Bandura A, Cervone D. Differential engagement of self-reactive influences in cognitive motivation. *Organ Behav Hum Dec.* 1986;38:92-113.
2. Baranowski T, Anderson C, Carmack C. Mediating variable framework in physical activity interventions. How are we doing? How might we do better? *Am J Prev Med.* 1998;15(4):266-297.
3. Bodrova E, Leon DJ. Self-regulation as a key to school readiness: how can early childhood teachers promote this critical competence? In M Zaslow & I Martinex-Beck (Eds), *Critical issues in early childhood professional development* (pp.223-270). Baltimore: Brookes.
4. Brug J, Kremers SP, van Lenthe F, Ball K, Crawford D. Environmental determinants of healthy eating: in need of theory and evidence. *Proc Nutr Soc.* 2008;67(3):307-316.
5. Coleman KJ, Tiller CL, Sanchez J, Heath EM, Sy O, Milliken G, Dzewaltowski DA. Prevention of the epidemic increase in child risk of overweight in low-income schools. *Arch Pediatr Adolesc Med.* 2005;159(3):217-224.
6. Cullen KW, Baranowski T, Owens E, Marsh T, Rittenberry L, de Moor C. Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children's dietary behavior. *Health Educ Behav.* 2003;30(5):615-626.
7. Davison KK, Jago R. Change in parent and peer support across ages 9 to 15 yr and adolescent girls' physical activity. *Med Sci Sports Exerc.* 2009;41(9):1816-1825.
8. Epstein LH, Paluch RA, Roemmich JN, Beecher MD. Family-based obesity treatment, then and now: twenty-five years of pediatric obesity treatment. *Health Psychol.* 2007;26(4):381-391.
9. Francis LA, Susman EJ. Self-regulation and rapid weight gain in children from age 3 to 12 years. *Arch Pediatr Adolesc Med.* 2009;136(4):297-302.
10. Franks A, Kelder SH, Dino GA, Horn KA, Gotmaker SL, Wiecha JL, Simoes EJ. School-based programs: lessons learned from CATCH, Planet Health, and Not-On-Tobacco. *Prev Chronic Dis.* 2007;4(2):A33.
11. Hendy HM. Comparison of five teacher actions to encourage children's new food acceptance. *Ann Behav Med.* 1999;21(1):20-26.
12. Hoelscher DM, Feldman HA, Johnson CC, Lytle LA, Osganian Sk, Parcel GS, Kelder SH, Stone EJ, Nader PR. School-based health education programs can be maintained over time: results from the CATCH institutionalization study. *Prev Med.* 2004;38(5):594-606.

13. Kopp C. The antecedents of self-regulation: A developmental perspective. *Dev Psychol.* 1982;18:199-214.
14. Llarques E, Franco R, Recasens A, Nadal A, Vila M, Perez MJ, Manresa JM, Recasens I, Salvador G, Serra J, Roure E, Castells C. Assessment of a school-based intervention in eating habits and physical activity in school children: the AVall study. *J Epidemiol Community Health.* 2011.
15. Ogden CL, Carroll MD, Curtin LR, Lam MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA.* 2010;303(3):242-249.
16. Rhodes RE, Pfaeffli LA. Mediators of physical activity behavior change among adult non-clinical populations: a review update. *Int J Behav Nutr Phys Act.* 2010;11(7):37.
17. Rosenkranz RR, Dzewaltowski DA. Model of the home food environment pertaining to childhood obesity. *Nutr Rev.* 2008;66(3):123-140.
18. Sallis JF, McKenzie TL, Alcaraz JE, Kolody B, Faucette N, Hovell MF. The effects of a 2-year physical education (SPARK) on physical activity and fitness in elementary school students. Sports, Play and Active Recreation for Kids. *Am J Public Health.* 1997;87(8):1328-1334.
19. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature. *Prev Med.* 1993;22(2):167-177.
20. Swinburn B, Egger G, Raza F. Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Prev Med.* 1999;29(6 Pt 1):563-570.
21. Van der Horst K, Oenema A, Ferreira I, Wndel-Vos W, Griskes K, Van Lenthe F, Brug J. A systematic review of environmental correlates of obesity-related dietary behaviors in youth. *Health Educ Res.* 2007;22:203-226.
22. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med.* 1997;337(13):869-873.

# **Chapter 1 - A review of parent and adult practices to foster eating and activity self-regulation in young children**

## **Introduction**

Child obesity is a growing public health concern. Current research suggests that being overweight ( $\geq 85^{\text{th}}$  percentile for age and gender) and obese ( $\geq 95^{\text{th}}$  percentile) in childhood is associated with increased risk for chronic disease, such as: metabolic syndrome, cardiovascular disease, type 2 diabetes, sleep apnea, osteoarthritis, hypertension.<sup>31,40,70</sup> Approximately 21% and 10% of preschool-aged children (3-5 years old) in the U.S. are overweight and obese, respectively.<sup>83</sup> The prevalence of overweight and obesity increases as children get older, with 20% of 6-11 year olds as obese, and almost 35% of school-aged children are overweight or obese.<sup>83</sup> Furthermore, overweight and obese children are more likely to become overweight adults.<sup>98,116</sup> Parents provide healthful options and build children's skills to promote healthful behaviors to prevent obesity. Children's decisions to be physically active or sedentary, and their eating behaviors are made in the context of the choices parents and adults provide for them.<sup>34,94</sup> Additionally, young children (3-5 years) depend more on their parents and other adults for guidance and building their skills for making healthy choices compared to older children.<sup>110</sup> To make sustainable health behavior changes in children, parents and adults should be targeted to provide healthful options and build children's skills to promote healthful behavior to prevent obesity. Young children are developing life-long habits, thus the early years are a critical period to shape healthy behaviors.<sup>17</sup>

There is much evidence to suggest that overweight and obesity is not a single faceted problem. While there are many factors associated with the increase with age,<sup>53</sup> targeting the prevention of overweight and obesity in young children may be a more effective route to solving the problem than treating obesity in later years. From an energy balance point-of-view, childhood obesity can be prevented by increasing caloric expenditure through increased PA and/or decreased sedentary behavior and/or decreasing caloric consumption.

Although no evidence-based quantitative guidelines exist for preschool-aged children's level of PA to prevent overweight and obesity, active play several times throughout the day is recommended.<sup>37</sup> Expert opinion suggests preschool-aged children engage in at least 60 minutes of structured and unstructured PA each day; and are not sedentary for more than 60 minutes at a time.<sup>81</sup> For children attending child care, the Institute of Medicine (2011) provides several recommendations for physical activity: 1) provide opportunities for PA for at least 15 minutes per hour; 2) provide daily outdoor time for PA; 3) care givers should participate in PA with children; 4) provide an outdoor environment with a variety of play equipment, grassy area, and adequate space per child; 5) provide an indoor environment with portable play equipment and adequate space per child; 6) avoid punishing children for being physically active; and 7) avoid withholding physical activity as punishment.

Although children attending preschool are thought of as being highly active, there is some evidence to suggest the reverse is true, and that children are not active. Pate and colleagues (2004) measured objective PA for children while attending preschool and found that children only spent 7.7 minutes per hour in MVPA.<sup>84</sup> This suggests that children spent approximately one hour in PA and it is unlikely they would achieve another hour outside of the preschool to meet PA recommendations. Current recommendations for school-age youth state that children should participate in 60 minutes or more of moderate-to-vigorous PA (MVPA) daily.<sup>108</sup> As part of the school-aged children PA guidelines, PA should be age (developmentally) appropriate, enjoyable, and offer a variety of activities. Objective data from a representative sample of U.S. children (NHANES) indicates that only 42% of children aged 6 to 11 years, and 8% of 12 to 15 year olds participated in 60 or more minutes per day of MVPA at least 5 days per week.<sup>104</sup> Since children decrease in PA from age three to four and five years<sup>102</sup> and this decrease in PA with age continues in later childhood,<sup>61,102</sup> thus, starting early to address a lack of caloric expenditure is of great importance.

In addition to targeting increased PA to increase caloric expenditure, addressing sedentary behavior may also be important. The American Academy of Pediatrics (2001), recommends that screen-based behaviors of children should be limited to less than 2 hours per day.<sup>1</sup> Higher TV viewing in preschool-aged children is associated with lower PA and higher body fat.<sup>55</sup> Similarly, Janz and colleagues (2002) showed low levels of vigorous PA and high television (TV) viewing were associated with body fatness in 4-6 year olds.<sup>57</sup> Preschool-aged

children that watch more hours per day of TV and those who watched for longer periods of time are less likely to engage in PA.<sup>39</sup> Children who are overweight engage in more TV viewing,<sup>50</sup> however it is unknown whether TV and sedentary behavior are associated with child overweight (due to lack of caloric expenditure, exposure to advertisements, food consumption in front of the TV), or if overweight children prefer sedentary opportunities.<sup>2,86,97,100</sup>

Finally, fruit and vegetable consumption is important in the prevention of obesity as it is associated with decreased consumption of energy dense foods, total energy intake and adiposity.<sup>19,93,112</sup> Current recommendations for fruit and vegetable (FV) consumption state that children aged 2-3 and 4-8 years should consume two cups, and two and one half to three cups of FV each day, respectively.<sup>107</sup> Guenther and colleagues (2006) examined FV intake in children and showed that approximately 48% of two to three year olds, between 5-10% of four to eight year olds (difference based on boys vs. girls), less than 4% of nine to thirteen year olds, and less than 2% of 14-18 year olds were meeting recommendations for FV intake.<sup>52</sup>

Research evidence supports the hypothesis that increased PA, decreased sedentary behavior and increased FV consumption are associated with an imbalance between energy expenditure and energy intake, the underlying mechanism in the development of childhood obesity.<sup>26,27,38,39,63,93,105</sup> Evidence suggests that there is a genetic influence on children's eating<sup>23</sup> and activity participation,<sup>59</sup> as well as child overweight and obesity.<sup>53</sup> However, genetics alone cannot explain the poor levels of PA, sedentary behavior, FV consumption and increase in obesity. Hence, it is important to understand and examine potential psychosocial mediators for children's healthy eating and activity behaviors.

Bauman and colleagues (2002) define mediators of behavior change as the “intervening causal variable” between a program or intervention and an outcome.<sup>9</sup> Simply stated, an intervention targets mediators to achieve a specific outcome. For example, an intervention may target parent PA social support (mediator) to increase child PA (outcome). Based on this framework, it is important to understand the identified mediators for young children's PA, sedentary behaviors, and healthful eating.

## ***Purpose***

The mediators of health behaviors are categorized into biological and demographic factors, psychological factors, behavioral factors, social and cultural factors, and physical

environment factors.<sup>28</sup> One critical setting to target and influence many types of mediators to prevent obesity in young children is home environments.<sup>94</sup> Parents are gatekeepers of young children's PA and nutrition opportunities because parents establish the home physical environment (availability and accessibility of food, physical activity and sedentary options) and social environment (parenting practices such as restriction, encouragement and limit setting).<sup>21,46</sup> Parents need to not only provide a healthy physical home environment, but parents also need to utilize parenting practices to foster the development of children's capacity (individual variables) for healthful behavior. Much of the evidence supports the notion that a healthy physical home environment (i.e., availability and accessibility of healthy foods and physical activity equipment) is necessary for the development of healthy eating and PA in children, however, children also need to be able to self-regulate their PA, sedentary, and eating behaviors.

Recent research suggests that the development of self-regulation skills is a central mediator of health behavior change. For example, a review of the mediators of change in experimental designs showed that changes in self-regulation constructs had the most effect on changes in physical activity in adults compared to constructs such as self-efficacy and outcome expectations.<sup>90</sup> This shift from environmental (external) to individual (internal) psychological factors occurs with increasing child development.<sup>64</sup> Psychological factors, such as the development of self-regulation in children becomes increasingly more important as children age, and make their own eating and activity decisions. For example, when children are at home the foods and activities that are available in the home influences what foods they eat and in which activities they participate. As children leave home to go to school or other activities outside the home, children are faced with food and activity decisions. Thus, children may need to develop self-regulatory skills to make healthy eating and PA choices. Children with lower levels of self-regulation gain weight at a higher rate than children with higher self-regulation.<sup>44</sup> A gap in the literature exists in addressing how parents and other adults influence the development of young children's self-regulation skills for PA, sedentary behaviors, and healthful eating to prevent obesity.

Young children are able to self-regulate their energy consumption,<sup>14</sup> however it is less clear on children's ability to regulate their physical activity and sedentary behaviors. Several studies have examined the influence of parenting practices on children's self-regulation ability. A recent review showed that parents influence the development of self-regulation in young



children.<sup>60</sup> Specifically, overly controlling parenting practices has negative implications for the development of children's self-regulation.<sup>11,41</sup> For example, parental use of restrictive feeding practices is associated with a decreased ability for children to use internal signals to regulate their energy intake.<sup>58</sup> Whereas parenting behaviors that are encouraging, teaching-based to guide behaviors and have children play a role in their own behaviors has positive implications for children's self-regulation.<sup>62,101</sup> For instance, children are better able to regulate their emotions when parents model those behaviors and use positive coaching strategies.<sup>36</sup> However, most studies examine parent behaviors that inhibit child self-regulation skills, and few studies have examined practices to foster child self-regulation.

The purpose of this paper is twofold; first, to describe the self-regulation of PA, sedentary behavior, and healthful eating in young children. Second, to describe the parent and adult practices associated with the development of self-regulation and to examine existing measures of parenting practices to foster or discourage the development of child self-regulation skills. The literature lacks explicit evidence for practices associated with young children's (aged 3-5 years) self-regulation, thus, this paper includes evidence from toddlers through adolescents. There is a gap in the literature such that, little evidence exists on the impact of parent/adult practices to develop self-regulation skills to prevent childhood obesity.

### **Self-Regulation and Child Obesity**

Self-regulation may be key mediator for children's PA, sedentary, and healthful eating behaviors. Self-regulation in young children has been shown to be positively associated with several longitudinal outcomes, such as greater social competence,<sup>74,78</sup> greater academic competence,<sup>78</sup> ability to cope with frustration,<sup>78</sup> and predict university entrance exam scores in adolescents.<sup>79</sup> Additionally, children with higher self-regulation at age four were rated by their parents ten years later to be more verbally fluent, have a greater ability to express ideas, have higher reasoning skills, greater competence, and greater ability to deal with stress more maturely and seemed more self-assured.<sup>78</sup> Recently, there is some evidence to suggest that self-regulatory skills impact the development of obesity. Sigal & Adler (1976) examined hunger motivation and delay of gratification in obese and nonobese boys. Results showed that compared to nonobese, obese boys lacked internal hunger cues and chose immediate rewards more frequently. This suggests that obese boys were less responsive to internal hunger cues and more responsive to

external cues compared to nonobese. Graziano and colleagues (2010) conducted a longitudinal study to examine self-regulation skills at age two, and overweight at age five. At age two, children participated in several videotaped laboratory tasks to assess self-regulation skills. Children watched a short video (5-min), and participated in several mother-child interaction tasks, such as a teaching task, free-play session, a compliance task, and a puzzle task. After these tasks, children participated in two emotion regulation tasks. For the first task, a desirable toy was placed in a clear box, and children were unable to open the box for two minutes. The second task, children sat in a high-chair without any toys for five-minutes and an observer recorded the children's emotion regulation and reactivity. Children also participated in a delay of gratification task to assess children's reward sensitivity and their inhibitory control skills. Children's heights and weights were measured at two and five years. Results showed that low self-regulation skills as a toddler was predictive of overweight and obesity at five years old. Similarly, Francis & Susman (2009) examined self-regulation capabilities at ages three and five years and measured BMI at six points over a nine-year period. Children participated in two videotaped behavioral procedures to assess children's ability to use self-regulatory skills. To assess self-control, children were introduced to a favorable target toy. Children were left alone with the toy and instructed to not touch the toy, but were allowed to play with other toys available in the room. Children were left alone for a total of 150 seconds. To assess delay of gratification, children chose candies, animal crackers or pretzels as their favorite food. Children were told they could eat the small pile of their favorite food at any time, but had to ring the bell and wait for the researcher to return. To eat from the large pile of food, children had to wait until the researcher returned on their own. Scores were dichotomized with children waiting at least 210 seconds as high on self-regulation, and less than 210 seconds were low. Children were classified into four groups based on self-control and delay of gratification: high self-regulation in both procedures; high in self-control only; high in delay of gratification only; and low in both self-control and delay of gratification. Results showed that compared to children that were high in self-control and delay of gratification, children who lacked self-regulation skills at age three and five were more likely to have the highest BMI z-scores at each follow-up point. These results suggest that self-regulation should be targeted in young children to prevent future child obesity.

Ability to delay gratification has also been associated with child weight status. At four years of age, a group of children participated in a pass/fail delay of gratification validated, self-imposed waiting task videotaped in a laboratory session. Children were to choose candy, animal crackers or pretzels as their preferred food. Children were left in a room with two plates (large and small quantity) of their chosen food and instructed that he/she would be allowed to eat the large quantity if he/she waited until the researcher returned. Also, the child could ring a bell that informed the researcher to come back into the room, and the child could eat the small quantity. Children were to be left alone for seven minutes, and were considered to “fail” the delay of gratification test if he/she rang the bell, ate any of the food, became distressed, went to the door or called for his/her parent or the researcher. Compared to children that passed the delay of gratification task, those children who failed were more likely to be overweight at age 11 (Seeyave et al., 2009). In a study of obese adults, increased self-regulatory skills were significantly positively associated with PA and fruit and vegetable consumption.<sup>3</sup> Thus, a need exists to target child self-regulation skills at a young age to prevent obesity.

Among the studies discussed, there is a lack of consensus on the definition of self-regulation.<sup>49,73,77,120</sup> For the purposes of examining sustained participation in health behaviors, we adopt a social cognitive definition of self-regulation that targets the development of personal agency.<sup>4</sup> From this perspective, self-regulation is defined as dealing with a broad range of social and situational environmental challenges through the processes of goal setting and goal striving.<sup>77</sup> Simply, self-regulation is the ability to do a goal-directed behavior in the face of environmental challenges.<sup>5</sup>

Zimmerman & Moylan’s (2009) Social Cognitive model of self-regulation for learning included three cyclical phases: forethought, performance, and self-reflection. First, the forethought phase precedes the behavior, and is where the processes of the behavior are learned. It is during forethought that an individual’s self-efficacy, outcome expectations, task value and goal orientation fosters their health behavior choices. As such, individuals learn and choose health behavior goals, and develop plans to accomplish the goal.<sup>120</sup> During forethought, an individual’s beliefs guide actions that lead to health behaviors.<sup>6</sup>

Second, the performance phase occurs while performing a behavior, and involves self-monitoring and self-control. Self-monitoring and self-control enable an individual to make healthy eating and PA choices. Self-monitoring is defined as the tracking of one’s behavior.<sup>120</sup>

Also as part of the performance phase is self-control. Self-control is defined by Karreman and colleagues (2006) as three processes: inhibition, emotion regulation, and compliance. The first process, inhibition is the ability to control impulses in reaction to unfamiliar objects and delay gratification.<sup>60</sup> As part of inhibition, is the ability to regulate emotions, which is how we modify our emotional reactions by recognizing, monitoring, and evaluating our reactions to accomplish one's goal.<sup>103</sup> Compliance is the ability to comply with a healthy goal. Kopp (1982) defines compliance as the ability for children to initiate, stop, or change their behavior based on parental requests.

Last, the self-reflection phase occurs after a behavior and influences an individual's reaction to their experience, which in turn influences their forethought (and the cycle repeats itself). Included in self-reflection is self-satisfaction, in which positive self-reflection will lead to increased self-satisfaction and continued health behaviors. On the other hand, negative self-reflection will lead to self-dissatisfaction and will lead to high motivation to change their behavior.<sup>7</sup> Self-satisfaction is the "cognitive and affective reactions to one's self-judgments".<sup>120</sup>

These phases of self-regulation can be applied to Mischel and colleagues' (1972) well-known delay of gratification cookie experiment.<sup>76</sup> Briefly, the cookie experiment tested how long young children (aged three to five) can resist eating a favorable, immediately available small reward (e.g., one cookie or other treat like a marshmallow or pretzel) in favor of a larger reward (two cookies). Children were randomized into five conditions: groups one, two, and three were the delay of gratification conditions where: Group 1) waited with a toy (overt distraction), Group 2) waited and were told to "think fun" (covert distraction), and Group 3) no distraction. In the control condition (no delay of gratification), group four had an overt distraction with a toy (but no reward), and group five had a covert distraction to "think fun" (but no reward). Results showed that children that were in the overt distraction group and were told to "think fun" were able to wait a much greater amount of time, followed by the overt distraction group with a toy. Children with no distraction or in the control condition had significantly quicker waiting times. To apply the three phases of self-regulation to Mischel's study, phase one, forethought, after receiving instructions from the researcher and prior to beginning the experiment, children would set a goal as to whether they would not wait and eat the non-preferred food item or wait and eat their preferred food item. Children's prior experiences and personal agency (e.g., self-efficacy, outcome expectations) would guide their goal-setting

decisions. During the performance phase (while children were to delay eating a favorable, immediately available reward), children would employ self-monitoring and self-control strategies to delay gratification. Self-monitoring would be used track their behavior to wait for the preferred food reward. Self-control would be used through inhibition, emotion regulation, and compliance. For inhibition, children were placed in one of three delay of gratification strategies, distracted with a toy, told to “think fun” or no distraction. Children would regulate their emotion while waiting for an immediate reward and this could be observed by watching the child be able to utilize appropriate distraction techniques or to become frustrated and upset and unable to distract themselves. Compliance would be applied to Mischel’s example by the child being able to comply with their goal (phase 1) of delaying gratification to receive the preferred food reward. Last, the self-reflection phase, children would reflect on their behavior (delaying gratification or not) and their satisfaction or dissatisfaction regarding their behavior. These phases are easily applied to Mischel’s respected delay of gratification research.<sup>73,75,76</sup>

### **Parenting Practices to Develop Child Self-Regulation**

Many parenting practices have been shown to be associated with children’s PA and healthy eating.<sup>13,20,46</sup> We define parenting practices as behaviors that directly and indirectly influence child eating, PA, and sedentary behaviors.<sup>32,66</sup> The literature also examines parenting style<sup>10</sup> defined as parent attitudes, beliefs and style that create an emotional climate in which child behaviors occur.<sup>32</sup> Parenting practices are strategies used and occur within the context of parenting style. Whereas, parenting style is thought of as being more stable over time and establishes the overall home environment climate.<sup>32</sup> Since parenting style is not an observable behavior (directly or indirectly) that parents use, and rather, describes characteristics of parenting, it will not be included in this review.

While several parenting practices have been shown to influence children’s behaviors,<sup>12,13</sup> the parenting practice literature rarely distinguishes between parenting practices designed to achieve an immediate behavior change and parenting practices designed to develop children’s capacity for self-regulation. For example, Birch and colleagues (2001) developed the Child Feeding Questionnaire (CFQ) to measure parental feeding control in a sample of five to nine year old children.<sup>16</sup> The CFQ measures several factors pertaining to parental perception: perceived responsibility, parent perceived weight, perceived child weight, and parental concerns

about child weight. Additionally, the CFQ identified three parenting practices related to their use of controlling feeding practices: monitoring, restriction, and pressure to eat. The CFQ framework suggests that parents who are more concerned about their child's development, and are more aware and interested in health/weight issues are more likely to exert higher levels of control. Higher parent control through monitoring, restriction, and pressure to eat target children's immediate behavior change and may have unhealthful consequences in the future, such as children's inability to self-regulate, eating in absence of hunger, and increased dietary, sweet, and savory food intake.<sup>22,60,66,113</sup> Parenting practices assessed as part of the CFQ do not target building the capacity of young children's self-regulation skills, and potentially inhibit self-regulation development.

Similarly, Kroller & Warschburger (2009) examined parental restriction, monitoring, pressure, use of rewards, and modeling on children's food intake, an immediate behavior. Unlike the CFQ, they assessed child control of their food intake, which targets the development of children's eating self-regulation. However, the authors only assessed immediate behavior change (child food intake) and not children's self-regulation skills. Child control and reward were positively, and negatively associated with healthy food intake, respectively. Only pressure was positively associated with unhealthy foods (Kroller & Warschburger, 2009). Thus, parenting practices that allow for children's control over their own food intake may also be associated with children's ability to self-regulate.<sup>67</sup>

In our conceptual model (Figure 1.1), we identified strategies to foster the development of PA, sedentary behavior, and eating self-regulation skills in children. These parenting practices include "positive persuasion",<sup>54</sup> "active parenting encouragement",<sup>35</sup> and "positive control",<sup>60</sup> where parents use "positive" control strategies about foods and PA. Positive control strategies are defined as deliberate comments and judgments and are associated with increased ability for children to self-regulate.<sup>60</sup> As such, these positive parenting practices include teaching, encouraging and guiding children's health behavior<sup>60,69</sup> to help foster children's *acceptance* of healthy eating and physical activity (Forethought Phase); *self-monitoring* and *self-control* for those behaviors (Performance Phase); and *reflection* and *self-satisfaction* with their eating and activity behaviors (Self-Reflection Phase). However, parental use of controlling, demanding and excessive control strategies to get children to set eating and activity goals and

engage in behaviors is associated with decreased healthy behaviors<sup>66,113</sup> and decreased ability to self-regulate.<sup>60</sup>

Some evidence suggests that parenting practices can inhibit the development of child self-regulation through excessive parent control.<sup>11</sup> Applying evidence from the self-regulation and child learning literature, children that take a more purposeful role in their own learning are more effective at self-regulation.<sup>119</sup> Additionally, Schunk & Zimmerman (1998) conclude that self-regulation processes for learning are teachable and can lead to increases in students' motivation and achievement.<sup>95</sup> Similarly, Zimmerman (2002) showed that parents, teachers, coaches, and peers play an essential role in children developing self-regulation (i.e., goal setting, performance, and self-evaluation) for learning.<sup>119</sup> These studies suggest that parents and adults play an important role in the development of children's self-regulation, and may apply to behaviors associated with childhood obesity.

Interventions that target parent and adult practices to foster self-regulation in children have been shown to be successful. Perels and colleagues (2009) developed a training intervention for kindergarten teachers to foster young children's (aged 4 to 6 years) self-regulation for learning.<sup>87</sup> Results showed that children significantly improved their self-regulated learning following the teacher training. Similarly, a multi-site intervention with teachers of children in preschool, kindergarten and first grade examined whether children of teachers that received the intervention would show more emotional self-regulation, social competence, teacher-parent involvement and absence of conduct problems. Teachers participated in one, 7-hour training per month for four months (28 hours). Trainings instructed teachers on ways to promote children's self-regulation and social competence, classroom management strategies, and how to involve parents in home-school behavior plans. Teacher's implemented the Dinosaur School intervention (Dina Dinosaur Social Skills and Problems Solving Curriculum) to promote child social competence, emotional self-regulation, and school behavior. Intervention teachers had students that showed more emotional self-regulation, social competence, and fewer conduct problems compared to control students.<sup>115</sup> Last, a teacher-based intervention to increase first graders' academic self-regulation skills compared to a control group was tested. The teacher intervention targeted teachers planning, classroom management and individualizing student instructor to foster academic self-regulation in their students. Results showed that students with lower self-regulation at pretest had greater self-regulation gains at

posttest compared to control students. Additionally, child self-regulation gains were greater when teachers implemented the intervention more fully.<sup>25</sup> These results show promise that parents/adults may be a key avenue to foster self-regulation in young children.

Parents play a key role in children's eating and PA behaviors,<sup>13,48,94</sup> and parenting practices are mediators for behavior change. However, there is a gap in the literature addressing parenting practices necessary to promote young children's self-regulation of PA, sedentary behavior and healthy eating. Existing measures of parenting practices to foster or inhibit the development of young children's self-regulation skills will be discussed based on Zimmerman and Moylan's (2009) cyclical phases of self-regulation. Table 1 provides a comprehensive list of existing measures of parenting practices related to child self-regulation.

### ***Forethought Phase***

During the Forethought Phase, parents employ practices that foster forethought and acceptance of the PA, sedentary behavior, and healthful eating goals. These include: discussion of the goal through limit setting, discussion of outcomes of the goal-directed health behavior, and child involvement in preparation of the healthy goal. Young children are developmentally not prepared to set their own goals, so parents need to foster goal-setting through positive control parenting practices. To develop forethought in children, parents should foster children's personal agency (i.e., self-efficacy, outcome expectations) for healthy eating and PA.

First, parental limit setting is included as goal-setting as it sets a goal for the amount of food a child should eat, or activity a child should participate in. However, parental limit setting typically does not foster children's goal-setting behavior. For example, Hendy and colleagues (2009) developed the Parent Mealtime Action Scale (PMAS) and parents reported snack limits using three questions: *During a typical week, how often did you set limits for how many... 1) sweets the child could have each day, 2) sodas the child could have each day, and 3) salty snacks the child could have each day.* Larios and colleagues (2009) also assessed parental limit setting for children aged 5-8 for sedentary behaviors, such as screen time (computer, television) as well as soda and snack food limits. Some of these questions included: *I limit the amount of time my child plays video games or is on the computer during the week (and during the weekend); and I limit the amount of time my child watches TV/videos during the week (and during the weekend).* Both of these behaviors were assessed via questionnaire would not foster the development of



child goal-setting as the parenting practices do include sharing the limit goal with their child or having their child assist in making the eating and activity goal. Controlling parenting practices such as limit setting without teaching children about the limit may not foster self-regulation in young children. Parents who use controlling practices may be more likely to have young children develop preferences for high-fat, energy-dense foods, inability to respond to internal hunger cues to regulate energy intake, and limit their acceptance of a variety of foods.<sup>17</sup> To relate the eating literature to PA and sedentary behaviors, it is possible that controlling parenting practices on children's PA would decrease their preference for PA. Similarly, parenting practices that limit screen time without allowing children to learn about the limit, could increase their preference for screen time and decrease their ability to regulate their screen time behaviors.

In a study with older children (aged 12-14 years), both parents and children completed the same questions about food limits. These questions were: Are there rules about... 1) *how much fruit servings the child should eat?* 2) *when the child should eat fruit?* 3) *how many snacks the child is allowed to eat?* 4) *when the child is allowed to eat snacks?* 5) *which snacks the child is allowed to eat?* 6) *how often the child should eat breakfast?* and 7) *what the child should eat for breakfast?*<sup>109</sup> These items may indicate that parents and/or children mutually made or children accepted the rules about the consumption of specific foods, which allowed the child to reflect on whether they accomplished their eating goals. Consequently, children need to be involved in the goal-setting process or at least understand and accept the health behavior goal.

To develop personal goals for PA, sedentary behavior, and healthful eating it is necessary to foster goal acceptance. Wilson and colleagues (2002) had children complete questions for FV consumption and PA. Examples of questions were, *I am very excited about eating more fruits and vegetables on a daily basis; I make it a priority to make sure that I eat healthy every day; I am very involved in making sure that I get plenty of exercise each day; and I am involved in planning a daily exercise program.* While these items include goal directed behaviors, they do not discuss parenting practices to foster child personal agency for PA and healthy eating, and limiting their sedentary behavior.

Vereecken and colleagues (2004) measured parenting practices to encourage child consumption of FV and participation in PA, and discourage sweets and soft drink consumption in children aged two to seven. Sample items included: *How often do you tell your child... fruit is good for you; vegetables taste good; sweets can make you fat; and soft drinks don't taste good.*

Cullen and colleagues (2000) developed a measure to assess parenting practices to encourage their child to eat a particular food by telling them: *this food will give him/her energy; it's good for his/her teeth; and it's good for him/her*, etc. Musher-Eizenman & Holub (2007) measured parental teaching about nutrition via two items: *1) I discuss with my child why it's important to eat healthy foods; and 2) I discuss with my child the nutritional value of foods*. Personal agency for eating and PA is also developed through parenting practices such as modeling.<sup>34,54</sup> An example of a measure for modeling parenting practices in one to eight year olds is: *1) I model healthy eating for my child by eating healthy foods myself; 2) I try to eat healthy foods in front of my child, even if they are not my favorite; 3) I try to show enthusiasm about eating healthy foods; and 4) I show my child how much I enjoy eating healthy foods*.<sup>80</sup> These items are positive examples of how parents can increase young children's personal agency for a PA and/or healthy eating goal. Thus, parents may need to adopt parenting practices that encourage positive outcome expectations and self-efficacy for children to comply with their health behavior goal.

Lastly, parenting practices that encourage child involvement in planning meals and PA opportunities may help to develop self-regulation skills. For example, Musher-Eizenman & Holub (2007) developed three items to measure parental encouragement of child involvement in meal planning and preparation which included: *1) I involve my child in planning family meals; 2) I allow my child to help prepare family meals; and 3) I encourage my child to participate in grocery shopping*. Cullen and colleagues (2000) developed a similar four-item measure of child involvement for grocery shopping: *1) my children ask me to buy certain foods at the grocery store; 2) my children ask me to buy certain vegetables at the grocery store; 3) my children go grocery shopping with me; and 4) my children ask me to buy certain foods at the grocery store*. To our knowledge, there are no survey items to measure parenting practices that encourage child involvement in PA and sedentary behaviors. To foster young children's forethought and acceptance of PA and sedentary behavior goals, parenting practices should encourage child involvement in their PA and sedentary behaviors.

In sum, parents play an important role in children's forethought and acceptance for health behavior goals. Positive control parenting practices to foster forethought include: encouragement of children's PA and healthy eating to foster their personal agency, discussion of the goal and outcomes of the goal-directed health behavior, and development of child autonomy through their participation in planning and preparation of the healthy goal.

## ***Performance Phase***

When children are actively engaged in eating and activity behaviors during the Performance Phase, parenting practices that foster self-monitoring and self-control in children are necessary. During the performance phase, parenting practices should foster children's self-monitoring of their own eating and activity by tracking their (child's) behavior.<sup>120</sup> Child self-control of eating and activity behaviors can also be learned from parents who provide an opportunity for their child to make a choice to comply with the goal of healthful eating and PA. Similarly, self-control can be learned when parents assist children in learning delay of gratification by assisting their child to avoid an immediate valued food or behavior for a healthier food and/or activity choice.

To our knowledge, there are no existing measures of parenting practices to foster child self-monitoring skills. As part of the Child Feeding Questionnaire (CFQ) developed by Birch and colleagues (2001), parent use of monitoring was measured via three items: *1) how much do you keep track of the sweets that your child eats; 2) how much do you keep track of the snack food that your child eats; and 3) how much do you keep track of the high-fat foods that your child eats.*<sup>16</sup> Larios and colleagues (2009) modified the CFQ items for monitoring to include PA and sedentary behaviors, those additional items are: *1) how much do you keep track of the amount of TV or videos your child is watching; and 2) how much do you keep track of the amount of exercise your child is getting.*<sup>68</sup> However, both of these measures do not assess parenting practices to foster children's ability to monitor their own behavior.

Child control of his/her eating has been shown to be positively associated with FV intake, negatively associated with child overweight and not associated with snack food intake.<sup>66</sup> However, allowing children too much food control has been shown to be positively associated with increased snack food intake in children in grades one through four, which is associated with child overweight.<sup>54</sup> Comparing the results from Hendy and colleagues (2009) to PA and sedentary behaviors, parenting practices should allow children an appropriate amount of control over their activity behavior to increase their PA and decrease their sedentary behaviors.

It is important to examine parenting practices that inhibit the development children's self-regulation skills. Parental control is frequently identified in the literature as pressuring and restriction of child PA, sedentary behavior and eating. The Parental Control Index (PCI) assesses parent control of child eating in children aged two to six<sup>113</sup> and in the third grade.<sup>92</sup>

Parent control was defined as the extent that parents use restriction and pressure to eat to control their child's eating. The PCI has been shown to be positively associated with food neophobia, negatively associated with frequency of child FV consumption,<sup>113</sup> and inversely associated with overweight in girls.<sup>92</sup>

There are several measures to assess parental pressure of child eating. As part of the CFQ, parental *pressure* of child eating is defined by four items, for example: my child should always eat all of the food on her plate.<sup>16</sup> The CFQ items were modified for children aged four to six to self-report perception of parental pressure (KCFQ).<sup>24</sup> The KCFQ for parental pressure included seven items each for the mother and father and included, *when you say "I'm not hungry" at dinnertime, does mommy say "you need to eat anyway"*.<sup>24</sup> Similarly, the use of pressure to eat, also called "insistence on eating" by Hendy and colleagues (2009) was measured by parents of children in grades one to four. The instrument consisted of three items, *1) you insisted the child eat even if he/she said "I'm not hungry", 2) you insisted the child eat when he/she was sleepy or not feeling well, and 3) you insisted the child eat when he/she was emotionally upset*. Parental use of pressuring practices decreases children's preferences for those foods and activities,<sup>22</sup> and inhibits their ability to self-regulate.

Birch and colleagues (2001) developed the CFQ and defined *restriction* using eight items. A few examples of the restriction items are, *I have to be sure my child does not eat too many sweets (candy, ice cream, cake or pastries), I intentionally keep some foods out of my child's reach, if I did not guide or regulate my child's eating, she would eat too many junk foods*. Child perception of parental restriction using the KCFQ is operationally defined using seven items, for mom and dad separately.<sup>24</sup> For example, *is it okay with your mommy if you don't eat all of the food on your plate?* Another measure of restriction identified in the literature is parental report (10 items) of child access to 10 palatable (snack) foods.<sup>15,42,43</sup> Daughter's (3-6 years) intake of the 10 snack foods was measured as eating in absence of hunger (eating followed by a standard lunch) when they had free access to the identified snack foods. Girls whose parents used higher levels of restriction were associated with greater snack food intake in absence of hunger.<sup>42</sup> There is much evidence to support that parental restriction is associated with decreased ability to self-regulate and eating restricted foods in absence of hunger,<sup>15,43</sup> a likely contributor to later in life overweight. Thus, parental control, including pressure and restriction does not teach children how to self-regulate their behavior to prevent obesity.

Less evidence exists for parental restriction for PA and sedentary behaviors. Bryant and colleagues (2008) assessed media and PA policies (restriction) via six items, including, *how often do you restrict active play indoors, how often do you restrict the amount of time your child spends watching TV, and how often would you say that you restrict the amount of time your child spends using a computer or laptop.*<sup>21</sup> Similar to practices for self-regulation of child eating, restriction of PA and sedentary behaviors may not foster self-regulation in children (Johnson & Birch, 1994). Rather, parents need to utilize teaching-based practices to develop children's self-control of PA and decreased sedentary behaviors.<sup>62,101</sup>

Similar to parent control for eating, Gubbels and colleagues (2011) developed the stimulation to be active subscale to assess parent control of children's activity via three items: 1) *if my child says, 'I don't feel like walking or bicycling to there', I try to get him/her to do this anyway,* 2) *I have to be careful that my child gets enough exercise,* and 3) *I make sure my child travels actively on foot or by bicycle as often as possible.* Based on the parent control of eating literature, we can postulate that parental discipline (i.e., negative reinforcement and punishment) for child screen time activities and excessive parent control of PA would be associated with increased preference for sedentary behaviors, a decreased preference for MVPA, and decreased self-control for screen time behaviors. Thus, it is critical for parents to allow children to use self-control strategies to foster eating and sedentary behavior self-regulation.

Parenting practices such as rewarding their child with food for good behavior or rewarding their child when they eat healthy food has been shown to have negative health behavior consequences, such as lack of FV intake,<sup>66</sup> and decreased ability to respond to internal satiety cues.<sup>18</sup> Kroller & Warschburger (2008) measure reward using four items; an example is, *I offer sweets to my child as a reward for good behavior.*<sup>66</sup> As part of Bryant and colleagues (2008) parent survey, the use of screen time rewards was assessed using three items, including, *how often would you say that you reward good behavior with extra TV time?* Using rewards for good behavior with screen time would be similar to rewarding with sweet and savory foods, such that children would develop preferences for those rewarded foods and activities,<sup>54</sup> and would have decreased ability to respond to internal satiety signals.<sup>18</sup> Thus, parental use of rewards would inhibit young children's development of PA, sedentary behavior, and healthy eating self-regulation.

Child's participation in choosing foods and activities to participate in has been shown to be negatively associated with overweight and positively associated with FV intake.<sup>66</sup> Several measures of parenting practices that foster child control in eating and activity exist.<sup>67,80,111</sup> For example, Vereecken and colleagues (2004) developed four items to assess authoritative parenting practices: *1) when I compose a meal, I let my child choose from several suggestions; 2) when I compose a meal, I consider the preferences of my child; 3) when my child does not like something, he/she gets something else; and 4) when my child does not like something, he/she gets something he/she does like.* Similarly, Musher-Eizenman & Holub (2007) measured child eating control parenting practices via five items, for example, *at dinner, do you let your child choose foods s/he wants from what is served?* To our knowledge, parenting practices to foster young children's control of their PA and sedentary behavior have not been examined. However, children's control of PA and sedentary behaviors should be similar to children's eating, in that parenting practices can foster children's development of self-control by allowing children to play an active role in their PA and sedentary behavior decisions. For example, *children would help choose which youth sport or organized PA they participated in.* Also, children would be given healthy activity options and allowed to make a choice, rather than having their parent tell them which activity they were going to participate in. Parents need to respect young children's development of autonomy through their decision-making participation to develop their self-regulation through self-control.

Young children require their parents to assist them in developing emotional regulation to prevent obesity. Riggs and colleagues (2007) developed the Appetitive and Physical Regulation survey in fifth grade students using 10 items and included, *it is good to stop eating when I know food is not good for me, when I'm frustrated, it is OK to eat a lot to make myself feel better, and when I'm bored, it is OK to sit and watch TV.* Phillips & Power (2007) also developed a regulation of emotions questionnaire in 12-19 year olds. Their questionnaire consisted of four subscales: internal-functional, external-dysfunctional, internal-dysfunctional, and external-functional. An example question for each item, respectively: *I concentrate on a pleasant activity; I take my feelings out on others verbally (e.g., shouting, arguing); I harm or punish myself in some way; and I talk to someone about how I feel.* These items measure children's ability to use emotional regulation techniques, but do not measure parenting practices to foster their emotional regulation.

To develop children's ability to self-monitor their eating and activity, parents need to utilize teaching-based practices that discuss the goals of healthful eating and PA behaviors.<sup>62,101</sup> Additionally, parents need to develop child self-control by providing healthy options and allowing children to choose which healthy foods and activities they would like, as this process allows children to develop autonomy and self-regulation skills. Parenting practices should help children learn to regulate their emotion when they are upset about eating and PA boundaries set by parents, and learn to delay gratification for foods and activities.

### ***Self-Reflection Phase***

After children participate in their PA, sedentary, and eating behaviors, parents can assist their young child to reflect on their behavior and satisfaction. These parenting practices encourage children to think about whether they are satisfied with their activity and eating behaviors. To our knowledge, there are no measures of parenting practices to foster the development of child self-reflection. However, Baughcum and colleagues (2001) measured parental reflection on their child's behavior via three different subscales. The first subscale, difficulty in child eating in children aged two to five was assessed with six items: *1) was he a picky eater; 2) was it hard to get him to eat new foods; 3) did you have to make special meals for him because he was a picky eater; 4) was it a struggle to get him to eat; 5) did he have a poor appetite; and 6) did you get upset if he did not eat enough?* The second subscale, concern about child overeating was measured via four items: *1) did you have to stop him from eating too much; 2) did you think about pulling him on a diet to keep him from becoming overweight; 3) did you worry that he was eating too much; and 4) did you get upset if he ate too much?* The last subscale, concern about child being overweight, was measured using three items: *1) I am worried that my son will become overweight; 2) I am worried that my son will have to diet to stay at a healthy weight; 3) I am worried that my son is underweight right now.* These measures indicate parent reflection on their child's eating behaviors, however, to foster child self-reflection, parenting practices should encourage children to think about their satisfaction or dissatisfaction regarding their behavior. We were unable to find any measures of children's reflection for PA and sedentary behaviors. We apply children's eating and overweight self-reflection parenting practices to PA and sedentary behaviors. Children that have negative self-reflection about their PA, sedentary, and/or eating behavior will lead to self-dissatisfaction and

higher motivation to change their behavior compared to children with high self-satisfaction.<sup>7</sup> Thus, positive parenting practices are necessary to teach children to reflect on their health behaviors, which ultimately impacts their goal-setting (phase one), and their performance of their PA, sedentary, and eating behaviors (phase two).

## **Discussion**

The home environment is one critical setting to target many types of mediators to prevent obesity in young children. Parents establish the home physical and social environments, and parenting practices target immediate behavior change as well as develop capacities in young children for self-regulation. A shift from environmental (external) to individual (internal) psychological factors occurs with increasing child development.<sup>64</sup> Thus, parenting practices should target the development of young children's self-regulation skills for PA, sedentary behaviors, and healthful eating to prevent obesity. However, little evidence exists on parenting practices to develop self-regulation skills to prevent obesity. Thus, the primary aim of this review was to describe parenting practices associated with the development of young children's self-regulation and to examine existing measures of parenting practices to foster or inhibit the development of children's self-regulation skills. To understand parenting practices to foster young children's eating and PA self-regulation skills, we applied Zimmerman and Moylan's (2009) cyclical, three-phase model: forethought, performance, and self-reflection.

During the forethought phase, parenting practices develop children's forethought and acceptance of healthful eating and PA goals. Parents utilize appropriate parenting practices to foster children's personal agency to eat healthfully, be active, and participate in less sedentary behavior. To do this, parenting practices should include encouraging (in a non-controlling way) healthy eating and PA to increase children's self-efficacy and outcome expectancies for healthy behaviors. Additionally, parenting practices should help children set PA, sedentary behavior and eating goals so they become active participants in their health behaviors. Lastly, to practice goal-setting, parenting practices need to support children's autonomy for PA, sedentary behavior and healthy eating by allowing children to help plan meals and activities.

Parenting practices during the performance phase should assist children in using self-monitoring and self-control behavior strategies. Parenting practices to foster child self-monitoring would include teaching-based practices that encourage children to track their eating



and activity behaviors. Similarly, parenting practices to foster child self-control would focus on teaching children to utilize emotional control and delay of gratification strategies. In addition, parenting practices that provide healthy options and allow their child to choose foods or activities can develop self-control.

During the last phase, self-reflection, parenting practices need to foster children's self-judgment and self-reaction of their eating and activity behaviors. Teaching-based parenting practices should encourage children to think about whether they are satisfied with their eating and activity behaviors. Positive self-reflection leads to increased self-satisfaction and continued healthy behaviors, whereas, negative self-reflection leads to self-dissatisfaction and high motivation to change their behavior.<sup>7</sup>

Based on this review, we provide recommendations to foster the development of children's healthy eating and PA self-regulation skills. First, parents need to adopt positive control parenting practices, such as teaching, encouraging and guiding children's health behavior. This could be done by intentionally setting aside time to talk with their child and set a small developmentally appropriate goal. Second, parents should plan ahead to be prepared to provide children healthy options and encourage children to make a choice based on the options provided. Parenting practices that allow children to make healthy choices assists in their development of autonomy and self-regulation skills. For example, parents can allow their child to choose which youth sport activity to participate in, or which vegetable to eat for lunch. Third, parenting practices need to develop child self-monitoring behaviors. To do this, parents should discuss in a developmentally appropriate manner how much children have eaten (help the child quantify this as a lot, some or not much), and how much PA and sedentary activities they've participated in (a lot, some, or not much). Last, parents need to assist children to self-reflect on their eating and activity behaviors as positive self-reflection will lead to increased self-satisfaction and continued health behavior. To encourage the development of child self-regulation skills parents need to utilize teaching-based versus controlling parenting practices to prevent obesity.

In sum, few measures exist to examine parenting practices that foster the development of self-regulation in children. Thus, a need exists to develop a comprehensive measure of parenting practices to foster the development of child eating and PA self-regulation skills. Future child

obesity prevention interventions should focus on targeting parenting practices to foster the development of child eating and PA self-regulation skills to prevent obesity.

## References

1. American Academy of Pediatrics. Children, adolescents, and television. *Pediatrics*. 2001;107(2):423-426.
2. Andreyeva T, Kelly IR, Harris JL. Exposure to food advertising on television: Associations with children's fast food and soft drink consumption and obesity. *Econ Hum Biol*. 2011.
3. Annesi JJ. Relationships between self-regulation skills and physical activity and fruit and vegetable consumption in obese adults: mediation of mood and self-efficacy. *Psychol Rep*. 2011;108(1):95-103.
4. Bandura A. Toward a psychology of human agency. *Perspect Psychol Sci*. 2006;1(2):164-180.
5. Bandura A. The primacy of self-regulation in health promotion. *Appl Psychol – Int Rev*. 2005;54(2):245-254..
6. Bandura A. *Human agency in Social Cognitive Theory*. Am Psychol. 1989;44(9):1175-1184.
7. Bandura A, Cervone D. Differential engagement of self-reactive influences in cognitive motivation. *Organ Behav Hum Dec*. 1986;38:92-113.
8. Baughcum AE, Powers SW, Johnson SB, Chamberlin LA, Deeks CM, Jain A, Whitaker RC. Maternal feeding practices and beliefs and their relationships to overweight in early childhood. *J Dev Behav Pediatr*. 2001;22(6):391-408.
9. Bauman AE, Sallis JF, Dzewaltowski DA, Owen N. Toward a better understanding of the influences on physical activity. The role of determinants, correlates ,causal variables, mediators, moderators, and confounders. *Am J Prev Med*. 2002;23(2 Suppl):5-14.
10. Baumrind D. Effects of authoritative parental control on child behavior. *Child Dev*. 1966;37:887-907.
11. Belsky J, Rha JH, Park SY. Exploring reciprocal parent and child effects in US and Korean samples. *Int J Behav Dev*. 2000;24:338-347.
12. Berge JM. A review of familial correlates of child and adolescent obesity: what has the 21<sup>st</sup> century taught us so far? *Int J Adolesc Med Health*. 2009;21(4):457-483.
13. Birch LL, Davison KK. Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatr Clin North Am*. 2001;48(4):893-907.

14. Birch L, Deysher M. Caloric compensation and sensory specific satiety: evidence for self-regulation of food intake by young children. *Appetite*. 1986;7(4):323-331.
15. Birch LL, Fisher JO. Mothers' child-feeding practices influence daughters' eating and weight. *Am J Clin Nutr*. 2000;71(5):1054-1061.
16. Birch LL, Fisher JO, Grimm-Thomas K, Markey CN, Sawyer R, Johnson SL. Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite*. 2001;36(3):201-210.
17. Birch LL, Fisher JO. Development of eating behaviors among children and adolescents. *Pediatrics*. 1998;101(3 Pt 2):539-549.
18. Birch LL, McPhee L, Shoba BC, Steinberg L, Krehbiel R. "Clean up your plate": Effects of child feeding practices on the conditioning of meal size. *Learn Motiv*. 1987;18:301-317.
19. Bradlee ML, Singer MR, Qureshi MM, Moore LL. Food group intake and central obesity among children and adolescents in the Third National Health and Nutrition Examination Survey (NHANES III). *Public Health Nutr*. 2009;13(6):797-805.
20. Bradley RH, McRitchie S, Houts RM, Nader P, O'Brien M. Parenting and the decline of physical activity from age 9 to 15. *Int J Behav Nutr Phys Act*. 2011;8(3):33.
21. Bryant MJ, Ward DS, Hales D, Vaughn A, Rabak RG, Stevens J. Reliability and validity of the Healthy Home Survey: A tool to measure factors within homes hypothesized to relate to overweight in children. *Int J Behav Nutr Phys Act*. 2008;5(23).
22. Campbell KJ, Crawford DA, Ball K. Family food environment and dietary behaviors likely to promote fatness in 5-6 year-old children. *Int J Obes*. 2006;30(8):1272-1280.
23. Carnell S, Haworth CMA, Plomin R, Wardle J. Genetic influence on appetite in children. *Int J Obes*. 2008;32(10):1468-1473.
24. Carper JL, Fisher JO, Birch LL. Young girls' emerging dietary restraint and disinhibition are related to parental control in child feeding. *Appetite*. 2000;35(2):121-129.
25. Connor C, Ponitz CC, Phillips BM, Travis QM, Glasney S, Morrison FJ. First graders' literacy and self-regulation gains: the effect of individualizing student instruction. *J Sch Psychol*. 2010;48(5):433-455.
26. Coon KA, Goldberg J, Rogers BL, Tucker KL. Relationships between use of television during meals and children's food consumption patterns. *Pediatrics*. 2000;107(1):E7.
27. Coon KA, Tucker KL. Television and children's consumption patterns. A review of the literature. *Minerva Pediatr*. 2002;54(5):423-436.
28. Craggs C, Corder K, van Sluijs EM, Griffin SJ. Determinants of change in physical activity in children and adolescents: a systematic review. *Am J Prev Med*. 2011;40(6):645-658.

29. Cullen KW, Baranowski T, Rittenberry L, Cosart C, Hebert D, de Moor C. Child-reported family and peer influences on fruit, juice and vegetable consumption: reliability and validity of measures. *Health Educ Res.* 2001;16(2):187-200.
30. Cullen KW, Baranowski T, Rittenberry L, Cosart C, Owens E, Hebert D, de Moor C. Socioenvironmental influences on children's fruit, juice and vegetable consumption as reported by parents: reliability and validity of measures. *Public Health Nutr.* 2000;3(3):345-356.
31. Daniels SR. The consequences of childhood overweight and obesity. *Future Child.* 2006;16(1):47-67.
32. Darling N, Steinber L. Parenting style as context: an integrative model. *Psychol Bull.* 1993;113(3):487-496.
33. Davison KK. Activity-related support from parents, peers, and siblings and adolescents' physical activity: are there gender differences. *J Phys Act Health.* 2004;1:363-376.
34. Davison KK, Jago R. Change in parent and peer support across ages 9 to 15 yr and adolescent girls' physical activity. *Med Sci Sports Exerc.* 2009;41(9):1816-1825.
35. De Bourdeaudhuij I, Klepp KI, Due P, Perez Rodrigo C, de Almeida MDV, Wind M, Krolner R, Sandvik C, Brug J. Reliability and validity of a questionnaire to measure personal, social and environmental correlates of fruit and vegetable intake in 10-11 year-old children in five European countries. *Public Health Nutr.* 2005;8(2):189-200.
36. Denham SA, Mitchell-Copeland J, Strandberg K, Auerbach S, Blaire K. Parental contributions to preschoolers' emotional competence: direct and indirect effects. *Motiv Emotion.* 1997;21:65-86.
37. Dietary Guidelines for Americans, 2010\_Chapter 2 Policy Document
38. Dietz WH, Gortmaker SL. Preventing obesity in children and adolescents. *Annu Rev Public Health.* 2001;22:337-353.
39. DuRant RH, Baranowski T, Johnson M, Thompson WO. The relationship among television watching, physical activity, and body composition of young children. *Pediatrics.* 1994;94(4 Pt 1):449-455.
40. Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. *Lancet.* 2002;360(9331):473-482.
41. Feldman R, Klein PS. Toddlers' self-regulated compliance to mothers, caregivers, and fathers: implications for theories of socialization. *Dev Psychol.* 2003;39(4):680-692.
42. Fisher JO, Birch LL. Parents' restrictive feeding practices are associated with young girls' negative self-evaluation of eating. *J Am Diet Assoc.* 2000;100(11):1341-1346.

43. Fisher JO, Birch LL. Restricting access to foods and children's eating. *Appetite*. 1999;32:405-419.
44. Francis LA, Susman EJ. Self-regulation and rapid weight gain in children from age 3 to 12 years. *Arch Pediatr Adolesc Med*. 2009;136(4):297-302.
45. Garner PW, Hinton TS. Emotional display rules and emotion self-regulation: associations with bullying and victimization in community-based after school programs. *J Community Appl Soc*. 2010;20:480-496.
46. Gattshall ML, Shoup JA, Marshall JA, Crane LA, Estabrooks PA. Validation of a survey instrument to assess home environments for physical activity and healthy eating in overweight children. *Int J Behav Nutr Phys Act*. 2008;5(3).
47. Golan M, Crow S. Parents are key players in the prevention and treatment of weight-related problems. *Nutr Rev*. 2004;62(1):39-50.
48. Golan M, Weizman A. Familial approach to the treatment of childhood obesity: conceptual model. *J Nutr Educ*. 2001;33(2):102-107.
49. Graziano PA, Calkins SD, Keane SP. Toddler self-regulation skills predict risk for pediatric obesity. *Int J Obes*. 2010;34(4):633-641.
50. Grund A, Dilba B, Forberger K, Krause H, Siewers M, Rieckert H, Muller MJ. Relationships between physical activity, physical fitness, muscle strength and nutritional state in 5- to 11-year-old children. *Eur J Appl Physiol*. 2000;82:425-438.
51. Gubbels JS, Kremers SPJ, Stafleu A, de Vries SI, Goldbohm RA, Dangelie P, de Vries NK, Buuren SV, Thijs C. Association between parenting practices and children's dietary intake, activity behavior and development of body mass index: the KOALA Birth Cohort Study. *Inr J Behav Nutr Phys Act*. 2011;14;8:18.
52. Guenther PM, Dodd KW, Reedy J, Krebs-Smith SM. Most Americans eat much less than recommended amounts of fruits and vegetables. *J Am Diet Assoc*. 2006;106(9):1371-1379.
53. Han JC, Lawlor DA, Kimm SY. Childhood obesity. *Lancet*. 2010;375(9727):1737-1748.
54. Hendy HM, Williams KE, Camise TS, Eckman N, Hedemann A. The Parent Mealtime Action Scale (PMAS). Development and association with children's diet and weight. *Appetite*. 2009;52(2):328-339.
55. Jackson DM, Djafarian K, Stewart J, Speakman JR. Increased television viewing is associated elevated body fatness but not lower total energy expenditure in children. *Am J Clin Nutr*. 2009;89(4):1031-1036.
56. Jacobsen T, Huss M, Fendrich M, Kruesi MJP, Ziegenhain U. Children's ability to delay gratification: longitudinal relations to mother-child attachment. *J Genet Psychol*. 1997;158(4):411-426.

57. Janz KF, Levy SM, Burns TL, Torner JC, Willing MC, Warren JJ. Fatness, physical activity, and television viewing in children during the adiposity rebound period: the Iowa bone development study. *Prev Med.* 2002;35:563-571.
58. Johnson SL, Birch LL. Parents' and children's adiposity and eating style. *Appetite.* 1994;94:653-661.
59. Joosen AM, Gielen M, Vlietinck R, Westerterp KR. Genetic analysis of physical activity in twins. *Am J Clin Nutr.* 2005;82(6):1253-1259.
60. Karreman A, van Tuijl C, van Aken MAG, Dekovic M. Parenting and self-regulation in preschoolers: a meta-analysis. *Infant Child Dev.* 2006;15:561-579.
61. Kimm, SYS, Barton BA, Obarzanek E, McMahon RP, Kronsberg SS, Waclawiw MA, Morrison JA, Schreiber GB, Sabry ZI, Daniels SR. Obesity development during adolescence in a biracial cohort: the HNLBI growth and health study. *Pediatrics.* 2002;110(e54).
62. Kochanska G, Knaack A. Effortful control as a personality characteristic of young children: antecedents, correlates, and consequences. *J Pers.* 2003;71(6):1087-1112.
63. Koplan JP, Liverman CT, Kraak VI. Preventing childhood obesity: Health in the balance: Executive Summary. *J Am Diet Assoc.* 2005;105(1):131-138.
64. Kopp C. The antecedents of self-regulation: A developmental perspective. *Dev Psychol.* 1982;18:199-214.
65. Kremers SPJ, Brug J, de Vries H, Engels RCME. Parenting style and adolescent fruit consumption. *Appetite.* 2003;41:43-50.
66. Kroller K, Warschburger P. Associations between maternal feeding style and food intake of children with a higher risk for overweight. *Appetite.* 2008;51(1):166-172.
67. Kroller K, Warschburger P. Maternal feeding strategies and child's food intake: considering weight and demographic influences using structural equation modeling. *Int J Behav Nutr Phys Act.* 2009;6(78).
68. Larios SE, Ayala GX, Arrendondo EM, Baquero B, Elder JP. Development and validation of a scale to measure Latino parenting strategies related to children's obesigenic behaviors. The parenting strategies for eating and activity scale (PEAS). *Appetite.* 2009;52(1):166-172.
69. Lecuyer E, Houck GM. Maternal limit-setting in toddlerhood: socialization strategies for the development of self-regulation. *Infant Ment Health J.* 2006;27(4):344-370.
70. Lee WWR. An overview of pediatric obesity. *Pediatr Diabetes.* 2007;8(Suppl 9):76-87.
71. Maccoby EE, Martin JA. Socialization in the context of the family: parent-child interaction. In PH Mussen & EM Hetherington. *Handbook of child psychology: Vol. 4. Socialization, personality, and social development* (4<sup>th</sup> ed.). New York: Wiley.

72. Metallinos-Katsaras ES, Freedson PS, Fulton JE, Sherry B. The association between an objective measure of physical activity and weight status in preschoolers. *Obesity*. 2007;15(3):686-694.
73. Mischel HN. From intention to action: the role of rule knowledge in the development of self-regulation. *Hum Dev*. 1984;27(3-4):124-129.
74. Mischel W. Preference for delayed reinforcement and social responsibility. *J Abnorm Soc Psychol*. 1961;62:1-7.
75. Mischel W, Ayduk O, Berman MG, Casey BJ, Gotlib IH, Jonides J, Kross E, Teslovich T, Wilson NL, Zayas V, Shoda Y. 'Willpower' over the life span: decomposing self-regulation. *Soc Cogn Affect Neurosci*. 2011;6(2):252-256.
76. Mischel W, Ebbesen EB, Zeiss AR. Cognitive and attentional mechanisms in delay of gratification. *J Pers Soc Psychol*. 1972;21(2):204-218.
77. Mischel W, Cantor N, Feldman S. Principles of self-regulation: the nature of willpower and self-control. In: Higgins ET, Kruglanski AW, eds. *Social Psychology: Handbook of basic principles*. New York: Guilford Press, 1996.
78. Mischel W, Shoda Y, Peake PK. The nature of adolescent competencies predicted by preschool delay of gratification. *J Pers Soc Psychol*. 1988;54(5):687-696.
79. Mischel W, Shoda Y, Rodriguez MI. Delay of gratification in children. *Science*. 1989;244(4907):933-938.
80. Musher-Eizenman D, Holub S. Comprehensive Feeding Practices Questionnaire: Validation of a new measure of parental feeding practices. *J Pediatr Psychol*. 2007;32(8):960-972.
81. National Association for Sport and Physical Education 2002
82. Neumark-Sztainer D, Wall M, Perry C, Story M. Correlates of fruit and vegetable intake among adolescents. Findings from Project EAT. *Prev Med*. 2003;37(3):198-208.
83. Ogden CL, Carroll MD, Curtin LR, Lam MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA*. 2010;303(3):242-249.
84. Pate RR, Pfeiffer KA, Trost SG, Ziegler P, Dowda M. Physical activity among children attending preschools. *Pediatrics*. 2004;114(5):1258-1263.
85. Patrick H, Nicklas TA, Hughes SO, Morales M. The benefits of authoritative feeding style: caregiver feeding styles and children's food consumption patterns. *Appetite*. 2005;44:243-249.
86. Perez A, Hoelscher DM, Springer AE, Brown HS, Barroso CS, Kelder SH, Castrucci BC. *Physical activity, watching television, and the risk of obesity in students, Texas, 2004-2005*. *Prev Chronic Dis*. 2001;8(3):A61.

87. Perels F, merget-Kullmann M, Wende M, Schmitz B, Buchbinder C. Improving self-regulated learning of preschool children: evaluation of training for kindergarten teachers. *Br J Educ Psychol.* 2009;79(Pt 2P):311-327.
88. Phillips KJV, Power MJ. A new self-report measure of emotion regulation in adolescents: the regulation of emotions questionnaire. *Eval Rev.* 1007;31(3):287-310.
89. Rhee KE, Lumeng JC, Appugliese DP, Kaciroti N, Bradley RH. Parenting styles and overweight status in first grade. *Pediatrics.* 2006;117(6):2047-2054.
90. Rhodes RE, Pfaeffli LA. Mediators of physical activity behavior change among adult non-clinical populations: a review update. *Int J Behav Nutr Phys Act.* 2010;11(7):37.
91. Riggs NR, Kobayakawa Sakuma K, Pentz MA. Preventing risk for obesity by promoting self-regulation and decision-making skills: pilot results from the PATHWAYS to health program (PATHWAYS). *Eval Rev.* 2007;31(3):287-310.
92. Robinson TN, Kiernan M, Matheson DM, Haydel KF. Is parental control over children's eating associated with childhood obesity? Results from a population-based sample of third graders. *Obes Res.* 2001;9(5):306-312.
93. Rolls BJ, Ello-Martin JA, Carlton Tohill B. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? *Nutr Rev.* 2004;62(1):1-17.
94. Rosenkranz RR, Dzewaltowski DA. Model of the home food environment pertaining to childhood obesity. *Nutr Rev.* 2008;66(3):123-140.
95. Schunk, DH, Zimmerman BJ. *Self-regulated learning: from teaching to self-reflective practice.* New York, NY: Guilford Press, 1998.
96. Seeyave DM, Coleman S, Appugliese D, Corwyn FR, Bradley RH, Davidson NS, Kaciroti N, Lumeng JC. Ability to delay gratification at age 4 years and risk of overweight at age 11 years. *Arch Pediatr Adolesc Med.* 2009;163(4):303-308.
97. Selassie M, Sinha AC. The epidemiology and aetiology of obesity: a global challenge. *Best Pract Res Clin Anaesthesiol.* 2011;25(1):1-9.
98. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature. *Prev Med.* 1993;22(2):167-177.
99. Sigal JJ, Adler LL. Motivational effects of hunger on time estimation and delay of gratification in obese and nonobese boys. *J Genet Psychol.* 1976;128:7-16.
100. Sonnevile KR, La Pelle N, Taveras EM, Gillman MW, Prosser LA. Economic and other barriers to adopting recommendations to prevent childhood obesity: results of a focus group study with parents. *BMC Pediatr.* 2009;21(9):81.



101. Stansbury K, Zimmermann LK. Relations among child language skills, maternal socialization of emotion regulation and child behavior problems. *Child Psychiatry Hum Dev.* 1999;30(2):121-142.
102. Taylor RW, Murdoch L, Carter P, Gerrard DF, Williams SH, Taylor BJ. Longitudinal study of physical activity and inactivity in preschoolers: the FLAME study. *Med Sci Sports Exerc.* 2009;41(1):96-102.
103. Thompson RA. Emotion regulation: A theme in search of definition. *Monogr Soc Res Child Dev.* 1994;59(2-3):25-52.
104. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc.* 2008;41(1):181-188.
105. Troiano RP, Briefel RR, Carroll MD, Bialostosky K. Energy and fat intakes of children and adolescents in the United States: data from the national health and nutrition examination surveys. *Am J Clin Nutr.* 2000;72(5 Suppl):1343S-1353S.
106. Trost SG, Sallis JF, Pate RR, Freedson PS, Taylor WC, Dowda M. Evaluating a model of parental influence on youth physical activity. *Am J Prev Med.* 2003;25(4):277-282.
107. USDHHS. *Dietary guidelines for Americans, 6<sup>th</sup> edn.* Washington, DC: US Government Printing Office; 2005.
108. USDHHS. Physical activity guidelines for Americans, 2008. <http://www.health.gov/paguidelines>. Accessed May 3, 2011
109. Van Assema P, Glanz K, Martens M, Brug J. Differences between parents' and adolescents' perceptions of family food rules and availability. *J Nutr Educ Behav.* 2007;39(2):84-89.
110. Van der Horst K, Oenema A, Ferreira I, Wndel-Vos W, Griskes K, Van Lenthe F, Brug J. A systematic review of environmental correlates of obesity-related dietary behaviors in youth. *Health Educ Res.* 2007;22:203-226.
111. Vereecken CA, Keukelier E, Maes L. Influence of mother's educational level on food parenting practices and food habits of young children. *Appetite.* 2004;43(1):93-103.
112. Wang Y, Ge K, Popkin BM. Why do some overweight children remain overweight, whereas others do not? *Public Health Nutr.* 2003;6:549-558.
113. Wardle J, Carnell S, Cooke L. Parental control over feeding and children's fruit and vegetable intake: how are they related? *J Am Diet Assoc.* 2005;105(2):227-232.
114. Wardle J, Sanderson S, Guthrie CA, Rapoport L, Plomin R. Parental feeding style and the inter-generational transmission of obesity risk. *Obes Res.* 2002;10(6):453-362.

115. Webster-Stratton C, Reid J, Stoolmiller M. Preventing conduct problems and improving school readiness: evaluation of the Incredible Years Teacher and Child Training Programs in high-risk schools. *J Child Psychol Psychiatry*. 2008;49(5):471-488.
116. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med*. 1997;337(13):869-873.
117. Wilson DK, Friend R, Teasley N, Green S. Motivational versus social cognitive interventions for promoting fruit and vegetable intake and physical activity in African American adolescents. *Ann Behav Med*. 2002;24(4):310-319.
118. Wilson AM, Magarey AM, Mastersson N. Reliability and relative validity of a child nutrition questionnaire simultaneously assess dietary patterns associated with positive energy balance and food behaviors, attitudes, knowledge, and environments associated with healthy eating. *Int J Behav Nutr Phys Act*. 2008;5(5).
119. Zimmerman BF. Becoming a self-regulated learner: an overview. *Theor Pract*. 2002;41(2):64-70.
120. Zimmerman BJ, Moylan AR. Self-Regulation: Where metacognition and motivation intersect. In: Hacker DJ, Dunlosky J, Graesser AC, eds. *Handbook of metacognition in education*. New York: Taylor & Francis Group, 2009.

## Figures and Tables

Figure 1.1 A model of parenting practices to foster the development of children's eating and activity self-regulation skills

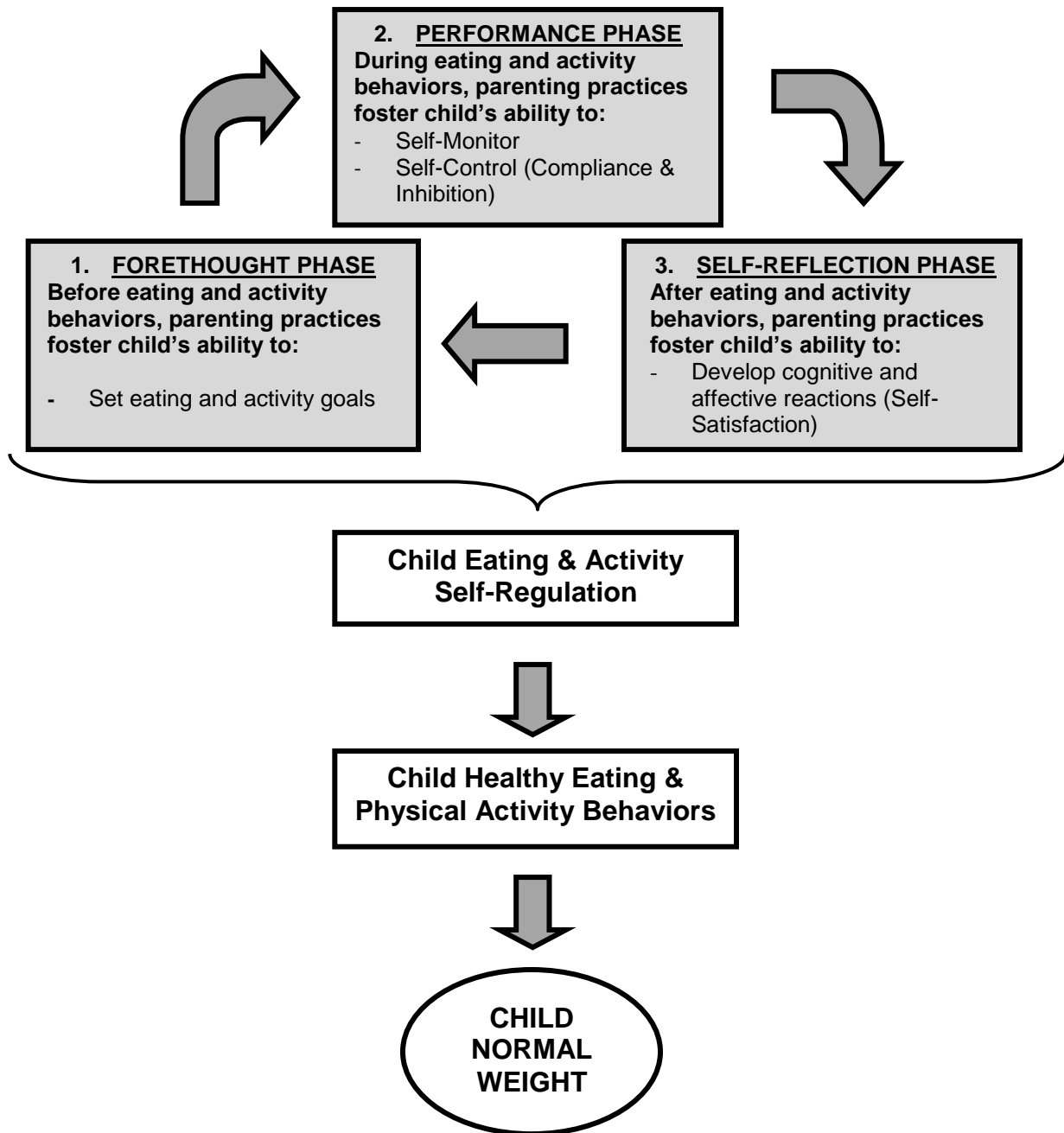


Table 1.1: Parenting practices that foster or discourage child eating and physical activity self-regulation behaviors

| SELF-REGULATION PHASE  | Completed by PARENT or CHILD | MEASURE (factor name given by author)                 | CHILD AGE   | ITEMS  | REFERENCES                    |
|--|------------------------------|---|-------------|--|-------------------------------|
| <b>1. FORETHOUGHT: survey items that assess child forethought and acceptance of a health behavior (eating and activity) goal</b> |                              |   |             |  |                               |
| <b>GOAL-SETTING</b>  | Parent                       | Snack Limits  | Grades 1-4  | During a typical week, how often did you...<br>1. Set limits for how many sweets the child could have each day<br>2. Set limits for how many sodas the child could have each day<br>3. Set limits for how many salty snacks the child could have each day  | Hendy et al., 2009 (PMAS)     |
| <b>GOAL-SETTING</b>  | Parent (Latino)              | Limit Setting (PEAS)                                  | 5-8 years   | 1. I limit the amount of time my child plays video games or is on the computer during the week.<br>2. I limit the amount of time my child plays video games or is on the computer during the weekend.<br>3. I limit the amount of time my child watches TV/videos during the weekend.<br>4. I limit the amount of time my child watches TV/videos during the week.<br>5. I limit the amount of soda my child drinks.<br>6. I limit the number of snacks my child eats. | Larios et al., 2009           |
| <b>GOAL-SETTING</b>  | Parent & Child               | Food rules  | 12-14 years | Are there rules about:<br>1. How many fruit servings the child should eat<br>2. When the child should eat fruit<br>3. How many snacks the child is allowed to eat<br>4. When the child is allowed to eat snacks<br>5. Which snacks the child is allowed to eat<br>6. How often the child should eat breakfast<br>7. What the child should eat for breakfast  | Van Assema et al., 2007       |
| <b>GOAL-SETTING</b>  | Child                        | Motivation<br><br>(6 related to FV & 6 related to PA) | 11-15 years | (Example questions):<br>1. I am very excited about eating more fruits and vegetables on a daily basis.<br>2. I make it a priority to make sure that I eat healthy every day.<br>3. I am very involved in making sure that I get plenty of exercise each day.<br>4. I am involved in planning a daily exercise program.   | Wilson et al., 2002           |
| <b>GOAL-SETTING</b>  | Child                        | Self-rated intake                                     | 10-11 years | 1. Do you think that you eat much or a little fruit?<br>2. Do you think you eat more or less fruit than most boys and girls of your age?<br>3. Do you think that you eat much or a little vegetables?  | De Bourdeaudhuij et al., 2005 |

|                     |        |   |               |  |                               |
|---------------------|--------|---|---------------|--|-------------------------------|
|                     |        |   |               | 4. Do you think you eat more or less vegetables than most boys and girls of your age?  |                               |
| <b>GOAL-SETTING</b> | Child  | Knowledge   | 10-11 years   | 1. How much fruit do you think you should eat to have a healthy diet?<br>2. How many vegetables do you think you should eat to have a healthy diet?  | De Bourdeaudhuij et al., 2005 |
| <b>GOAL-SETTING</b> | Child  | Knowledge   | 10-12 years   | 1. Number of servings of fruit that should be consumed by a child your age each day<br>2. Number of servings of vegetables that should be consumed by a child your age each day  | Wilson et al., 2008           |
| <b>GOAL-SETTING</b> | Child  | Attitudes   | 10-11 years   | 1. To eat fruit every day makes me feel good<br>2. To eat fruit every day gives me more energy<br>3. To eat vegetables every day makes me feel good<br>4. To eat vegetables every day gives me more energy   | De Bourdeaudhuij et al., 2005 |
| <b>GOAL-SETTING</b> | Child  | Attitude  | 10-12 years   | With regards to fruit, agreement with:<br>1. Makes me feel healthy<br>2. Tastes good<br>3. Easy snack<br>4. I like tasting new fruits<br>5. Cheap<br>With regards to vegetables, agreement with:<br>3. Makes me feel healthy<br>4. Tastes good<br>5. I like tasting new vegetables<br>6. Easy to prepare | Wilson et al., 2008           |
| <b>GOAL-SETTING</b> | Parent | Authoritative:<br><i>Encouragement fruit through rationale</i>      | 2.5 – 7 years | How often do you tell your child...<br>1. Fruit is good for you<br>2. By eating fruit you will get bigger<br>3. Fruit tastes good<br>4. Fruit is healthy   | Vereecken et al., 2004        |
| <b>GOAL-SETTING</b> | Parent | Authoritative:<br><i>Encouragement vegetables through rationale</i> | 2.5 – 7 years | How often do you tell your child...<br>1. Vegetables are good for you<br>2. By eating vegetables you will get bigger<br>3. Vegetables tastes good<br>4. Vegetables are healthy   | Vereecken et al., 2004        |
| <b>GOAL-SETTING</b> | Parent | Authoritative:<br><i>Discouragement sweets through rationale:</i>   | 2.5 – 7 years | How often do you tell your child...<br>1. Sweets are unhealthy<br>2. Sweets are bad for the teeth<br>3. Sweets don't taste good<br>4. Sweets can make you fat<br>5. If you eat too many sweets you will get ill  | Vereecken et al., 2004        |
| <b>GOAL-SETTING</b> | Parent | Authoritative:<br><i>Discouragement soft drinks through</i>         | 2.5 – 7 years | How often do you tell your child...<br>1. Soft drinks are unhealthy<br>2. Soft drinks are bad for the teeth  | Vereecken et al., 2004        |

|                     |        |  |   |  |                                 |
|---------------------|--------|--|---|--|---------------------------------|
|                     |        | <i>rationale</i>   |   | 3. Soft drinks don't taste good<br>4. Soft drinks can make you fat<br>5. If you drink too much soft drinks you will get ill  |                                 |
| <b>GOAL-SETTING</b> | Parent | Parent food-socialization-encouraging practices questionnaire:<br><br>Expectancies | Grade 4-6                               | To encourage your child to eat a particular food, how often do you...<br>1. Tell your child this food will give him/her energy<br>2. Tell your child that it's good for his/her health<br>3. Tell your child that it's good for him/her<br>4. Tell your child he/she will get strong<br>5. Tell your child it tastes good<br>6. Tell your child to taste it because it's delicious<br>7. Let your child see you eat the food | Cullen et al., 2000             |
| <b>GOAL-SETTING</b> | Parent | Teaching about nutrition   | 1.5-8 years                             | 1. I discuss with my child why it's important to eat healthy foods.<br>2. I discuss with my child the nutritional value of foods.<br>3. I tell my child what to eat and what not eat without explanation (removed from final survey).  | Musher – Eizenman & Holub, 2007 |
| <b>GOAL-SETTING</b> | Parent | Positive Persuasion  | 1 <sup>st</sup> -4 <sup>th</sup> grade  | During a typical week, how often did you...<br>1. You told the child how much you liked the food.<br>2. You told the child how good the food will taste if he/she tries it.<br>3. You told the child that his/her friends or siblings like the food.<br>4. You told the child that a food will make him/her healthy, smart, and strong.  | Hendy et al., 2009 (PMAS)       |
| <b>GOAL-SETTING</b> | Child  | Enjoyment of Physical Activity   | 6 <sup>th</sup> & 8 <sup>th</sup> grade | When I am active...<br>1. I feel bored<br>2. I dislike it<br>3. It's no fun at all<br>4. It frustrates me<br>5. It's not at all interesting<br>6. I feel as though I would rather be doing something else  | Dishman et al., 2009            |
| <b>GOAL-SETTING</b> | Child  | Liking   | 10-11 years                             | 1. I like to eat fruit every day<br>2. Fruit tastes good<br>3. I like to eat vegetables every day<br>4. Vegetables tastes good   | De Bourdeaudhuij et al., 2005   |
| <b>GOAL-SETTING</b> | Child  | Preferences  | 10-11 years                             | 1. Which of the following fruits do you like or dislike?<br>- Apple, banana, pear, orange, tangerine, plum, peach, melon, strawberry, grape, cherry, kiwi<br>2. Which of the following vegetables do you like or dislike?<br>- Tomatoes, cucumber, salad, cabbage, spinach, leek, green beans, onion, carrots, broccoli, cauliflower, green peas   | De Bourdeaudhuij et al., 2005   |
| <b>GOAL-</b>        | Child  | Taste preferences  | 11-18 years                             | 1. "I like the taste of most fruits."  | Neumark-                        |

|                     |        |   |   |  |                               |
|---------------------|--------|---|---|--|-------------------------------|
| <b>SETTING</b>      |        |   |   | 2. “Most vegetables taste bad.”<br>3. Most healthy foods just don’t taste great.”<br>4. Most unhealthy foods taste better than healthy foods.”.”   | Sztainer et al., 2003         |
| <b>GOAL-SETTING</b> | Parent | Child preferences for FV (Home Nutrition Questionnaire-HNQ) | 5-12 years                              | 1. My child likes to eat fruits<br>2. My child likes to eat vegetables<br>3. My child likes to try different FV<br>4. My child chooses fruits in meals when eating out<br>5. My child chooses vegetables in meals when eating out  | Dave et al., 2010             |
| <b>GOAL-SETTING</b> | Child  | Perceived barriers  | 10-11 years                             | 1. When you do not eat fruit, is it because...<br>a. It takes too much time to eat fruit?<br>b. You want to eat something else (e.g., sweets)?<br>c. Your fingers get greasy?<br>d. Fruit get squeezed in the school bag?<br>2. When you do not eat vegetables, is it because...<br>a. It takes too much time to eat vegetables?<br>b. You are still hungry after having eaten vegetables?<br>c. You want to eat something else (e.g., sweets)?<br>d. Vegetables get squeezed in the school bag?   | De Bourdeaudhuij et al., 2005 |
| <b>GOAL-SETTING</b> | Child  | Perceived Barriers  | 6 <sup>th</sup> & 8 <sup>th</sup> grade | How often do these things keep you from being physically active?<br>1. The weather is bad.<br>2. I don’t know how to do the physical activity that I want to do.<br>3. I don’t have time to do physical activity.<br>4. I’m chosen last for teams.<br>5. I don’t like to sweat.<br>6. It would take time away from my friends.<br>7. I might get hurt or sore.<br>8. It would make me embarrassed.<br>9. It would make me tired.   | Dishman et al., 2009          |
| <b>GOAL-SETTING</b> | Child  | Barriers self-efficacy                                      | 6 <sup>th</sup> & 8 <sup>th</sup> grade | 1. I can be physically active during my free time on most days.<br>2. I can ask my parent or other adult to do physically active things with me.<br>3. I can be physically active during my free time on most days even if I could watch TV or play video games instead.<br>4. I can be physically active during my free time on most days even if it is very hot or cold outside.<br>5. I can ask my best friend to be physically active with me during my free time on most days.<br>6. I can be physically active during my free time on most days even if I have to stay at home.<br>7. I have the coordination I need to be physically active during my free time on most days.<br>8. I can be physically active during my free time on most days | Dishman et al., 2009          |

|                     |       |  |             |  |                               |
|---------------------|-------|--|-------------|--|-------------------------------|
|                     |       |  |             | no matter how busy my day is.  |                               |
| <b>GOAL-SETTING</b> | Child | General self-efficacy                      | 10-11 years | <ol style="list-style-type: none"> <li>1. It is difficult for me to eat fruit every day</li> <li>2. If I decide to eat fruit every day, I can do it</li> <li>3. It is difficult for me to eat vegetables every day</li> <li>4. If I decide to eat vegetables every day, I can do it</li> </ol>   | De Bourdeaudhuij et al., 2005 |
| <b>GOAL-SETTING</b> | Child | Self-efficacy to make healthy food choices | 11-18 years | <p>If you wanted to, how sure are you that you could eat healthy foods when you are...</p> <ol style="list-style-type: none"> <li>1. At the mall</li> <li>2. With your friends</li> <li>3. At a fast food restaurant</li> </ol> <p>If you wanted to, how sure are you that you could eat healthy foods when you are...</p> <ol style="list-style-type: none"> <li>1. Stressed out</li> <li>2. Feeling down</li> <li>3. Bored</li> </ol> <p>If you wanted to, how sure are you that you could eat healthy foods when you are...</p> <ol style="list-style-type: none"> <li>1. Hungry after school</li> <li>2. Alone</li> <li>3. Eating dinner with your family</li> </ol> | Neumark-Sztainer et al., 2003 |
| <b>GOAL-SETTING</b> | Child | Intention                                  | 10-11 ears  | <ol style="list-style-type: none"> <li>1. I want to eat fruit every day</li> <li>2. I want to eat vegetables every day</li> </ol>  | De Bourdeaudhuij et al., 2005 |
| <b>GOAL-SETTING</b> | Child | Habit                                      | 10-11 ears  | <ol style="list-style-type: none"> <li>1. To eat fruit every day is a habit for me</li> <li>2. To eat vegetables every day is a habit for me</li> </ol>  | De Bourdeaudhuij et al., 2005 |
| <b>GOAL-SETTING</b> | Child | Active parental encouragement              | 10-11 years | <ol style="list-style-type: none"> <li>1. My mother encourages me to eat fruit every day</li> <li>2. My father encourages me to eat fruit every day</li> <li>3. My mother encourages me to eat vegetables every day</li> <li>4. My father encourages me to eat vegetables every day</li> </ol>   | De Bourdeaudhuij et al., 2005 |
| <b>GOAL-SETTING</b> | Child | Parent FJV normative expectations          | Grades 4-6  | <p>How much do your parents encourage you to...</p> <ol style="list-style-type: none"> <li>1. Eat fruit at lunch?</li> <li>2. Eat fruit at snack?</li> <li>3. Drink 100% fruit juice at breakfast?</li> <li>4. Eat vegetables at supper?</li> <li>5. Eat vegetables at snack?</li> <li>6. Drink 100% fruit juice instead of soda?</li> <li>7. Eat vegetables at lunch?</li> </ol>  | Cullen et al., 2001           |
| <b>GOAL-SETTING</b> | Child | Peer FJV normative expectations            | Grades 4-6  | <p>How much do your friends encourage you to...</p> <ol style="list-style-type: none"> <li>1. Eat vegetables at snack?</li> <li>2. Drink 100% fruit juice at breakfast?</li> <li>3. Eat vegetables at lunch?</li> <li>4. Eat fruit at snack?</li> </ol>  | Cullen et al., 2001           |



|                     |        |  |   |  |                                 |
|---------------------|--------|--|---|--|---------------------------------|
|                     |        |  |   | 5. Eat vegetables at supper?<br>6. Drink 100% fruit juice instead of soda?<br>7. Eat fruit at lunch?   |                                 |
| <b>GOAL-SETTING</b> | Parent | Stimulation of healthy intake              | Preschool-aged                          | 1. I get my child enthusiastic about health products, such as vegetables, fruit and whole meal products  | Gubbels et al., 2011            |
| <b>GOAL-SETTING</b> | Child  | Social Support – Friends                   | 6 <sup>th</sup> & 8 <sup>th</sup> grade | During a typical week, how often...<br>1. Do your friends encourage you to do physical activities or play sports?<br>2. Do your friends do physical activities or play sports with you?<br>3. Do your friends tell you that you are doing well at physical activities or sports?   | Dishman et al., 2009            |
| <b>GOAL-SETTING</b> | Parent | Social Support                             | Grades 7 – 12                           | 1. Encouraged their child to do PA or play sports<br>2. Done a PA or played sports with their child<br>3. Provided transportation so their child could go to a place where he or she can do PA or play sports<br>4. Watched their child participate in PA or sport<br>5. Told their child that PA is good for his/her health   | Trost et al., 2003              |
| <b>GOAL-SETTING</b> | Child  | Social support for healthy eating          | 11-18 ears                              | 1. My mother cares about eating healthy food.<br>2. My father cares about eating healthy food.<br>3. My mother encourages me to eat healthy food.<br>4. My father encourages me to eat healthy food.<br>5. Many of my friends care about eating healthy food.  | Neumark-Sztainer et al., 2003   |
| <b>GOAL-SETTING</b> | Parent | FJV parent modeling / socialization        | Grades 4-6                              | 1. Regularly tell your child you like fruit for snacks<br>2. Regularly tell your child you like vegetable for snacks<br>3. Regularly tell your child you like fruit for lunch<br>4. Regularly tell your child you like vegetables for supper<br>5. Regularly leave out a bowl of fruit for snacks<br>6. Regularly involve your child in preparing fruit and vegetables | Cullen et al., 2000             |
| <b>GOAL-SETTING</b> | Parent | Modeling                                   | 3-6 years                               | 1. How often do you offer your child food that you find especially important or healthy?<br>2. How often do you eat something that you would like your child to eat as well?   | Kroller & Warschburger, 2009    |
| <b>GOAL-SETTING</b> | Parent | Modeling                                   | 1.5-8 years                             | 1. I model healthy eating for my child by eating healthy foods myself.<br>2. I try to eat healthy foods in front of my child, even if they are not my favorite.<br>3. I try to show enthusiasm about eating healthy foods.<br>4. I show my child how much I enjoy eating healthy foods.  | Musher – Eizenman & Holub, 2007 |
| <b>GOAL-SETTING</b> | Parent | Authoritative:<br><i>Avoiding negative</i> | 2.5 – 7 years                           | 1. If I would like to eat sweets, I would restrain myself because of the presence of my child  | Vereecken et al., 2004          |

|                     |       |                                       |   |   |                               |
|---------------------|-------|---------------------------------------|---|---|-------------------------------|
|                     |       | <i>modeling behavior...</i>           |   | 2. If it would like to drink soft drinks, I would restrain myself because of the presence of my child   |                               |
| <b>GOAL-SETTING</b> | Child | Subjective norm                       | 10-11 ears                              | 1. My mother eats fruit every day<br>2. My father eats fruit every day<br>3. My best friend eats fruit every day<br>4. My mother eats vegetables every day<br>5. My father eats vegetables every day<br>6. My best friend eats vegetables every day   | De Bourdeaudhuij et al., 2005 |
| <b>GOAL-SETTING</b> | Child | Peer FJV normative behaviors          | Grades 4-6                              | 1. Most kids eat fruit at lunch<br>2. Most kids eat fruit at snack<br>3. Most kids eat vegetables at lunch<br>4. Most kids eat vegetables at supper<br>5. Most kids like to drink 100% fruit juice with breakfast<br>6. Most kids drink 100% fruit juice at snack<br>7. Most kids eat vegetables at snack<br>8. My friends like to drink 100% fruit juice<br>9. Most kids drink 100% fruit juice at lunch<br>10. Most kids eat fruit at supper<br>11. My friends like to eat fruit<br>12. My friends like to eat vegetables | Cullen et al., 2001           |
| <b>GOAL-SETTING</b> | Child | Peer low-fat food normative behaviors | Grades 4-6                              | 1. My friends like to eat low-fat mayonnaise on sandwiches<br>2. My friends like to drink low-fat milk<br>3. Most kids drink low-fat milk<br>4. Most kids eat low-fat mayonnaise on sandwiches<br>5. My friends likes to eat low-fat dressing with vegetables or salad<br>6. My friends like to eat low-fat snack foods<br>7. Most kids eat low-fat snack foods   | Cullen et al., 2001           |
| <b>GOAL-SETTING</b> | Child | Peer FJV normative beliefs            | Grades 4-6                              | Most kids my age think that eating...<br>1. Or drinking 1 serving of fruit or juice at breakfast is ____<br>2. 1 serving of vegetable at snack is ____<br>3. 1 serving of vegetable at supper is ____<br>4. Or drinking 1 serving of fruit or juice at lunch is ____<br>5. 1 serving of vegetable at lunch is ____<br>6. Or drinking 1 serving of fruit or juice at snack is ____   | Cullen et al., 2001           |
| <b>GOAL-SETTING</b> | Child | Family FJV normative beliefs          | Grades 4-6                              | Most people in my family think that eating...<br>1. Or drinking 1 serving of fruit or juice at lunch is ____<br>2. Or drinking 1 serving of fruit or juice at breakfast is ____<br>3. 1 serving of vegetable at snack is ____<br>4. Or drinking 1 serving of fruit or juice at snack is ____<br>5. 1 serving of vegetable at supper is ____<br>6. Or drinking 1 serving of vegetable at lunch is ____   | Cullen et al., 2001           |
| <b>GOAL-SETTING</b> | Child | Self-Management                       | 6 <sup>th</sup> & 8 <sup>th</sup> grade | 1. How OFTEN was each of these things true for you in the last month?   | Dishman et al., 2009          |

|                     |        |                                      |   |   |                                 |
|---------------------|--------|--------------------------------------|---|---|---------------------------------|
|                     |        |                                      |   | <ul style="list-style-type: none"> <li>a. I think about the benefits I will get from being physically active.</li> <li>b. I say positive things to myself about physical activity.</li> <li>c. When I get off track with my physical activity plans, I tell myself I can start again and get right back on track.</li> <li>d. I try different kinds of physical activity so that I have more options to choose from.</li> <li>e. I set goals to do physical activity.</li> <li>f. I make back-up plans to be sure I get my physical activity.</li> </ul>  |                                 |
| <b>GOAL-SETTING</b> | Child  | Perceived benefits of healthy eating | 11-18 years                             | <p>The types of food I eat affect.</p> <ul style="list-style-type: none"> <li>1. My health</li> <li>2. How I look</li> <li>3. My weight</li> <li>4. How well I do in sports</li> <li>5. How well I do in school</li> </ul>  | Neumark-Sztainer et al., 2003   |
| <b>GOAL-SETTING</b> | Child  | Outcome-Expectancy Value             | 6 <sup>th</sup> & 8 <sup>th</sup> grade | <p>If I were to be physically active during my free time on most days...</p> <ul style="list-style-type: none"> <li>1. It would help me spend more time with my friends.</li> <li>2. It would help me control my weight.</li> <li>3. It would put me in a better mood.</li> <li>4. It would make me better in sports, dance, or other activities.</li> <li>5. I would feel better about myself.</li> </ul>  | Dishman et al., 2009            |
| <b>GOAL-SETTING</b> | Child  | Outcome-Expectancy Value             | 6 <sup>th</sup> & 8 <sup>th</sup> grade | <p>How important are these things...</p> <ul style="list-style-type: none"> <li>1. Spending more time with my friends is...</li> <li>2. Controlling my weight is...</li> <li>3. Being in a better mood is...</li> <li>4. Being better in sports, dance, or other activities is...</li> <li>5. Feeling good about myself is...</li> </ul>  | Dishman et al., 2009            |
| <b>GOAL-SETTING</b> | Parent | FJV parent planning / encouraging    | Grades 4-6                              | <ul style="list-style-type: none"> <li>1. Regularly plan menus for the family that contain 1 serving of fruit at every supper</li> <li>2. Regularly plan menus for the family that contain 1 serving of vegetable at every supper</li> <li>3. Regularly have fruit at each dinner</li> <li>4. Regularly insist that your child try at least one bite of a new fruit</li> <li>5. Regularly insist that your child try at least one bite of a new vegetable</li> <li>6. Regularly serve 2 vegetables at dinner</li> <li>7. Regularly encourage your child to eat fruit</li> <li>8. Regularly use a grocery list for shopping trips</li> </ul> | Cullen et al., 2000             |
| <b>GOAL-SETTING</b> | Parent | Child Involvement                    | 1.5-8 years                             | <ul style="list-style-type: none"> <li>1. I involve my child in planning family meals.</li> <li>2. I allow my child to help prepare family meals.</li> <li>3. I encourage my child to participate in grocery shopping.</li> </ul>   | Musher – Eizenman & Holub, 2007 |

|  |                |  |             |   |                         |
|--|----------------|--|-------------|---|-------------------------|
| <b>GOAL-SETTING</b>  | Parent         | Child shopping influence   | Grade 4-6   | <ol style="list-style-type: none"> <li>1. My children ask me to buy certain fruits at the grocery store</li> <li>2. My children ask me to buy certain vegetables at the grocery store</li> <li>3. My children go grocery shopping with me</li> <li>4. My children ask me to buy certain foods at the grocery store</li> </ol>   | Cullen et al., 2000     |
| <b>GOAL-SETTING</b>  | Parent         | Food preparation questionnaire:<br><br>Parent FJV preparation practices  | Grade 4-6   | <ol style="list-style-type: none"> <li>1. How often do you include a fruit in that snack?</li> <li>2. How often do you include a vegetable in that snack?</li> <li>3. How often do you include a vegetable in your child's lunch?</li> <li>4. How often do you prepare your child's snacks?</li> <li>5. How often does your child prepare his/her own snacks?</li> <li>6. How often do you include a fruit in your child's lunch?</li> <li>7. How often does your child eat vegetables for a snack?</li> <li>8. How often do you prepare your child's lunch?</li> <li>9. How often does your child eat fruit for a snack?</li> </ol>  | Cullen et al., 2000     |
| <b>GOAL-SETTING</b>  | Parent         | Food preparation questionnaire:<br><br>Child lunch/snack FJV preparation | Grade 4-6   | <ol style="list-style-type: none"> <li>1. How often do you tell him/her to include a fruit in his/her lunch?</li> <li>2. How often does your child put fruit in the lunch he/she packs?</li> <li>3. How often do you tell him/her to eat a fruit at their snack?</li> <li>4. How often do you tell him/her to include a vegetable in his/her lunch?</li> </ol>  | Cullen et al., 2000     |
| <b>GOAL-SETTING</b>  | Parent         | Food preparation questionnaire:<br><br>Child dinner FJV preparation      | Grade 4-6   | <ol style="list-style-type: none"> <li>1. How often do you tell him/her to include a vegetable at dinner?</li> <li>2. How often does your child prepare his/her own dinner?</li> <li>3. How often do you tell him/her to include a fruit at dinner?</li> </ol>  | Cullen et al., 2000     |
| <b>GOAL-SETTING</b>  | Parent & Child | Availability and Accessibility   | 12-14 years | <ol style="list-style-type: none"> <li>1. If the child indicates that he/she likes a certain type of fruit, would the parent buy it</li> <li>2. Is there fruit at home the child likes</li> <li>3. Is fruit available in a place where it catches the eye</li> <li>4. How many days per week does the child get fruit to take to school</li> <li>5. If the child indicates that he/she like a particular snack, would the parent buy it</li> <li>6. Are snacks usually available at home</li> <li>7. How many days per week does the child get snacks to take to school</li> <li>8. If the child indicates that he/she likes a certain breakfast product, would the parent buy it</li> <li>9. Is the table set for breakfast</li> </ol> | Van Assema et al., 2007 |
| <b>2. PERFORMANCE PHASE: survey items that assess child self-monitoring and self-control during eating and activity behaviors.</b> |                |  |             |   |                         |
| <b>SELF-</b>   | Parent         | Monitoring   | 5-9 years   | <ol style="list-style-type: none"> <li>1. How much do you keep track of the sweets (candy, ice</li> </ol>   | Birch et al., 2001      |

|                        |                 |                               |                |  |                                 |
|------------------------|-----------------|-------------------------------|----------------|--|---------------------------------|
| <b>MONITORING</b>      |                 |                               |                | cream cake, pies, pastries) that your child eats?<br>2. How much do you keep track of the snack food (potato chips, Doritos, cheese puffs)?<br>3. How much do you keep track of the high-fat foods that your child eats?   |                                 |
| <b>SELF-MONITORING</b> | Parent          | Stimulation of healthy intake | Preschool-aged | 1. I make sure my child eats enough healthy food products  | Gubbels et al., 2011            |
| <b>SELF-MONITORING</b> | Parent (Latino) | Monitoring (PEAS)             | 5-8 years      | 1. How much do you keep track of the amount of TV or videos your child is watching.<br>2. How much do you keep track of the high fat foods your child eats<br>3. How much do you keep track of the salty food your child eats<br>4. How much do you keep track of sweets that your child eats<br>5. How much do you keep track of the amount of exercise your child is getting<br>6. How much do you keep track of the servings of fruits and vegetables your child is eating<br>7. My child must ask permission before getting a snack  | Larios et al., 2009             |
| <b>SELF-MONITORING</b> | Parent          | Monitoring                    | 1.5-8 years    | 1. How much do you keep track of the sweets (candy, ice cream, cake, pies, pastries) that your child eats?<br>2. How much do you keep track of snack food (potato chips, Doritos, cheese puffs) that your child eats?<br>3. How much do you keep track of the high-fat foods that your child eats?<br>4. How much do you keep track of the sugary drinks (soda/pop, kool-aid) this child drinks)?  | Musher – Eizenman & Holub, 2007 |
| <b>SELF-CONTROL</b>    | Parent          | Restriction                   | 5-9 years      | 1. I have to be sure that my child does not eat too many sweets (candy, ice cream, cake, pastries).<br>2. I have to be sure that my child does not eat too many high-fat foods.<br>3. I have to be sure that my child does not eat too much of their favorite foods.<br>4. I intentionally keep some foods out of my child's reach.<br>5. I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behavior.<br>6. I offer my child her favorite foods in exchange for good behavior.<br>7. If I did not guide or regulate my child's eating, she would eat too many junk foods.<br>8. If I did not guide or regulate my child's eating, she would eat too much of her favorite foods. | Birch et al., 2001              |
| <b>SELF-</b>           | Child           | Restriction                   | 4-6 years      | 1. Is it okay with your mommy (daddy) if you don't eat all of  | Carper, Fisher,                 |

|                     |        |   |             |   |                                 |
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| <b>CONTROL</b>      |        |   |             | <p>the food on your plate?</p> <ol style="list-style-type: none"> <li>Does your mommy (daddy) ever say things like “You’ve had enough to eat now, you need to stop”?</li> <li>Does your mommy (daddy) ever let you have snacks?</li> <li>Does your mommy (daddy) buy candy for you when you ask for it?</li> <li>If you ask for a snack, does mommy (daddy) let you have it?</li> <li>If you’re with your mommy (Daddy) and you want something to eat, does she let you pick what you want to eat?</li> <li>If you’re with your mommy (daddy) and you want something to eat, does she let you pick how much you eat?</li> <li>If you don’t eat all of your dinner, are you allowed to have dessert?</li> <li>Are you allowed to get your own snacks?</li> </ol> | Birch, 2000                     |
| <b>SELF-CONTROL</b> | Parent | Restriction   | 4-6 years   | <p>For 10 Snack Foods: Pretzels; Popcorn; Fig Bars; Frozen Yogurt; Nuts; Chocolate Chip Cookie; Ice Cream; Potato Chips; Fruit-Chew Candy; Chocolate Bars</p> <ol style="list-style-type: none"> <li>If parents limit the time of day when the food is allowed</li> <li>Get upset if the child obtained the food without asking</li> <li>Monitor the child’s consumption</li> <li>Generally limit the amount consumed</li> <li>Allow second helpings</li> <li>Generally limit opportunities to consume the food</li> <li>Provide the food relative to how often the child asks for it</li> <li>Keep the food out of reach</li> <li>Limit how often the food is in the home</li> <li>Limit the type of eating occasions at which the food is provided</li> </ol> | Fisher & Birch, 2000 (ADA)      |
| <b>SELF-CONTROL</b> | Parent | Restriction for Health – Parents control the child’s food intake with the purpose of limiting less healthy foods and sweets | 1.5-8 years | <ol style="list-style-type: none"> <li>If I did not guide or regulate my child’s eating, s/he would eat too much of his/her favorite foods.</li> <li>If I did not guide or regulate my child’s eating, he/she would eat too many junk foods.</li> <li>I have to be sure that my child does not eat too much of his/her favorite foods.</li> <li>I have to be sure that my child does not eat too many sweets (candy, ice cream, cake, or pastries)</li> </ol>   | Musher – Eizenman & Holub, 2007 |
| <b>SELF-CONTROL</b> | Parent | Restriction for Weight Control – Parents control the child’s food intake  | 1.5-8 years | <ol style="list-style-type: none"> <li>I have to be sure that my child does not eat too many high-fat foods</li> <li>I encourage my child to eat less so he/she won’t get fat</li> <li>I give my child small helpings at meals to control his/her</li> </ol>  | Musher – Eizenman & Holub, 2007 |

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|                     |        | with the purpose of decreasing or maintaining the child's weight |               | <p>weight</p> <ol style="list-style-type: none"> <li>If my child eats more than usual at one meal, I try to restrict his/her eating at the next meal.</li> <li>I restrict the food my child eats that might make him/her fat.</li> <li>There are certain foods my child shouldn't eat because they will make him/her fat.</li> <li>I don't allow my child to eat between meals because I don't want him/her to get fat.</li> <li>I often put my child on a diet to control his/her weight.</li> </ol>  |                                 |
| <b>SELF-CONTROL</b> | Parent | Media & Physical Activity Policies<br><br>Restrict & Reward      | 3-7 years     | <ol style="list-style-type: none"> <li>Would you say that you restrict active play indoors?</li> <li>Would you say that you restrict outdoor play in your yard?</li> <li>Would you say that you restrict outdoor play in your immediate neighborhood?</li> <li>How often would you say that you restrict the amount of time your child spends watching TV?</li> <li>How often would you say that you restrict the amount of time your child spend using a computer or laptop?</li> <li>How often would you say that you restrict the amount of time your child spends playing games on the games console?</li> <li>How often would you say that you reward good behavior with extra TV time?</li> <li>How often would you say that you reward good behavior with extra computer time?</li> <li>How often would you say that you reward good behavior with extra game/game console time?</li> </ol> | Bryant et al., 2008             |
| <b>SELF-CONTROL</b> | Parent | Reward   | 3-6 years     | <ol style="list-style-type: none"> <li>I offer sweets (candy, ice cream, cake or pastries) to my child as a reward for good behavior.</li> <li>I offer my child her favorite foods in exchange for good behavior.</li> <li>I encourage my child to eat something by suing food as a reward (for example, "If you finish your vegetables, you will get some fruit").</li> <li>I promise my child something other than food if he or she eats (for example, "If you eat your beans, we can play ball after dinner")</li> </ol>   | Kroller & Warschburger, 2009    |
| <b>SELF-CONTROL</b> | Parent | Authoritarian:<br><i>Encouragement through material reward</i>   | 2.5 – 7 years | <ol style="list-style-type: none"> <li>If my child does not like something, I tell him/her that he/she will get a dessert</li> <li>My child gets a reward if he/she eats fruit or vegetables</li> <li>My child gets a reward if he/she finishes his/her plate</li> </ol>   | Vereecken et al., 2004          |
| <b>SELF-CONTROL</b> | Parent | Food as reward – parents use food as reward for child behavior   | 1.5-8 years   | <ol style="list-style-type: none"> <li>I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behavior.</li> <li>I withhold sweets/dessert from my child in response to bad behavior.</li> </ol>   | Musher – Eizenman & Holub, 2007 |

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|                     |        |   |  | 3. I offer my child his/her favorite foods in exchange for good behavior.  |                                 |
| <b>SELF-CONTROL</b> | Parent | Use non-food rewards                                | 2-8 years                              | 1. Offer child activity rewards for eating<br>2. Praise child for eating<br>3. Use child's favorite plates or utensils<br>4. Make meals fun  | Williams et al., 2008           |
| <b>SELF-CONTROL</b> | Parent | Use of rewards                                      | 1 <sup>st</sup> -4 <sup>th</sup> grade | During a typical week, how often did you ...<br>1. You made eating the food a game or fun for the child.<br>2. You gave the child a favorite food as a reward for good behavior.<br>3. You offered the child a toy or favorite activity as a reward for eating.<br>4. You offered the child a special dessert as a reward for eating.  | Hendy et al., 2009 (PMAS)       |
| <b>SELF-CONTROL</b> | Parent | Increase intake with foods                          | 2-8 years                              | 1. Offer child desserts for eating foods<br>2. Allow child's favorite flavors on foods<br>3. Put food in the child's mouth   | Williams et al., 2008           |
| <b>SELF-CONTROL</b> | Parent | Authoritative: <i>Catering on children's demand</i> | 2.5 – 7 years                          | 1. When I compose a meal, I let my child choose from several suggestions<br>2. When I compose a meal, I consider the preferences of my child<br>3. When my child does not like something, he/she gets something else<br>4. When my child does not like something, he/she gets something he/she does like   | Vereecken et al., 2004          |
| <b>SELF-CONTROL</b> | Parent | Child Control                                       | 1.5-8 years                            | 1. Do you let your child eat whatever s/he wants?<br>2. At dinner, do you let this child choose the foods s/he wants from what is served?<br>3. If this child does not like what is being served, do you make something else?<br>4. Do you allow this child to eat snacks whenever s/he wants?<br>5. Do you allow this child to leave the table when s/he is full, even if your family is not done eating? | Musher – Eizenman & Holub, 2007 |
| <b>SELF-CONTROL</b> | Parent | Child Control                                       | 3-6 years                              | 1. How often do you allow your child to eat as much as he or she wants?<br>2. How often do you allow your child to eat what he or she wants to eat?<br>3. How often do you permit your child to decide whether he or she gets a second or third helping?   | Kroller & Warschburger, 2009    |
| <b>SELF-CONTROL</b> | Parent | Child control of feeding interactions               | 2-5 years                              | 1. At dinner, did you let him choose the foods he wanted from what was served?<br>2. If he did not like what was being served, did you make something else<br>3. Did you allow him to eat snack whenever he wanted?  | Baughcum et al., 2001           |



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| <b>SELF-CONTROL</b> | Parent | Permissive  | 2.5 – 7 years | <ol style="list-style-type: none"> <li>1. If my child asks for sweets or biscuits, I will give it to him/her</li> <li>2. If my child asks for soft drinks, I will give it to him/her</li> <li>3. My child is allowed to take sweets whenever he/she wants</li> <li>4. My child is allowed to take soft drinks whenever he/she wants</li> </ol>   | Vereecken et al., 2004 |
| <b>SELF-CONTROL</b> | Parent | Authoritative:<br><i>Encouragement through negotiation</i>            | 2.5 – 7 years | <ol style="list-style-type: none"> <li>1. If my child does not like something we agree that he/she only has to eat a small amount</li> <li>2. My child has to taste at least, even if he/she does not like something</li> <li>3. If I prepare a new kind of vegetable, my child has to taste at least</li> <li>4. I negotiate with my child how much he/she can leave on his/her plate</li> <li>5. I negotiate with my child how much he/she has to eat</li> </ol> | Vereecken et al., 2004 |
| <b>SELF-CONTROL</b> | Child  | Parent-child food control questionnaire:<br><br>Permissive eating     | Grades 4-6    | <ol style="list-style-type: none"> <li>1. She lets me eat whatever I want for lunch</li> <li>2. She lets me eat whatever I want for snacks</li> <li>3. She lets me eat whatever I want for dinner</li> <li>4. She lets me eat whatever I want for breakfast</li> </ol>   | Cullen et al., 2001    |
| <b>SELF-CONTROL</b> | Child  | Parent-child food control questionnaire:<br><br>Food self-preparation | Grades 4-6    | <ol style="list-style-type: none"> <li>1. She lets me prepare my breakfast</li> <li>2. She lets me prepare my lunch</li> <li>3. She lets me prepare my dinner</li> <li>4. She lets me prepare my snacks</li> </ol>   | Cullen et al., 2001    |
| <b>SELF-CONTROL</b> | Parent | Many food choices   | Grades 1-4    | <p>During a typical week, how often did you...</p> <ol style="list-style-type: none"> <li>1. You let the child eat whatever he/she wanted</li> <li>2. You let the child flavor the food however he/she wanted</li> <li>3. You let the child substitute a food for one he/she liked</li> <li>4. You let the child choose which foods to eat, but only from those offered</li> </ol>   | Hendy et al., 2009     |
| <b>SELF-CONTROL</b> | Parent | Boundaries of child's autonomy in buying or taking foods              | 6-11 years    | <ol style="list-style-type: none"> <li>1. To what degree can your child eat snacks and/or sweets without your permission?</li> <li>2. How frequently does your child buy his/her own sweets?</li> </ol>  | Golan & Weizman, 1998  |
| <b>SELF-CONTROL</b> | Parent | Become permissive   | 2-8 years     | <ol style="list-style-type: none"> <li>1. Allow foods between meals</li> <li>2. Give child the option of other foods</li> <li>3. Encourage child to eat FV each day</li> </ol>   | Williams et al., 2008  |
| <b>SELF-CONTROL</b> | Parent | Pressure to eat   | 5-8 years     | <ol style="list-style-type: none"> <li>1. My child should always eat all of the food on her plate.</li> <li>2. I have to be especially careful to make sure my child eats enough.</li> <li>3. If my child says "I'm not hungry", I try to get her to eat anyway.</li> <li>4. If I did not guide or regulate my child's eating she would eat much less than she should.</li> </ol>  | Birch et al., 2001     |
| <b>SELF-</b>        | Child  | Pressure to eat   | 4-6 years     | <ol style="list-style-type: none"> <li>1. When you say "I'm not hungry" at dinnertime, does</li> </ol>   | Carper, Fisher,        |

|                     |        |  |               |  |                                 |
|---------------------|--------|--|---------------|--|---------------------------------|
| <b>CONTROL</b>      |        |  |               | mommy say “You need to eat anyway”?<br>2. Does your mommy (daddy) make you eat all the food on your plate?<br>3. If there is something you mommy (daddy) wants you to eat, but you don’t eat it, does she ever make you sit at the table till you eat it?<br>4. Does your mommy (daddy) get upset when you play with your food?<br>5. Does your mommy (daddy) ever say things like “I don’t think you’ve had enough to eat, you need to eat more”?<br>6. If you tell your mommy (daddy) you’re full and don’t want to eat anymore, does she ever say “you need to eat more anyway”?<br>7. Does your mommy (daddy) say “If you don’t eat all your food, you won’t get dessert?” | Birch, 2000                     |
| <b>SELF-CONTROL</b> | Parent | Pressure   | 3-6 years     | 1. I have to be especially careful to make sure my child eats enough.<br>2. If my child says “I’m not hungry”, I try to get her to eat anyway.<br>3. If I did not guide or regulate my child’s eating, she would eat much less than she should.  | Kroller & Warschburger, 2009    |
| <b>SELF-CONTROL</b> | Parent | Pressure – parents pressure the child to consume more food at meals. | 1.5-8 years   | 1. My child should always eat all of the food on his/her plate.<br>2. If my child says, “I’m not hungry,” I try to get him/her to eat anyway.<br>3. If my child eats only a small helping, I try to get him/her to eat more.<br>4. When he/she says he/she is finished eating, I try to get my child to eat one more (two more, etc.) bites of food  | Musher – Eizenman & Holub, 2007 |
| <b>SELF-CONTROL</b> | Parent | Authoritarian: <i>Pressure</i>                                       | 2.5 – 7 years | 1. My child has to finish his/her plate<br>2. My child has to eat even if he/she is not hungry<br>3. Even if my child does not like something, he/she is obliged to eat it<br>4. I punish my child if he/she does not want to eat fruit or vegetables  | Vereecken et al., 2004          |
| <b>SELF-CONTROL</b> | Parent | Pushing the Child to Eat More  | 2-5 years     | 1. Did you make him eat all the food on his plate?<br>2. Did you ever punish or remove privileges to get him to eat more?<br>3. Did you use foods that he liked as a way to get your son to eat “healthy” foods he didn’t like?<br>4. Did you make your son finish all his dinner before he could have a dessert?<br>5. Did you offer him dessert after a meal to get him to eat foods that were good for him?   | Baughcum et al., 2001           |
| <b>SELF-</b>        | Parent | Insistence on eating   | Grades 1-4    | During a typical week, how often did you...  | Hendy et al.,                   |

|                     |        |  |                |  |                       |
|---------------------|--------|--|----------------|--|-----------------------|
| <b>CONTROL</b>      |        |  |                | <ol style="list-style-type: none"> <li>1. insist the child eat even if he/she said, "I'm not hungry"</li> <li>2. insist the child eat when he/she was sleepy or not feeling well</li> <li>3. insist the child eat when he/she was emotionally upset</li> </ol>   | 2009                  |
| <b>SELF-CONTROL</b> | Parent | Insist food amounts  | 2-8 years      | <ol style="list-style-type: none"> <li>1. Insist child remains until food amount eaten</li> <li>2. Insist child cleans the plate</li> </ol>  | Williams et al., 2008 |
| <b>SELF-CONTROL</b> | Parent | Become punitive  | 2-8 years      | <ol style="list-style-type: none"> <li>1. Insist child tries a bite of new foods</li> <li>2. Insist child tries foods before leaving table</li> <li>3. Punish child for not eating</li> </ol>  | Williams et al., 2008 |
| <b>SELF-CONTROL</b> | Parent | Parent food-socialization-encouraging practices questionnaire:<br><br>Consequences | Grade 4-6      | <p>To encourage your child to eat a particular food, how often do you...</p> <ol style="list-style-type: none"> <li>1. Give your child something he/she will like (other than dessert)</li> <li>2. Tell your child if you will take them somewhere if he/she eats it</li> <li>3. Take away a privilege from your child (e.g., watching TV, going outside, etc.) if it is not eaten</li> <li>4. Make something else for him/her</li> <li>5. Tell your child if he/she eats it you will give him/her dessert</li> <li>6. Force your child to eat it</li> </ol>   | Cullen et al., 2000   |
| <b>SELF-CONTROL</b> | Parent | Stimulation to be active   | Preschool-aged | <ol style="list-style-type: none"> <li>1. If my child says, "I don't feel like walking or bicycling to there", I try to get him/her to do this anyway</li> <li>2. I have to be careful that my child gets enough exercise</li> <li>3. I make sure my child travels actively on foot or by bicycle (with or without me) as often as possible.</li> </ol>  | Gubbels et al., 2011  |
| <b>SELF-CONTROL</b> | Parent | Parent food-socialization-discouraging practices questionnaire                     | Grade 4-6      | <p>To discourage your child to eat a particular food, how often do you...</p> <ol style="list-style-type: none"> <li>1. Get rid of it</li> <li>2. Tell your child it's not nutritious</li> <li>3. Tell your child it will make him/her sick</li> <li>4. Tell your child it's too sweet</li> <li>5. Give your child something else to do</li> <li>6. Put it somewhere your child can't find it</li> <li>7. Tell your child it's too greasy</li> <li>8. Tell your child it's bad for his/her teeth</li> <li>9. Say "don't eat it"</li> <li>10. Take away things your child likes to do (privileges) for eating it</li> <li>11. Give your child a small portion</li> <li>12. Tell your child it will make him/her fat</li> <li>13. Just don't buy it</li> <li>14. Just don't give it to your child</li> </ol> | Cullen et al., 2000   |
| <b>SELF-CONTROL</b> | Parent | Parent control over their children's food  | Grade 3        | <ol style="list-style-type: none"> <li>1. When my child does not finish dinner, he/she should not get dessert.</li> </ol>  | Robinson et al., 2001 |

|                     |                 |   |            |   |                     |
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|                     |                 | intake  |            | <ol style="list-style-type: none"> <li>My child should always eat all of the food on his/her plate.</li> <li>Generally, my child should only be permitted to eat at set mealtimes.</li> <li>My child often has to be strongly encouraged to eat things he/she doesn't like because those foods are often good for him/her.</li> <li>My child should be strongly reprimanded for playing or fiddling with food.</li> </ol>   |                     |
| <b>SELF-CONTROL</b> | Parent          | Parent control  | 3-5 years  | <ol style="list-style-type: none"> <li>I allow my child to choose which foods to have for meals</li> <li>I decide how many snacks my child should have</li> <li>I allow my child to wander around during a meal</li> <li>I let my child decide when s/he would like to have her meal</li> <li>I allow my child to decide when s/he has had enough snacks to eat</li> <li>I decide when it is time for my child to have a snack</li> <li>I decide the times when my child eats his/her meals</li> <li>I let my child eat between meals whenever s/he wants</li> <li>I insist my child eat meals at the table</li> <li>I decide what my child eats between meals</li> </ol> | Wardle et al., 2002 |
| <b>SELF-CONTROL</b> | Parent (Latino) | Control (PEAS)  | 5-8 years  | <ol style="list-style-type: none"> <li>If I don't regulate my child's eating he/she would eat much less</li> <li>I have to make sure my child eats enough</li> <li>If my child says, "I'm not hungry" I try to get them to eat anyway.</li> <li>My child should always eat all the food on his/her plate</li> <li>I offer TV, video games, videos as a reward for good behavior</li> <li>I offer sweets as a reward for good behavior</li> </ol>  | Larios et al., 2009 |
| <b>SELF-CONTROL</b> | Child           | Parent-child food control questionnaire:<br><br>Parent control  | Grades 4-6 | <ol style="list-style-type: none"> <li>She makes sure I eat all my vegetables before I can eat dessert</li> <li>She plans all my meals</li> <li>She insists on proper manners at the dinner table</li> <li>She has dinner ready at the same time everyday</li> <li>She wants the family to eat dinner together all the time</li> <li>She asks me what I eat at school</li> <li>She asks me how things went at school</li> <li>She prepares all my meals</li> <li>She tells me what I will eat for meals</li> <li>She asks me what foods I would like for meals</li> <li>She has my favorite foods at home</li> </ol>  | Cullen et al., 2001 |
| <b>SELF-CONTROL</b> | Parent          | Parental practices that promote FV intake<br><br>Home Nutrition | 5-8 years  | <ol style="list-style-type: none"> <li>I include fruits and/or vegetables in meals for my child at home</li> <li>I include fruits and/or vegetables in snacks for my child at home</li> </ol>   | Dave et al., 2010   |

|                     |                 |  |            |   |                       |
|---------------------|-----------------|--|------------|---|-----------------------|
|                     |                 | Questionnaire (HNQ)  |            | 3. I fix vegetable dishes on most days of the week<br>4. I make sure my child eats vegetables before he/she can eat dessert   |                       |
| <b>SELF-CONTROL</b> | Parent          | Parent-centered strategies:<br><br>Caregiver feeding styles Questionnaire (CFSQ) | 3-5 years  | 1. Physically struggles with child to get him/her to eat<br>2. Warn the child that you will take a food away if child doesn't eat<br>3. Promises child something other than food if child eats<br>4. Spoon-feeds child<br>5. Tells child to eat a small amount of food<br>6. Shows disapproval of child for not eating<br>7. Suggests child eat<br>8. Tells child to eat something on plate<br>9. Hurries child<br>10. Warn the child that you will take away something other than food if child doesn't eat<br>11. Encourages child to eat by using food as a reward<br>12. Begg child to eat  | Hughes et al., 2005   |
| <b>SELF-CONTROL</b> | Parent          | Eating related to hunger   | 6-11 years | 1. When your child asks to eat, does he/she claim to be hungry? Yes or no<br>2. Usually when the child eats:<br>a. He/she asked for it?<br>b. The food was offered by the mother/father<br>3. If it is meal time and your child is not hungry, how would you respond?<br>a. You suggest that the child will eat later<br>b. You suggest that the child sits at the table with the rest of the family but would not eat<br>c. You suggest that the child sits at the table with the rest of the family but would eat less<br>d. You convince the child to eat with the family<br>e. It is an irrelevant question, the child is always hungry.<br>4. When it is meal time and you are not hungry what would you do? (Answer for mother & father)<br>a. Not eat                      c. eat the same<br>b. Eat less                    d. it never happens | Golan & Weizman, 1998 |
| <b>SELF-CONTROL</b> | Parent (Latino) | Discipline (PEAS)  | 5-8 years  | 1. How often do you discipline your child if she/he plays video games without my permission?<br>2. How often do you discipline your child if she/he watches TV without my permission?<br>3. How often do you discipline your child if she/he gets a snack without my permission?<br>4. How often do you discipline your child if she/he drinks soda without my permission?<br>5. My child must ask permission before drinking a soda.   | Larios et al., 2009   |

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|---------------------|-----------------|--------------------------------------|---------------|--|---------------------------------|
| <b>SELF-CONTROL</b> | Parent          | Family support for physical activity | 3-5 years     | <ol style="list-style-type: none"> <li>1. Family encouraged physical activity</li> <li>2. Participated in physical activity with child</li> <li>3. Provided transportation to physical activity facilities</li> <li>4. Watching child in activities</li> <li>5. Told the child that physical activity is good for them</li> </ol>  | Pfeifer et al., 2009            |
| <b>SELF-CONTROL</b> | Parent          | Encourage balance and variety        | 1.5-8 years   | <ol style="list-style-type: none"> <li>1. Do you encourage this child to eat healthy foods before unhealthy ones?</li> <li>2. I encourage my child to try new foods.</li> <li>3. I tell my child that health food tastes good.</li> <li>4. I encourage my child to eat a variety of foods.</li> </ol>  | Musher – Eizenman & Holub, 2007 |
| <b>SELF-CONTROL</b> | Parent (Latino) | Reinforcement (PEAS)                 | 5-8 years     | <ol style="list-style-type: none"> <li>1. How often do you praise your child for being physically active?</li> <li>2. How often do you praise your child for eating a healthy snack?</li> </ol>  | Larios et al., 2009             |
| <b>SELF-CONTROL</b> | Parent          | Authoritative: <i>Verbal Praise</i>  | 2.5 – 7 years | <ol style="list-style-type: none"> <li>1. I praise my child if he/she eats fruit</li> <li>2. I praise my child if he/she eats vegetables</li> </ol>  | Vereecken et al., 2004          |
| <b>SELF-CONTROL</b> | Parent          | Special meals                        | Grades 1-4    | <p>During a typical week, how often did you...</p> <ol style="list-style-type: none"> <li>1. You ate the same foods as those offered to the child</li> <li>2. You sat with the child, but did not eat</li> <li>3. You prepared a special meal for the child, different from the family meal</li> <li>4. You placed some of each food on the child's plate</li> </ol>   | Hendy et al., 2009              |
| <b>SELF-CONTROL</b> | Parent          | Second helpings:<br>CFSQ             | 3-5 years     | <ol style="list-style-type: none"> <li>1. Waits to give the child more food until he/she has finished another food on the plate</li> <li>2. Offers seconds to child</li> <li>3. Takes a second helping in front of the child</li> </ol>  | Hughes et al., 2005             |
| <b>SELF-CONTROL</b> | Child           | Family Rules                         | 10-11 years   | <p>Demand:</p> <ol style="list-style-type: none"> <li>1. Do your parents demand that you eat fruit every day?</li> <li>2. Do your parents demand that you eat vegetables every day?</li> </ol> <p>Allow:</p> <ol style="list-style-type: none"> <li>1. Are you allowed to eat as much fruit as you like at home?</li> <li>2. Are you allowed to eat as many vegetables as you like at home?</li> </ol>   | De Bourdeaudhuij et al., 2005   |
| <b>SELF-CONTROL</b> | Parent          | Set meal rules                       | 2-8 years     | <ol style="list-style-type: none"> <li>1. Restrict child from foods without permission</li> <li>2. Send child from table if does not eat</li> </ol>  | Williams et al., 2008           |
| <b>SELF-CONTROL</b> | Parent          | Eating Policies                      | 3-6 years     | <ol style="list-style-type: none"> <li>1. Do you ask your child to eat everything on their plate at dinner?</li> <li>2. Do you restrict dessert if your child does not eat the food on their plate at dinner?</li> <li>3. Do you reward your child with desserts, snacks or candy if they finish foods from their plate at dinner?</li> <li>4. Do you allow your child to have seconds if they finish foods from their plate at dinner?</li> <li>5. Do you generally allow your child to eat only at set meal</li> </ol> | Bryant et al., 2008             |

|                     |        |  |                       |  |                        |
|---------------------|--------|--|-----------------------|--|------------------------|
|                     |        |  |                       | times?<br>6. Do you allow your child to serve themselves at dinner?<br>7. Do you allow your child to help themselves to snacks, including salty and sweet snacks, or candy when they are at home?<br>8. Would you say that you serve the “same amount”, “more” or “less” dinner to your child compared to what you serve yourself?   |                        |
| <b>SELF-CONTROL</b> | Parent | Parental policies to support Healthy Eating                  | 8-12 years            | How often do you...<br>1. Use food as a reward?<br>2. Prepare meals with child?<br>3. Plan meals with child?<br>4. Offer healthy snacks?<br>5. Eat breakfast with child?<br>6. Eat lunch with child?<br>7. Eat pm snack with child?<br>8. Eat dinner with child?<br>9. Eat dinner with child?<br>10. Have scheduled meals?<br>11. Can child eat snacks without permission?   | Gattshall et al., 2008 |
| <b>SELF-CONTROL</b> | Parent | Parental policies to support physical activity               | 8-12 years            | How often do you...<br>1. Encourage your child to be physically active?<br>2. Transport your child for physical activity?<br>3. Send your child outside to play?<br>4. Give your child physical activity options?<br>5. Praise your child for being physically active?   | Gattshall et al., 2008 |
| <b>SELF-CONTROL</b> | Parent | Child-centered strategies:<br><br>CFSQ                       | 3-5 years             | 1. Says something positive about food<br>2. Arranges the food to make it more interesting<br>3. Asks questions about food<br>4. Reasons with child to get him/her to eat<br>5. Allows choosing of appropriate foods<br>6. Helps child to eat<br>7. Compliments child for eating  | Hughes et al., 2005    |
| <b>SELF-CONTROL</b> | Parent | Family Nutrition and Physical Activity Screening Tool (FNPA) | 1 <sup>st</sup> grade | 1. Does your child eat breakfast and does the family eat a meal together?<br>2. Does the family watch TV while eating and do they eat fast food during the week?<br>3. Does the family eat prepackaged food or do they use fresh foods and fruits and vegetables?<br>4. Does the family drink soda and Kool-Aid or 100% fruit juices and low fat milk?<br>5. Does the family use food as a reward and do they restrict unhealthy foods?<br>6. Do the parents participate in physical activity and does the | Ihmels et al., 2009    |

|                     |        |  |                       |  |                                 |
|---------------------|--------|--|-----------------------|--|---------------------------------|
|                     |        |  |                       | <p>family participate or play together?</p> <p>7. Does the child participate in physical activity and organized sports?</p> <p>8. How many hours of screen time does the child get?</p> <p>9. Does the child have a TV in his bedroom and do the parents monitor the screen time?</p> <p>10. How many hours does the child sleep and is there a bedtime routine?</p>   |                                 |
| <b>SELF-CONTROL</b> | Parent | Emotion regulation – parents use food to regulate child’s emotional states | 1.5-8 years           | <p>1. When this child gets fussy, is giving him/her something to eat or drink the first thing you do?</p> <p>2. Do you give this child something to eat or drink if s/he is bored even if you think s/he is not hungry?</p> <p>3. Do you give this child something to eat or drink if s/he is upset even if you think s/he is not hungry?</p>  | Musher – Eizenman & Holub, 2007 |
| <b>SELF-CONTROL</b> | Child  | Appetitive and Physical Regulation Survey                                  | 5 <sup>th</sup> grade | <p>1. It is good to stop eating when I know food is not good for me.</p> <p>2. It is important to control feelings so I do not eat too much.</p> <p>3. I should stop and think how good food is for me.</p> <p>4. I should think when finding out how healthy food is for me.</p> <p>5. When I’m frustrated, it is OK to take a deep breath.</p> <p>6. When I’m frustrated, it is OK to eat a lot to make myself feel better.</p> <p>7. When I don’t get to eat the food I want, it is OK to get mad.</p> <p>8. If a classmate gives me food, I should eat it.</p> <p>9. It is OK to grab the first food that I see and eat it.</p> <p>10. When I’m bored, it is OK to sit and watch TV.</p>                             | Riggs et al., 2007.             |
| <b>SELF-CONTROL</b> | Child  | Regulation of Emotions Questionnaire                                       | 12-19 years           | <p>Internal-Functional scale:</p> <p>1. I review (rethink) my thoughts or beliefs.</p> <p>2. I review (rethink) my goals or plans</p> <p>3. I put the situation into perspective</p> <p>4. I concentrate on a pleasant activity</p> <p>5. I plan what I could do better next time</p> <p>External-Dysfunctional scale:</p> <p>1. I take my feelings out on others verbally (e.g., shouting, arguing)</p> <p>2. I take my feelings out on others physically (e.g., fighting, lashing out)</p> <p>3. I try to make others feel bad (e.g., being rude, ignoring them)</p> <p>4. I bully other people</p> <p>5. I take my feelings out on objects around me (e.g., deliberately...)</p> <p>Internal-Dysfunctional scale:</p> | Phillips & Power, 2007          |



|   |        |                                      |           |   |                       |
|---|--------|--------------------------------------|-----------|---|-----------------------|
|   |        |                                      |           | <ol style="list-style-type: none"> <li>1. I harm or punish myself in some way</li> <li>2. I dwell on my thoughts and feelings (e.g., it goes round and round...)</li> <li>3. I think about people better off and make myself feel worse</li> <li>4. I keep the feeling locked up inside</li> <li>5. Things feel unreal (e.g., I feel strange, things around me feel strange...)</li> </ol> <p>External-Functional scale:</p> <ol style="list-style-type: none"> <li>1. I talk to someone about how I feel</li> <li>2. I ask others for advice</li> <li>3. I seek physical contact from friends or family (e.g., a hug, hold hands)</li> </ol> |                       |
| <b>3. SELF-REFLECTION: survey items that assess child self-reaction (satisfaction) and self-evaluation of their eating and activity behaviors</b> |        |                                      |           |   |                       |
| <b>Self-Reflection</b>  | Parent | Difficulty in Child Eating           | 2-5 years | <ol style="list-style-type: none"> <li>1. Was he a picky eater?</li> <li>2. Was it hard to get him to eat new foods?</li> <li>3. Did you have to make special meals for him because he was a picky eater?</li> <li>4. Was it a struggle to get him to eat?</li> <li>5. Did he have a poor appetite?</li> <li>6. Did you get upset if he did not eat enough?</li> </ol>  | Baughcum et al., 2001 |
| <b>Self-Reflection</b>  | Parent | Concern about Child Overeating       | 2-5 years | <ol style="list-style-type: none"> <li>1. Did you have to stop him from eating too much?</li> <li>2. Did you think about pulling him on a diet to keep him from becoming overweight?</li> <li>3. Did you worry that he was eating too much?</li> <li>4. Did you get upset if he ate too much?</li> </ol>  | Baughcum et al., 2001 |
| <b>Self-Reflection</b>  | Parent | Concern about child being overweight | 2.5 years | <ol style="list-style-type: none"> <li>1. I am worried that my son will become overweight.</li> <li>2. I am worried that my son will have to diet to stay at a healthy weight.</li> <li>3. I am worried that my son is underweight right now.</li> </ol>  | Baughcum et al., 2001 |

## **Chapter 2 - Validation of a survey to measure parenting practices to foster eating and activity self-regulation in young children**

### **Introduction**

Parents are gatekeepers of young children's eating, physical activity (PA), and screen time (ST) opportunities because they establish the home physical (availability and accessibility), and social environment (parenting practices). Parenting practices play a critical role in the development of young children's taste preferences, eating habits, PA and ST behaviors.<sup>6,8,10,12,23</sup> Numerous parenting practices to influence children's eating and activity behaviors have been studied. While parental use of rewards to get children to eat certain foods or participate in an activity are effective at immediately increasing the targeted behaviors,<sup>26,44</sup> evidence suggests that children's long term preferences for the targeted foods and activities decreases and preferences for the reward increases.<sup>9,13</sup> Furthermore, excessive parent control such as pressure to eat or insisting their child participate in an activity may increase children's initial response for those behaviors, but may decrease preference later in life.<sup>15,21,41</sup> Therefore, a need exists to identify the parenting practices that will lead to the development of children's capacity for lifelong healthful eating and PA.

Recent research suggests that developing self-regulation skills is a central mediator of health behavior change. For example, a review of the mediators of change in experimental designs showed that changes in self-regulation constructs had the most effect on changes in PA in adults compared to constructs such as self-efficacy and outcome expectations.<sup>45</sup> Among children, self-regulation is positively associated with several outcomes, such as greater academic competence,<sup>39</sup> university entrance exam scores,<sup>40</sup> higher reasoning skills, and a greater ability to deal with stress more maturely.<sup>39</sup> Evidence suggests that self-regulation is protective against overweight, as children with lower levels of self-regulation gain weight at a higher rate.<sup>20</sup> Compared to normal weight children, overweight counterparts are less likely to delay gratification, lack internal hunger cues, and respond more frequently to immediate rewards.<sup>48</sup> Thus, a need exists to determine if parenting practices can contribute to the development of children's self-regulation skills to prevent obesity.

Some research has examined the relationship between parenting practices and children's self-regulation skills, such as eating in absence of hunger, and ability to delay gratification. Children's ability to self-regulate their behavior increases in importance as children age, and are responsible for their own eating and activity decisions.<sup>33</sup> Higher parent control through monitoring, restriction, and pressure to eat may have negative consequences for children's health behaviors in the future, such as an inability self-regulate, eating in absence of hunger, and increased dietary, sweet, and savory food intake.<sup>15,32,34,51</sup> Similarly, restriction of certain foods and activities is associated with greater snack food intake, and decreased ability to self-regulate behavior.<sup>11,19</sup> There is a gap in the literature such that, little evidence exists on the impact of parenting practices to develop self-regulation skills to prevent childhood obesity.

There is not a consensus on the theoretical underpinnings and theoretical and operational definitions of self-regulation.<sup>25,37,38,53</sup> To examine self-regulation from a health behavior perspective, we adopt a social cognitive definition that targets the development of personal agency.<sup>3</sup> From this perspective, self-regulation is defined as dealing with a broad range of social and situational environmental challenges through the processes of goal setting and goal striving.<sup>38</sup> Simply, self-regulation is the ability to do a goal-directed behavior in the face of environmental challenges.<sup>2</sup> Given that there are environmental pressures throughout life to choose unhealthy behaviors, this definition of self-regulation may identify a key skill necessary to develop in children and adults to perform sustained healthful eating, PA and decreased sedentary behavior.

Figure 1.1 illustrates our conceptual model for self-regulation based on a social cognitive health behavior approach<sup>3</sup> that has been developed in the literature on self-regulation of learning in children.<sup>53</sup> Our model suggests that parenting practices to foster self-regulation include three cyclical phases: forethought, performance, and self-reflection.<sup>53</sup>

The forethought phase precedes the behavior, and is where the processes of the behavior are learned. It is during this phase that an individual chooses health behavior goals, and develops plans to accomplish the goal. During the forethought phase, an individual's self-efficacy, outcome expectations, task value and goal orientation fosters their health behavior choices. As such, individual's learn and choose health behavior goals, and develop plan to accomplish those goals.<sup>53</sup> During forethought, an individual's beliefs guide actions that lead to health behaviors.<sup>1</sup>

The performance phase occurs while participating in a behavior, and involves self-monitoring and self-control to make healthy eating and activity choices. Self-monitoring is defined as the tracking of one's behavior.<sup>53</sup> Three processes comprise self-control: inhibition, emotion regulation, and compliance. First, inhibition is the ability to control impulses in reaction to unfamiliar objects and delay gratification.<sup>32</sup> Second, there is a need to regulate emotions by recognizing, monitoring, and evaluating our reactions to accomplish one's goal.<sup>50</sup> Third, compliance is the ability for children to initiate, stop, or change their behavior to comply with the healthy goal.<sup>33</sup>

The last phase, self-reflection, occurs following a behavior and influences an individual's reaction to their experience, which in turn influences their forethought (and the cycle repeats itself). Self-satisfaction is included within self-reflection, such that positive self-reflection leads to increased self-satisfaction and continued health behaviors. However, negative self-reflection is more influential on behavior change, such that negative self-reflection will lead to self-dissatisfaction and higher motivation to change behavior.<sup>4</sup> Zimmerman and Moylan (2009) define self-satisfaction as the "cognitive and affective reactions to one's self-judgments."

Based on the literature that informed our conceptual model, parenting practices that foster children's self-regulation include "positive persuasion",<sup>28</sup> "active parenting encouragement",<sup>17</sup> and "positive control",<sup>32</sup> where parents use "positive" control strategies about foods and activities (PA and ST). Positive control strategies are defined as deliberate comments and judgments and are associated with increased ability for children to self-regulate.<sup>32</sup> As such, these positive parenting practices include teaching, encouraging and guiding children's health behavior<sup>32,36</sup> to help foster children's *acceptance* of healthy eating and PA (forethought phase); *self-monitoring* and *self-control* for those behaviors (performance phase); and *reflection* and *self-satisfaction* with their eating and activity behaviors (self-reflection phase).

Specific parenting practices may foster or discourage the development of self-regulation in children.<sup>15,17,28,32,34</sup> However, few measures exist to examine parenting practices and the development of self-regulation in children. Thus, a need exists to develop a comprehensive measure of parenting practices to foster the development of child eating and activity self-regulation skills. Future interventions could target the identified parenting practices that foster self-regulation in children to prevent obesity.

The purpose of this study is to develop a new measure of parenting practices to foster eating and activity self-regulation in young children. Through a review of the literature, we have developed a theory-based conceptual model (Figure 1.1) to operationalize parenting practices that foster self-regulation in young children. The model is an adaptation of Zimmerman and Moylan's (2009) social cognitive model of children's self-regulation for learning to children's self-regulation of eating, PA, and ST behaviors. We hypothesized that parenting practices to foster self-regulation of these health behaviors would be greater in normal weight compared to overweight children, and in higher socioeconomic status (SES) families compared to lower SES families. Also, it was hypothesized that children of parents who employ more practices to foster self-regulation compared to children of parents that employ lesser practices would perform greater healthful behaviors (FV consumption, PA) and less sedentary behavior.

## **Methods**

### ***Participants and Procedures***

Parents (n=258) were included in the study if they had a child aged 2.5 to 5.5 years, and completed a parent survey. Parents completed informed consents to have their child's height and weight measured, and nine parents did not consent to having their child measured and were excluded from the study. Parents were recruited through flyers sent home at child care programs, as well as research assistants asking parents directly at a local community center. Parents received a \$10 gift card to a local department store as an incentive to complete the survey. The Kansas State University Institutional Review Board approved the research protocol.

### ***Survey Development***

#### ***Phase 1: Content Validity***

To establish the content domain for parental practices for the development of self-regulation skills for healthful behaviors, survey items were identified and developed based on a review of theory and the empirical literature (Chapter 1). The initial survey consisted of 113 items divided into the three self-regulation phases. Each phase was separated into multiple scales based on their construct definition (Table 2.1). Phase one was separated into four scales: 1) goal-setting for eating, 1) goal-setting for activity, 3) child involvement for eating, and 4)

child involvement for activity. The construct definition for goal-setting was parenting practices that foster forethought and acceptance of a health behavior goal. Child involvement was defined as parents allowing their child to help choose foods and activities to eat and participate in. Phase two was separated into eight parenting practice scales for promoting self-regulation: 1) self-monitoring for eating, 2) self-monitoring for activity, 3) delay of gratification for eating, 4) delay of gratification for activity, 5) compliance for eating, 6) compliance for activity, 7) emotional control for eating, and 8) emotional control for activity. Self-monitoring was defined as parenting practices that foster children's tracking of their eating and activity behaviors. Emotional regulation is within the delay of gratification scope, and was defined as parents assisting their child to make healthier food and activity choices. Parenting practices that provide an opportunity for their child to make a choice to comply with the healthy goal was the definition for compliance. For the last phase, self-reflection was divided into two scales: 1) self-reflection for eating, and 2) self-reflection for activity. Parenting practices that foster self-reflection for these health behaviors was defined as practices that foster self-judgment and self-reaction of their child's eating and activity behavior, and practices that encourage children to think about whether they are satisfied with their eating and activity behaviors. All survey items were answered using the same six-point behavioral scale: "never," "less than 1 time per week," "1-2 times per week," "3-4 times per week," "5-6 times per week," and "daily."

#### *Panel of Experts.*

Four experts in the field of obesity prevention were asked to review the survey for content relevance and for additional items or scales that should be added to the survey. Content relevance was assessed using a five-point Likert scale: 1 – poor match, 2 – fair match, 3 – good match, 4 – very good match, and 5 – excellent match. Each expert was provided our conceptual model (Figure 1.1), and a 1-page description of the model. For each scale (e.g., compliance for eating), experts were given the construct definition and the list of items, and were asked to rate it using the content relevance scale. After rating each scale, space was provided for experts to list items that should be listed under a different content, and any items that should be added or removed from the survey. There was also space for any comments that the expert reviewers wanted to provide. Experts were also provided a copy of the actual self-report instrument that parents would complete and asked to provide feedback.

#### *Readability and Understanding*

After incorporating the expert feedback and modifying the self-report measure, five mothers (of 2.5 – 5 year olds) were asked to read, complete the questionnaire and take notes on their understanding of the items, as well as any questions that needed clarification. Following their completion of the survey, the researcher and parent discussed any misunderstandings and comments, and changes were made to improve readability and understanding.

### ***Phase 2: Construct Validity***

To assess construct validity we conducted an exploratory factor analysis (EFA) for each self-regulation phase (three total). For the goal-setting phase of self-regulation (phase 1) we expected the EFA would load the items on four hypothesized scales. For the performance phase we expected eight scales, and for the self-reflection phase, we expected two scales. Additionally, to examine that factors were not highly related to one another, and thus would be the same construct (discriminant validity), Pearson correlations were conducted within each phase, between all factors.

### ***Phase 3: Criterion Validity***

To establish criterion validity several variables were measured. First, child obesity was assessed because we hypothesized that parenting practices to foster child self-regulation would be greater in normal weight compared to overweight children.<sup>30,34</sup> In addition, SES was measured because we hypothesized that parents of lower SES households would use less parenting practices to foster self-regulation. Similarly, low-income families experience obesity at higher rates,<sup>14</sup> thus, it would be expected that those parents would use less practices promoting child self-regulation.

Concurrent validity was assessed for the EFA identified subscales to determine if the measure was associated with related behaviors. We did not measure self-regulation directly in children, but rather used child and parent health behaviors to establish validity. These behaviors included fruit and vegetable (FV) intake, PA, and ST behaviors, for children and their parents. For example, parenting practices to foster self-regulation of child PA should be predictive of child PA.

### ***Phase 4: Reliability***

Chronbach's alpha was conducted to determine the internal consistency of each factor following the EFA. In addition, a convenience sample of 43 parents completed the survey one to two weeks after initial completion to establish test-retest reliability. Parents received another \$10 gift card for completing the survey a second time.

### ***Criterion Validity Measures***

#### ***Body Mass Index***

For child body mass index, a research assistant travelled to the child care center to measure height and weight. In the case where parents were recruited from the community center, children were measured on-site following completion of their class. Measurements were assessed in a semi-private setting with shoes and heavy clothing removed. Height was measured to the nearest millimeter, using a portable stadiometer (Seca Corp, Model 214, Hamburg, Germany). Weight was measured to the nearest 0.1 kg using high precision digital scales (Seca Corp, Model 770, Hamburg, Germany). To ensure reliability, height and weight were measured twice and if the first two measurements differed by more than 5mm or 0.1kg, respectively, a third measure was taken. The two closest measures were averaged and used to calculate BMI. Raw BMI scores were converted to percentiles and z-scores using the Centers for Disease Control and Prevention (CDC) norm reference standards.<sup>35</sup>

Parent's self-reported their height in feet and inches, and weight in pounds. Height and weight was converted from imperial to metric (e.g., inches \* .0254=m; pounds/2.21=kg). Body mass index was calculated as  $\text{kg/m}^2$  and were converted in percentiles using the CDC's adult body mass index reference values.

#### ***Child Health Behaviors***

Parents reported child FV intake, child PA, and child ST, as some evidence shows that parents are able to accurately assess child behaviors.<sup>49</sup> Child FV consumption was measured with two-items from the Eating and Physical Activity Questionnaire (EPAQ).<sup>7</sup> Parents were provided a description and examples for fruits and vegetables, and serving sizes were provided. Responses were given on a five-point scale ranging from "none" to "four or more".

Parents reported child ST behavior and PA using a modified SMART Questionnaire.<sup>46</sup> The SMART questionnaire is a validated instrument to assess children's ST behaviors.<sup>46</sup> Two



items assessed ST behavior on a typical weekday and weekend day, and scores were averaged. Screen time behaviors included: watching television and movies, and playing video games or computer. Two items assessed child PA using the same format (weekday and weekend day), and included: playing outside, and at youth sport or organized PA. Examples for both items were provided. Responses were given on a 9-point scale from none, 15 min, 30 min, 1 hour, 2 hours to 6 or more hours.

### ***Demographics***

Parents reported their gender, marital status, parent and child race/ethnicity, socioeconomic status (free or reduced lunch), mother and father highest education achieved, and annual household income.

### ***Statistical Analysis***

An exploratory factor analyses with principal axis factor (PAF) extraction method and varimax rotation was conducted for each self-regulation phase (three analyses). The number of factors retained was determined using four criteria: a) factors with eigenvalues exceeding 1,<sup>31</sup> b) a scree test,<sup>16</sup> c) items with the highest factor loads of less than 0.40 were removed,<sup>24</sup> and d) items loading 0.40 or higher on more than one factor.<sup>24</sup> Internal consistency for each scale was analyzed by calculating Cronbach's alphas. A correlation matrix was used to analyze each phase of self-regulation. Test-retest reliability was analyzed using Pearson correlations. Pearson correlations were computed between child behaviors (FV intake, ST, and PA) with each self-regulation scale. Independent t-tests were used to analyze child body mass index, and demographic variables with each self-regulation scale. All data were analyzed using SPSS Version 17.0. All significance level tests were conducted at  $p < 0.05$ .

## **Results**

### ***Participant Information***

Table 2.2 provides descriptive characteristic for all children and their parents. A total of 270 surveys were completed by parents with 12 surveys being removed as children did not meet inclusion criteria (child was older than 5.5 years, parent did not allow research assistants to measure child height and weight). Children's mean age was 4.3 years (SD=1.03), 52.3% female,

67.5% non-Hispanic Caucasian, and 72.9% were normal weight. On average, parents were 32.7 years old ( $SD=6.3$ ), 89.1% were mothers, 79.1% non-Hispanic Caucasian, 79.3% were married, 72.1% were not eligible for free or reduced lunch, and 49.6% were normal weight.

### ***Phase 1: Content Validity***

Content validity was established through expert review of the new measure. All experts rated the scale with moderate to high content validity. Based on ratings from the panel of experts changes were made to the survey, which included the addition of several items, changes to the wording for clarity, and suggestions for examples to increase understanding of survey items. All expert reviewers rated the underlying theory of the scale to be relevant and appropriate.

### ***Phase 2: Construct Validity***

For phase one (45 items) of the self-regulation scale, exploratory factor analysis extracted 10 factors, and the Keiser-Meyer-Okin test of sampling adequacy coefficient was .89, exceeding the .60 minimum required for factor analysis (see Table 2.3). Two of the items were removed for not loading on any of the factors. The 10-factor solution accounted for 64.6% of the variability among the 43 items. First, five factors (Factors 1, 3, 4, 7, 8), assessed parenting practices that fostered goal setting for FV (Factor 4), PA (Factor 1), youth sport (Factor 7), ST (Factor 8), and asked the child to set their PA and ST goal (Factor 3). The goal setting group of factors identified parenting practices that instructed, encouraged and discussed each health behavior goal. Second, three factors (Factors 2, 9, 10) assessed parenting practices that involved children in parental decisions: child involvement in FV and PA (Factor 2), child involvement in shopping (Factor 10), and child planning FV (Factor 9). Last, two factors (Factors 5, 6) identified parental practices that promote children's outcome expectations for FV and PA (Factor 5), and just FV (Factor 6). Factor 5 was non-health related expectancy – FV, PA, and captured parenting practices to foster extrinsic motivation for their child to eat FV and participate in PA (i.e., being active will him/her handsome/beautiful). Factor 6, positive expectancy for FV, identified parenting practices to foster intrinsic motivation to increase child FV consumption (i.e., eating FV will make you healthy).

For phase two (52 items), seven factors were extracted, and the Keiser-Meyer-Okin test of sampling adequacy coefficient was .87 (see Table 2.4). Eight items did not load on any of the factors, or loaded above 0.40 on more than one factor and were excluded. The final seven-factor

solution accounted for 66.7% of the variability among the 44 items. First, three factors (Factors 3, 5, 7) captured parenting practices that fostered self-monitoring for FV (Factor 3), PA (Factor 7), and ST (Factor 5). Second, three factors (Factors 1, 2, 4) assessed parenting practices to foster delay of gratification: negative emotional control for eating and activity (Factor 1), positive delay of gratification (Factor 2), and explain delay of gratification (Factor 4). The delay of gratification group of factors identified parenting practices that explained, assisted and used excessive control to assist their child delay gratification and employ emotional control. Last, one factor (Factor 6), identified one parenting practice to foster child compliance to the FV, PA, and ST goal.

For phase three, all 16 items had factor loadings exceeding 0.40, and three factors were extracted. The Keiser-Meyer-Okin test of sampling adequacy coefficient was .91. The final three-factor solution accounted for approximately 78.3% of the variability among the 16 items. All three factors captured parenting practices encouraging children to reflect on their FV (Factor 1), PA (Factor 3), and ST (Factor 2) behaviors.

Tables 2.6, 2.7, and 2.8 present construct validity correlations for each scale within each phase. The correlations between scales were low to moderate, indicating separate scales were necessary.

### ***Phase 3: Criterion Validity***

Independent t-tests evaluated the differences in parenting practices that promote self-regulation for children that varied on child weight status, household SES, parent weight status and child ethnicity (Table 2.9). Normal weight children had parents that promoted greater self-reflection compared to overweight/obese children. Parents with an overweight/obese child and families of lower household SES promoted goal setting for PA and ST more than parents with a normal weight child and of higher SES. Parents of lower SES households also had higher child involvement in shopping and promoted non-health related expectancy for PA and FV compared to parents of higher SES households. Parents of lower SES households promoted greater positive delay of gratification, self-monitoring and self-reflection compared to higher SES households. Obese parents employed parenting practices that fostered greater self-reflection than normal weight parents. Non-Hispanic Caucasian children had parents that promoted less non-

health related expectancy, less delay of gratification, and less self-reflection compared to parents of non-Caucasian children.

To evaluate predictive validity, correlations between child health behaviors (FV, ST and PA) and the 20 factors were calculated. Results from the Pearson correlations are presented in Table 2.10. Briefly, most factors related to eating and FV were associated in the expected direction for child FV, and many factors not related to eating and FV intake were not associated. For example, parenting practices that promoted increased child involvement for shopping was associated with increased child FV consumption. Parenting practices that fostered child goal setting for ST, non-health related expectancy, and delay of gratification were all positively associated with child ST behavior. Last, parenting practices that promoted goal setting for FV, PA and ST; child involvement, compliance and self-monitoring for PA were all positively associated to child PA behavior.

#### ***Phase 4: Reliability***

In general, internal consistencies for all scales were high, with a range of 0.76 to 0.95. Only one scale was below 0.80, goal-setting – ST. Pearson correlations for test-retest reliability showed low to good reliability of the measure, with values ranging from 0.43 to 0.89. Many scales were below the cut-point of 0.70 for good reliability: goal setting for PA ( $r=.63$ ), youth sport ( $r=.69$ ), ST ( $r=.68$ ); asking child to set PA and ST goals ( $r=.52$ ); child involvement for FV, PA ( $r=.57$ ), shopping ( $r=.52$ ); self-monitoring for FV ( $r=.56$ ); positive delay of gratification for FV and activity ( $r=.67$ ); explain delay of gratification for FV and activity ( $r=.52$ ); compliance of FV, PA, ST ( $r=.51$ ); and self-reflection for FV ( $r=.43$ ).

### **Discussion**

This was the first study to develop and validate a self-report measure of parenting practices to foster young children's eating, PA and ST self-regulation. Self-regulation was defined as the ability to do a goal-directed behavior in the face of environmental challenges.<sup>2</sup> We developed a three phase self-regulation model for eating, PA, and ST that was an adaptation of Zimmerman and Moylan's (2009) Social Cognitive model of children's self-regulation for learning. The present measure is consistent with the self-regulation literature, in that there are several constructs related to self-regulation.<sup>53</sup>

We hypothesized that parenting practices to foster self-regulation of these health behaviors could be assessed following the three phases of forethought, performance, and self-reflection. Content validity was conducted based on theory and a review of the literature to develop several scales related to self-regulation. Furthermore, expert reviewers rated the initial items with moderate to high validity.

Based on an exploratory factor analysis, our new self-report measure had good construct validity for our theoretically-developed items. The forethought phase consisted of parenting practices to promote goal setting and child involvement in FV, PA, and ST behaviors. The performance phase identified parenting practices to promote self-monitoring, delay of gratification and compliance for each health behavior. Last, the self-reflection phase captured parenting practices to foster self-reflection for FV, PA, and ST in young children. There were 43 items for the forethought phase (10 factors), 44 items for the performance phase (7 factors), and 16 items (3 factors) for self-reflection phase for a total of 103 items (20 factors).

Based on a comprehensive literature review and on our conceptual model (Figure 1.1) we identified 14 constructs within the three phases to foster self-regulation. However, after conducting an EFA, 20 factors emerged from the data. All constructs in our initial model were present following the EFA, however, some constructs that were only one construct with multiple behaviors (i.e., ST and PA), were separated into two constructs. For example, phase three for parenting practices to promote self-regulation (self-reflection) was initially grouped into two constructs, self-reflection for FV and activity (PA and ST together). However, a three factor solution for self-reflection of FV, PA, and ST came about. New evidence shows that PA and sedentary behavior (ST) are important, but different behaviors,<sup>18</sup> thus, separating our 2-factor solution into 3 factors is supported by the literature. Interestingly, parenting practices to foster self-regulation for FV consumption were grouped together and separated into different behaviors, which is contrary to recent evidence that suggests eating fruits is separate from vegetables.<sup>22</sup> This is an important finding because unlike the FV consumption evidence, self-regulating behavior for FV consumption may be the same.

We hypothesized that parental practices would be greater in normal weight compared to overweight children, and in higher SES families compared to lower SES families. Contrary to our hypothesis, only one self-regulation scale (self-reflection for PA) was higher in parents of normal weight children compared to parents of overweight/obese children; the remainder of the

self-regulation scales were not different between the two groups. Similarly, several parenting practices to foster child self-regulation were higher in parents of lower SES households, such as asking child to set goals for PA and ST; child involvement for shopping and self-monitoring for ST. Increased child involvement in lower SES parents may be explained such that, children of low-income families have higher advertising-induced purchase requests.<sup>52</sup> Also, parents asking their child about how much ST and PA they should participate in may also be the result of children of lower-income families having more control over their eating and activity behaviors compared to children of higher SES households. Likewise, parenting practices that promote non-health related expectancy for FV and PA were greater in parents of lower SES households compared to parents of higher SES households. This is consistent with evidence that suggests parents of lower SES status are authoritarian in their parenting style, and more likely to use physical discipline, and more controlling parenting practices.<sup>42</sup> Higher SES parents typically use an authoritative parenting style and have more verbal interactions with their child.<sup>5,43</sup>

As hypothesized, parents with a normal weight child were significantly more likely to use self-reflection for ST compared to parents with an overweight child. Much evidence has shown that overweight children engage in less PA and more ST.<sup>29</sup> Parenting practices that foster young children's self-reflection of their ST behaviors may help explain the difference in ST between normal and overweight children. Contrary to our hypothesis, parents with overweight children self-reported higher on asking their child how much PA and ST they should participate in. However, since child overweight is associated with increased ST behavior and decreased PA, perhaps, these parents perceive their child is participating in too much ST and not enough PA, and therefore is discussing these behaviors more than parents of normal weight children.

Parenting practices to foster child self-reflection for PA was the only practice associated with parental weight status. Specifically, practices that foster child self-reflection were positively associated with the parent being obese. As expected, parenting practices to foster self-reflection of ST was lower in overweight children. This suggests that parents of normal weight children used more positive control strategies regarding their child's ST reflection compared to parents of overweight children.

Also, it was hypothesized that children of parents who employ more practices to foster self-regulation compared to children of parents that employ lesser practices would perform greater healthful behaviors (FV consumption, FV) and less sedentary behavior. Predictive

validity was established as many child health behaviors were related with the self-regulation scales. It is particularly noteworthy that self-regulation was related to child health behaviors compared to child weight status, as weight status is much more complex and subject to a myriad of influences beyond these behaviors. In most instances, predictive validity of the new self-report measure was associated with the hypothesized child health behaviors. Specifically, goal setting for PA and youth sport was positively associated with child PA. Similarly, child involvement in shopping and FV and PA decisions were associated with greater child FV intake. This corroborates previous research showing that children with greater self-regulation skills are less likely to be obese, and would be more likely to engage in obesity preventing behavior, such as consuming FV and participating in PA.<sup>20,47</sup>

Last, the measure demonstrated impressive internal consistency within scales, as well as low to moderate test-retest reliabilities. To our knowledge, this is the first self-report measure for parenting practices to foster children's FV, PA, and ST self-regulation skills. Psychometric examination of the new measure demonstrated very good internal consistency and acceptable test-retest reliability. The mean test-retest reliability for all scales was .66, and 11 of the 20 scales were lower than the acceptable value of .70. However, our test-retest reliability score was similar to other measures of parenting practices for children's eating and PA behaviors.<sup>27,34</sup> Based on parent feedback after completing the questionnaire, the low test-retest reliability could be due to the survey functioning as an educational tool and parents may have increased the frequency of the parenting practices assessed. Another possibility is that parents may be more aware of their use of the specific parenting practices, which would have changed their responses between the two tests.

This was a novel study with several strengths and limitations. This study is unique in that it focused extensively on parenting practices, rather than parenting style. The application for parents to understand and employ parenting practices from the measure may be more useful compared to items on parental attitudes and beliefs. Many researchers have assessed parenting practices and their influence on children's immediate health behaviors, but a specific measure to foster child self-regulation is novel. Similarly, most researchers assess dietary intake, PA, and ST behaviors separately, and few have developed measures for a specific population (preschool-age, school-age, adolescent). Last, the use of objective height and weight measures, and survey items based on theory and a comprehensive review of the literature are strengths.

There were several limitations. First, parents reported their child's eating and activity, and using objective PA measures would have strengthened the study. Second, we were not able to establish criterion validity as there are not any other measures of parenting practices to foster child self-regulation. Perhaps the use of in-home assessments may have been valuable to establish criterion validity. Third, the use of cross sectional data does not allow inferences for cause and effect, and rather only correlations between parenting practices, demographic variables, and child and parent eating and activity behaviors. It is unknown whether the parenting practices influenced children's behaviors or children's behaviors influenced parenting practices. Fourth, all parent-child dyads were from a small geographic area in Kansas, and mostly non-Hispanic Caucasian race/ethnicity. Fifth, because data were collected at the end of the school year, a convenience sample was used for test-retest reliability as a majority of children were no longer attending child care. Last, child self-regulation was not measured, and would have been helpful to establish validity. Longitudinal studies are necessary to assess which parenting practices in young children are associated with child eating and activity self-regulation skills when they are older.

In conclusion, varying constructs of parenting practices to foster self-regulation may have different relationships with child weight status and health behaviors. Future research should examine whether all three phases are necessary to measure parenting practices to foster child self-regulation. Perhaps only one or two of the phases are important in fostering child self-regulation to prevent obesity. Since 20 scales resulted from the EFA, further work is needed to establish whether all 20 scales are important mediators for the development of children's FV, PA, and ST self-regulation skills. This measure may be useful for researchers to assess parenting practices for child self-regulation or as an outcome measure used pre- and post-intervention. Additionally, this measure could serve as an educational tool for parents to increase understanding on how specific parenting practices are associated with children's behaviors and self-regulation skills.

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## References

1. Bandura A. *Human agency in Social Cognitive Theory*. *Am Psychol*. 1989;44(9):1175-1184.
2. Bandura A. The primacy of self-regulation in health promotion. *Appl Psychol – Int Rev*. 2005;54(2):245-254.
3. Bandura A. Toward a psychology of human agency. *Perspect Psychol Sci*. 2006;1(2):164-180.
4. Bandura A, Cervone D. Differential engagement of self-reactive influences in cognitive motivation. *Organ Behav Hum Dec*. 1986;38:92-113.
5. Barkin S, Scheindlin B, Ip EH, Richardson I, Finch S. Determinants of parental discipline practices: a national sample from primary care practices. *Clin Pediatr*. 2007;46(1):64-69.
6. Bauer KW, Neumark-Sztainer D, Fulkerson JA, Hannan PJ, Story M. Familial correlates of adolescent girls' physical activity, television use, dietary intake, weight, and body composition. *Int J Behav Nutr Phys Act*. 2011;8(25).
7. Bennett C, de Silva-Sanigorski AM, Nichols M, Bell AC, Swinburn BA. Assessing the intake of obesity-related foods and beverages in young children: comparison of a simple population survey with 24 hr-recall. *Int J Behav Nutr Phys*. 2009;6(71).
8. Berge JM. A review of familial correlates of child and adolescent obesity: what has the 21<sup>st</sup> century taught us so far? *Int J Adolesc Med Health*. 2009;21(4):457-483.
9. Birch LL, Birch D, Marlin D, Kramer L. Effects of instrumental eating on children's food preferences. *Appetite*. 1982;3:125-134.
10. Birch LL, Davison KK. Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatr Clin North Am*. 2001;48(4):893-907.
11. Birch LL, Fisher JO. Mothers' child-feeding practices influence daughters' eating and weight. *Am J Clin Nutr*. 2000;71(5):1054-1061.
12. Birch LL, Fisher JO, Grimm-Thomas K, Markey CN, Sawyer R, Johnson SL. Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite*. 2001;36(3):201-210.
13. Birch LL, Marlin DW, Rotter J. Eating as the "means" activity in a contingency: effects on young children's food preferences. *Child Dev*. 1984;55(2):432-439.
14. Black JL, Macinko J. Neighborhoods and obesity. *Nutr Rev*. 2008;66(1):2-20.

15. Campbell KJ, Crawford DA, Ball K. Family food environment and dietary behaviors likely to promote fatness in 5-6 year-old children. *Int J Obes*. 2006;30(8):1272-1280.
16. Cattell RB. The scree test for the number of factors. *Multivariate Behav Res*. 1966;3:245-276.
17. De Bourdeaudhuij I, Klepp KI, Due P, Rodrigo CP, de Almeida MDV, Wind M, Krolner R, Sandvik C, Brug J. Reliability and validity of a questionnaire to measure personal, social and environmental correlates of fruit and vegetable intake in 10-11 year old children in five European countries. *Public Health Nutr*. 2005;8(2):189-200.
18. Dunstan DW, Barr EL, Healy GN, Salmon J, Shaw JE, Balkau B, Magliano DJ, Cameron AJ, Zimmet PZ, Owen N. Television viewing time and mortality: the Australian Diabetes, Obesity and Lifestyle Study (AusDiab). *Circulation*. 2010;121(3):384-391.
19. Fisher JO, Birch LL. Restricting access to foods and children's eating. *Appetite*. 1999;32:405-419.
20. Francis LA, Susman EJ. Self-regulation and rapid weight gain in children from age 3 to 12 years. *Arch Pediatr Adolesc Med*. 2009;136(4):297-302.
21. Galloway AT, Fiorito LM, Francis LA, Birch LL. 'Finish your soup': counterproductive effects of pressuring children to eat on intake and affect. *Appetite*. 2006;46(3):318-323.
22. Geller KS, Dzewaltowski DA. Examining elementary school-aged children's self-efficacy and proxy efficacy for fruit and vegetable consumption. *Health Educ Behav*. 2010;37(4):465-478.
23. Golan M, Weizman A. Familial approach to the treatment of childhood obesity: conceptual model. *J Nutr Educ*. 2001;33(2):102-107.
24. Gorsuch RL. *Factor Analysis*. 2<sup>nd</sup> ed. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc; 1983.
25. Graziano PA, Calkins SD, Keane SP. Toddler self-regulation skills predict risk for pediatric obesity. *Int J Obes*. 2010;34(4):633-641.
26. Hendy HM. Comparison of five teacher actions to encourage children's new food acceptance. *Ann Behav Med*. 1999;21(1):20-26.
27. Hendy HM, Williams KE, Riegel K, Paul C. Parent mealtime actions that mediate associations between children's fussy eating and their weight and diet. *Appetite*. 2010;54(1):191-195.
28. Hendy HM, Williams KE, Camise TS, Eckman N, Hedemann A. The Parent Mealtime Action Scale (PMAS). Development and association with children's diet and weight. *Appetite*. 2009;52(2):328-339.

29. Janz KF, Levy SM, Burns TL, Torner JC, Willing MC, Warren JJ. Fatness, physical activity, and television viewing in children during the adiposity rebound period: the Iowa bone development study. *Prev Med.* 2002;35:563-571.
30. Johnson SL, Birch LL. Parents' and children's adiposity and eating style. *Pediatrics.* 1994;94(5):653-661.
31. Kaiser H. A note on guttman's lower bound for the number of common factors. *Multivariate Behav Res.* 1961;1:249-276.
32. Karreman A, van Tuijl C, van Aken MAG, Dekovic M. Parenting and self-regulation in preschoolers: a meta-analysis. *Infant Child Dev.* 2006;15:561-579.
33. Kopp C. The antecedents of self-regulation: A developmental perspective. *Dev Psychol.* 1982;18:199-214.
34. Kroller K, Warschburger P. Associations between maternal feeding style and food intake of children with a higher risk for overweight. *Appetite.* 2008;51(1):166-172.
35. Kuczmarski RJ, Ogden CI, Grummer-Strawn LM, Flegal KM, Guo SS, Wei R, Mei Z, Curtin LR, Roche AF, Johnson CL. CDC growth charts: United States. *Advance Data.* 2000;8(314):1-27.
36. Lecuyer E, Houck GM. Maternal limit-setting in toddlerhood: socialization strategies for the development of self-regulation. *Infant Ment Health J.* 2006;27(4):344-370.
37. Mischel HN. From intention to action: the role of rule knowledge in the development of self-regulation. *Hum Dev.* 1984;27(3-4):124-129.
38. Mischel W, Cantor N, Feldman S. Principles of self-regulation: the nature of willpower and self-control. In: Higgins ET, Kruglanski AW, eds. *Social Psychology: Handbook of basic principles.* New York: Guilford Press, 1996.
39. Mischel W, Shoda Y, Peake PK. The nature of adolescent competencies predicted by preschool delay of gratification. *J Pers Soc Psychol.* 1988;54(5):687-696.
40. Mischel W, Shoda Y, Rodriguez MI. Delay of gratification in children. *Science.* 1989;244(4907):933-938.
41. Nicklas TA, Baranowski T, Baranowski JC, Cullen K, Rittenberry L, Olvera N. Family and child-care provider influences on preschool children's fruit, juice, and vegetable consumption. *Nutr Rev.* 2001;59(7):224-235.
42. Pinderhughes EE, Dodge KA, Bates JE, Pettit GS, Zelli A. Discipline responses: influences of parents' socioeconomic status, ethnicity, beliefs about parenting, stress, and cognitive emotional processes. *J Fam Psychol.* 2000;14(3):380-400.

43. Regaldo M, Sareen H, Inkelas M, Wissow L, Halfon N. Parents' discipline of young children: results from the national survey of early childhood health. *Pediatrics*. 2004;113(6 Suppl):1952-1958.
44. Reynolds KD, Franklin FA, Binkley D, Raczynski JM, Harrington KF, Kirk KA, Person S. Increasing the fruit and vegetable consumption of fourth-graders: results from the High-5 project. *Prev Med*. 2000;30(4):309-319.
45. Rhodes RE, Pfaeffli LA. Mediators of physical activity behavior change among adult non-clinical populations: a review update. *Int J Behav Nutr Phys Act*. 2010;11(7):37.
46. Robinson TN, Killen JD. Ethnic and gender differences in the relationships between television viewing and obesity, physical activity, and dietary fat intake. *J Health Educ*. 1995;26:S91-S98.
47. Seeyave DM, Coleman S, Appugliese D, Corwyn RF, Bradley RH, Davidson NS, Kaciroti N, Lumeng JC. Ability to delay gratification at age 4 years and risk of overweight at age 11. *Arch Pediatr Adolesc Med*. 2009;163(4):303-308.
48. Sigal JJ, Adler LL. Motivational effects of hunger on time estimation and delay of gratification in obese and nonobese boys. *J Genet Psychol*. 1976;128:7-16.
49. Sithole F, Veugelers PJ. Parent and child reports of children's activity. *Health Rep*. 2008;19(3):19-24.
50. Thompson RA. Emotion regulation: A theme in search of definition. *Monogr Soc Res Child Dev*. 1994;59(2-3):25-52.
51. Wardle J, Carnell S, Cooke L. Parental control over feeding and children's fruit and vegetable intake: how are they related? *J Am Diet Assoc*. 2005;105(2):227-232.
52. Young BM. *Television advertising and children*. Oxford, UK: Clarendon, 1990.
53. Zimmerman BJ, Moylan AR. Self-Regulation: Where metacognition and motivation intersect. In: Hacker DJ, Dunlosky J, Graesser AC, eds. *Handbook of metacognition in education*. New York: Taylor & Francis Group, 2009.

## Tables

Table 2.1: Construct definitions for self-regulation scales (before factor analysis)

| Self-Regulation Phase               | Scales                            | Construct Definition for Scale   |
|-------------------------------------|-----------------------------------|--|
| <b>Phase 1:<br/>Forethought</b>     | Goal setting – eating             | Parenting practices that foster forethought and acceptance of a health behavior goal.  |
|                                     | Goal setting – activity           |  |
|                                     | Child involvement – eating        | Parenting practices that allow their child to help choose foods and activities to eat and participate in   |
|                                     | Child involvement – activity      |  |
| <b>Phase 2:<br/>Performance</b>     | Self-monitoring – eating          | Parenting practices that foster children’s tracking of their eating and activity behaviors   |
|                                     | Self-monitoring – activity        | Parenting practices to assist their child to make healthier food and activity choices  |
|                                     | Delay of gratification – eating   |  |
|                                     | Delay of gratification – activity | Parenting practices that provide an opportunity for their child to make a choice to comply with the healthy goal   |
|                                     | Compliance – eating               |  |
|                                     | Compliance – activity             | Parenting practices that foster children’s regulation of their emotion to comply with a behavior   |
|                                     | Emotional control – eating        |  |
|                                     | Emotional control – activity      | Parenting practices that foster self-judgment and self-reaction of their child’s eating and activity behavior, and encourage children to think about whether they are satisfied with their behaviors |
| <b>Phase 3:<br/>Self-Reflection</b> | Self-Reflection – eating          |  |
|                                     | Self-Reflection – activity        |  |

Table 2.2: Parent and child demographic characteristics (n=258)

| <b>PARENT CHARACTERISTICS</b>                 |              |
|---|--------------|
| <b>Mean age (SD)</b>                          | 32.7 (6.3)   |
| <b>Gender, % (n)</b>                          |              |
| Male  | 10.9 (28)    |
| Female  | 89.1 (230)   |
| <b>Race/Ethnicity, % (n)</b>                  |              |
| Non-Hispanic Caucasian                        | 79.1 (201)   |
| Racial/ethnic minority                        | 20.9 (53)    |
| <b>Marital status, % (n)</b>                  |              |
| Married                                       | 79.3 (203)   |
| Divorced or singles                           | 20.7 (53)    |
| <b>SES, % (n)</b>                             |              |
| Not eligible                                  | 72.1 (176)   |
| Free/Reduced                                  | 23.4 (57)    |
| <b>Mother Education, % (n)</b>                |              |
| High school or less                           | 13.2 (33)    |
| Some college                                  | 30.5 (76)    |
| Graduated college or above                    | 56.2 (140)   |
| <b>Father Education, % (n)</b>                |              |
| High school or less                           | 16.4 (35)    |
| Some college or more                          | 29.6 (63)    |
| Graduated college or above                    | 54 (115)     |
| <b>Annual household income, % (n)</b>         |              |
| Less than \$15,000                            | 9.1 (23)     |
| \$15,000 to less than \$25,000                | 9.5 (24)     |
| \$25,000 to less than \$35,000                | 7.9 (20)     |
| \$35,000 to less than \$50,000                | 16.3 (41)    |
| More than \$50,000                            | 54.0 (136)   |
| <b>Body Mass Index, kg/m<sup>2</sup> (SD)</b> | 25.94 (5.41) |
| <b>Body Mass Index, % (n)</b>                 |              |
| Normal weight                                 | 49.6 (117)   |
| Overweight                                    | 32.2 (76)    |
| Obese   | 18.2 (43)    |
| <b>CHILD CHARACTERISTICS</b>                  |              |
| <b>Age, Years (SD)</b>                        | 4.34 (1.03)  |
| <b>Gender, % (n)</b>                          |              |
| Male  | 47.7 (123)   |
| Female  | 52.3 (135)   |
| <b>Race/Ethnicity, % (n)</b>                  |              |
| Non-Hispanic Caucasian                        | 67.5 (166)   |
| Racial/ethnic minority                        | 32.5 (80)    |
| <b>Child Body Mass Index</b>                  |              |
| Child BMI, kg/m <sup>2</sup> (SD)             | 16.24 (1.50) |
| Child BMI-Z (SD)                              | .397 (.98)   |
| <b>Child Weight Status, % (n)</b>             |              |
| Normal  | 72.9 (188)   |
| Overweight                                    | 19.4 (50)    |
| Obese   | 7.8 (20)     |
| Overweight/Obese                              | 27.1 (70)    |

Table 2.3: Exploratory Factor Analysis Results, Factor Loadings, Internal Consistency and Test-Retest Reliability for Phase 1: Forethought Scales

| PHASE 1: PARENTING PRACTICES   | Factor<br>1 | Factor<br>2 | Factor<br>3 | Factor<br>4 | Factor<br>5 | Factor<br>6 | Factor<br>7 | Factor<br>8 | Factor<br>9 | Factor<br>10 |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| <b>GOAL SETTING</b>  |             |             |             |             |             |             |             |             |             |              |
| <b>Goal Setting - FV (n=4)</b>   |             |             |             |             |             |             |             |             |             |              |
| <i>How often do you TELL your child how much they should have to eat of...</i>                   |             |             |             |             |             |             |             |             |             |              |
| Fruit  |             |             |             | .77         |             |             |             |             |             |              |
| Vegetables   |             |             |             | .77         |             |             |             |             |             |              |
| <i>How often do you ASK your child how much they should have to eat of...</i>                    |             |             |             |             |             |             |             |             |             |              |
| Fruit  |             |             |             | .68         |             |             |             |             |             |              |
| Vegetables   |             |             |             | .72         |             |             |             |             |             |              |
| <b>Goal-Setting – PA (n=9)</b>   |             |             |             |             |             |             |             |             |             |              |
| <i>How often do you TELL your child that being active...</i>                                     |             |             |             |             |             |             |             |             |             |              |
| Is good for them   | .74         |             |             |             |             |             |             |             |             |              |
| Is fun   | .71         |             |             |             |             |             |             |             |             |              |
| Will keep him healthy  | .71         |             |             |             |             |             |             |             |             |              |
| <i>How often do you DISCUSS with your child...</i>   |             |             |             |             |             |             |             |             |             |              |
| Playing outside  | .65         |             |             |             |             |             |             |             |             |              |
| Being physically active  | .66         |             |             |             |             |             |             |             |             |              |
| <i>How often do you TELL your child...</i>   |             |             |             |             |             |             |             |             |             |              |
| How much playing outside they should do  | .49         |             |             |             |             |             |             |             |             |              |
| How much physical activity they should do  | .52         |             |             |             |             |             |             |             |             |              |
| <i>How often does your child HELP...</i>   |             |             |             |             |             |             |             |             |             |              |
| Plan outdoor activities for them to do   | .54         |             |             |             |             |             |             |             |             |              |
| Plan physical activities for them to do  | .54         |             |             |             |             |             |             |             |             |              |
| <b>Goal Setting – youth sport (n=4)</b>  |             |             |             |             |             |             |             |             |             |              |
| How often do you DISCUSS with your child participating in youth sport or organized PA            |             |             |             |             |             |             | .66         |             |             |              |
| How often do you TELL your child how much they should participate in youth sport or organized PA |             |             |             |             |             |             | .65         |             |             |              |
| How often does your child help plan youth sport or organized PA                                  |             |             |             |             |             |             | .68         |             |             |              |
| How often do you involve your child in decisions to participate in youth sport or organized PA   |             |             |             |             |             |             | .47         |             |             |              |
| <b>Goal Setting - ST (n=3)</b>   |             |             |             |             |             |             |             |             |             |              |
| How often do you DISCUSS with your child   |             |             |             |             |             |             |             | .54         |             |              |

|   |     |      |
|---|-----|------|
| participating in screen time activities   |     |      |
| How often does your child help plan screen time activities                                |     | .76. |
| How often do you involve your child in decisions to participate in screen time activities |     | .73  |
| <b>Asking Child to Set PA, ST Goal (n=4)</b>  |     |      |
| <i>How often do you ASK your child how much they should participate in...</i>             |     |      |
| Playing outside   | .74 |      |
| Youth sport or organized physical activity  | .70 |      |
| Physical activity   | .76 |      |
| Screen time   | .62 |      |
| <b>CHILD INVOLVEMENT</b>  |     |      |
| <b>Child Involvement – Shopping (n=2)</b>   |     |      |
| <i>How often do you involve child in decisions to...</i>                                  |     |      |
| Choose fruits to buy at the store   |     | .74  |
| Choose vegetables buy at the store  |     | .74  |
| <b>Child Involvement – FV,PA (n=6)</b>  |     |      |
| <i>How often do you involve your child in decisions to...</i>                             |     |      |
| Choose fruits to eat for meals  | .78 |      |
| Choose fruit to eat for snack   | .82 |      |
| Choose vegetables to eat for meals  | .73 |      |
| Choose vegetables to eat for snack  | .68 |      |
| To play outside   | .42 |      |
| To choose a physical activity   | .49 |      |
| <b>Child Planning – FV (n=3)</b>  |     |      |
| <i>How often does your child HELP...</i>  |     |      |
| Plan fruit and/or vegetables for meals  |     | .70  |
| Plan fruit and/or vegetables for snacks   |     | .69  |
| Plan a grocery list with fruits and/or vegetables   |     | .56  |
| <b>OUTCOME EXPECTANCY</b>   |     |      |
| <b>Non-Health Related Expectancy – FV,PA (n=4)</b>  |     |      |
| <i>How often do you TELL your child..</i>   |     |      |
| FV will make him like an admired character  | .59 |      |
| FV will make him handsome   | .69 |      |
| PA will make him like admired character   | .76 |      |
| PA will make him handsome   | .74 |      |
| <b>Positive Expectancy - FV (n=4)</b>   |     |      |
| <i>How often do you TELL your child..</i>   |     |      |
| FV is good for him  |     | .77  |



|   |      |      |      |      |      |      |      |      |      |      |
|---|------|------|------|------|------|------|------|------|------|------|
| FV tastes good  |      |      |      |      |      | .68  |      |      |      |      |
| FV will keep him health   |      |      |      |      |      | .69  |      |      |      |      |
| <i>How often do you DISCUSS with your child...</i>                                  |      |      |      |      |      |      |      |      |      |      |
| Eating fruit  |      |      |      |      |      | .51  |      |      |      |      |
| <b>Eigenvalue</b>   | 4.60 | 4.35 | 3.61 | 3.28 | 2.83 | 2.77 | 2.45 | 2.20 | 1.69 | 1.29 |
| <b>% variance explained</b>   | 10.2 | 9.7  | 8.0  | 7.3  | 6.3  | 6.2  | 5.5  | 4.9  | 3.7  | 2.9  |
| <b>Cumulate %</b>   | 10.2 | 19.9 | 27.9 | 35.2 | 41.5 | 47.6 | 53.1 | 58.0 | 61.7 | 64.6 |
| <b>Chronbach's alpha</b>  | .92  | .88  | .88  | .90  | .83  | .88  | .86  | .76  | .83  | .93  |
| <b>Pearson Test-Retest</b>  | .63  | .57  | .47  | .73  | .82  | .82  | .69  | .68  | .81  | .52  |
| <b>Items Not loading on either factor</b>   |      |      |      |      |      |      |      |      |      |      |
| How often do you discuss with your child eating a lot of vegetables                 |      |      |      |      |      |      |      |      |      |      |
| How often do you tell your child how much they should participate in of screen time |      |      |      |      |      |      |      |      |      |      |

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**Note:** FV – fruits and vegetables; PA – physical activity; ST – screen time

Table 2.4: Exploratory Factor Analysis Results, Factor Loadings, Internal Consistency and Test-Retest Reliability for Phase 2: Performance Scales

| PHASE 2: PARENTING PRACTICES  |  | Factor<br>1 | Factor<br>2 | Factor<br>3 | Factor<br>4 | Factor<br>5 | Factor<br>6 | Factor<br>7 |
|---|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>SELF-MONITORING</b>  |  |             |             |             |             |             |             |             |
| <b>Self-monitoring - FV (n=5)</b>   |  |             |             |             |             |             |             |             |
| <i>When eating, how often do you DISCUSS with your child...</i>   |  |             |             |             |             |             |             |             |
|   | What they are eating                                       |             |             | .40         |             |             |             |             |
|   | How much fruit they have eaten                             |             |             | .86         |             |             |             |             |
|   | How much fruit they should eat                             |             |             | .83         |             |             |             |             |
|   | How much vegetables they have eaten                        |             |             | .84         |             |             |             |             |
|   | How much vegetables they should eat                        |             |             | .84         |             |             |             |             |
| <b>Self-Monitoring- PA (n=3)</b>  |  |             |             |             |             |             |             |             |
| <i>When your child is doing a physical activity, how often do you discuss with your child...</i>                          |  |             |             |             |             |             |             |             |
|   | What they are doing  |             |             |             |             |             |             | .64         |
|   | How much PA they have done                                 |             |             |             |             |             |             | .63         |
|   | How much time they should spending doing PA                |             |             |             |             |             |             | .60         |
| <b>Self-monitoring – ST (n=5)</b>   |  |             |             |             |             |             |             |             |
| <i>When your child is doing a screen time activity, how often do you discuss with your child...</i>                       |  |             |             |             |             |             |             |             |
|   | What they are doing  |             |             |             |             | .58         |             |             |
|   | How much screen time they have done                        |             |             |             |             | .87         |             |             |
|   | How much time they should spend doing screen time activity |             |             |             |             | .85         |             |             |
|   | How much PA they have done                                 |             |             |             |             | .58         |             |             |
|   | How much time they should spending doing PA                |             |             |             |             | .49         |             |             |
| <b>DELAY OF GRATIFICATION</b>   |  |             |             |             |             |             |             |             |
| <b>Negative Emotional Control – FV and activity (n=14)</b>  |  |             |             |             |             |             |             |             |
| <i>When child is upset because you do not allow them to eat a FOOD they want, how often do you tell your child...</i>     |  |             |             |             |             |             |             |             |
|   | Choose something else to eat                               | .52         |             |             |             |             |             |             |
|   | It is not a choice   | .63         |             |             |             |             |             |             |
|   | No, because I said so                                      | .76         |             |             |             |             |             |             |
|   | No, it is not time to eat                                  | .61         |             |             |             |             |             |             |
|   | It is too close to dinner                                  | .62         |             |             |             |             |             |             |
|   | To stop asking   | .80         |             |             |             |             |             |             |
| <i>When child is upset because you do not allow them to do an ACTIVITY they want, how often do you tell your child...</i> |  |             |             |             |             |             |             |             |

|   |     |
|---|-----|
| To choose something else to do          | .53 |
| To go outside                           | .40 |
| It is not a choice                      | .74 |
| No, because I said so                   | .79 |
| No, it is not time to do that activity  | .65 |
| No, it is time to...                    | .61 |
| You can't do that activity in the house | .57 |
| To stop asking                          | .83 |

**Positive delay of gratification – FV and activity (n=8)**

*When child is upset because you do not allow them to do an ACTIVITY they want, how often do you tell your child...*

|                              |     |
|------------------------------|-----|
| To think about something fun | .71 |
|------------------------------|-----|

*When child is upset because you do not allow them to eat a FOOD they want, how often do you tell your child...*

|                                     |     |
|-------------------------------------|-----|
| To think about something fun        | .74 |
| To think about something else to do | .55 |

*When child needs to make a healthier FOOD choice, how often do you...*

|   |     |
|---|-----|
| Help child put less healthy food out of sight | .53 |
|---|-----|

|   |     |
|---|-----|
| Help child put less healthy food away so aren't tempted to eat it | .63 |
|---|-----|

|                                      |     |
|--------------------------------------|-----|
| Tell your child to do something else | .70 |
|--------------------------------------|-----|

*When child needs to make a healthier ACTIVITY choice, how often do you...*

|   |     |
|---|-----|
| Help your child make the less healthy activity out of sight | .65 |
|---|-----|

|   |     |
|---|-----|
| Help your child put less healthy activity away, so aren't tempted | .67 |
|---|-----|

**Explain delay of gratification – FV and activity (n=4)**

*When child needs to make a healthier ACTIVITY choice, how often do you...*

|  |     |
|--|-----|
| Explain why they should make a healthier activity choice | .80 |
|--|-----|

|   |     |
|---|-----|
| Explain why they shouldn't do that activity right now | .78 |
|---|-----|

|   |     |
|---|-----|
| Explain why they should find something else to do | .73 |
|---|-----|

*When child needs to make a healthier FOOD choice, how often do you...*

|   |     |
|---|-----|
| Explain why they should find something else to do | .44 |
|---|-----|

**COMPLIANCE**

**Compliance – FV, PA, ST (n=5)**

*How often do you provide...*

|   |     |
|---|-----|
| Fruit options and encourage your child to make a choice | .81 |
|---|-----|

|  |     |
|--|-----|
| Vegetables options and encourage your child to make a choice | .72 |
|--|-----|

|   |     |
|---|-----|
| Outside play activity options and encourage your child to make a choice | .77 |
|---|-----|

|   |     |
|---|-----|
| Youth sport options and encourage your child to make a choice | .42 |
|---|-----|

|  |     |
|--|-----|
| PA options and encourage your child to make a choice | .74 |
|--|-----|

|                   |      |      |      |      |      |      |      |
|-------------------|------|------|------|------|------|------|------|
| <b>Eigenvalue</b> | 8.10 | 5.10 | 4.18 | 4.11 | 3.27 | 2.99 | 2.12 |
|-------------------|------|------|------|------|------|------|------|

|                             |      |     |     |     |     |     |     |
|-----------------------------|------|-----|-----|-----|-----|-----|-----|
| <b>% variance explained</b> | 15.8 | 9.8 | 8.0 | 7.9 | 6.3 | 5.8 | 4.1 |
|-----------------------------|------|-----|-----|-----|-----|-----|-----|

|                            |      |      |      |      |      |      |      |
|----------------------------|------|------|------|------|------|------|------|
| <b>Cumulate %</b>          | 15.8 | 25.4 | 33.4 | 41.3 | 47.6 | 53.4 | 57.4 |
| <b>Cronbach's alpha</b>    | .93  | .87  | .91  | .88  | .90  | .83  | .82  |
| <b>Pearson Test-Retest</b> | .71  | .67  | .56  | .52  | .70  | .51  | .76  |

**Items Not loading on either factor**

*When your child gets upset because you do not allow them to eat a food they want, how often do you tell your child...*

To go outside

If you wait, you will get \_\_\_\_\_

No, it is not time to \_\_\_\_\_

*When your child gets upset because you do not allow them to do an activity they want, how often do you tell your child...*

Think about something else to do

To choose something else to do

If you wait, you will get \_\_\_\_\_

*When child needs to make a healthier FOOD choice, how often do you...*

Explain why they should make a healthier food choice

Explain why they shouldn't eat that food right now

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**Note:** FV – fruits and vegetables; PA – physical activity; ST – screen time

Table 2.5: Exploratory Factor Analysis Results, Factor Loadings, Internal Consistency and Test-Retest Reliability for Phase 3: Self-Reflection Scales

| PHASE 3: PARENTING PRACTICES  |  | Factor 1 | Factor 2 | Factor 3 |
|---|--|----------|----------|----------|
| <b>SELF-REFLECTION</b>  |  |          |          |          |
| <b>Self-Reflection – FV (n=8)</b>   |  |          |          |          |
| <i>After eating, how often do you ASK your child...</i>                       |  |          |          |          |
| If they had enough fruit to eat   |  | .70      |          |          |
| If they thought they ate enough fruit   |  | .75      |          |          |
| If they are satisfied with the amount of fruit that they ate                  |  | .80      |          |          |
| If they think they need to eat more fruit                                     |  | .81      |          |          |
| If they had enough vegetables to eat  |  | .79      |          |          |
| If they thought they ate enough vegetables                                    |  | .75      |          |          |
| If they are satisfied with amount of vegetables that they ate                 |  | .78      |          |          |
| If they think they need to eat more vegetables                                |  | .80      |          |          |
| <b>Self-Reflection – PA (n=4)</b>   |  |          |          |          |
| <i>After doing a physical activity, how often do you ASK your child...</i>    |  |          |          |          |
| If they did enough physical activity  |  |          |          | .74      |
| If they thought they did enough physical activity                             |  |          |          | .86      |
| If they're satisfied with amount of physical activity they did                |  |          |          | .78      |
| If they think they need to do more physical activity                          |  |          |          | .75      |
| <b>Self-Reflection - ST (n=4)</b>   |  |          |          |          |
| <i>After doing a screen time activity, how often do you ASK your child...</i> |  |          |          |          |
| If they did too much screen time activity                                     |  |          | .83      |          |
| If they thought they did too much screen time activity                        |  |          | .90      |          |
| If they are satisfied with amount of screen time activity they did            |  |          | .71      |          |
| If they think they need to do less screen time activity                       |  |          | .82      |          |
| <b>Eigenvalue</b>   |  | 5.45     | 3.42     | 3.32     |
| <b>% variance explained</b>   |  | 34.2     | 21.4     | 20.7     |
| <b>Cumulative %</b>   |  | 34.2     | 55.6     | 76.3     |
| <b>Cronbach's alpha</b>   |  | .95      | .93      | .94      |
| <b>Pearson test-retest</b>  |  | .43      | .89      | .70      |

**Note:** FV – fruits and vegetables; PA – physical activity; ST – screen time

Table 2.6: Validity Correlation (Pearson) for Phase 1: Forethought Scales

|                                   | Goal-Setting |      |             |                          | Child Involvement |          |             | Outcome Expectancy |          |
|-----------------------------------|--------------|------|-------------|--------------------------|-------------------|----------|-------------|--------------------|----------|
|                                   | PA           | ST   | Youth Sport | Asking Child to Set Goal | FV & PA           | Shopping | Planning FV | Non-Health Related | Positive |
| <b>Goal Setting – FV</b>          | .48*         | .43* | .25*        | .55*                     | .30*              | .40*     | .38*        | .47*               | .52*     |
| <b>Goal Setting – PA</b>          |              | .62* | .41*        | .54*                     | .56*              | .43*     | .42*        | .44*               | .62*     |
| <b>Goal Setting – youth sport</b> |              |      | .30*        | .56*                     | .40*              | .42*     | .33*        | .42*               | .39*     |
| <b>Goal Setting – ST</b>          |              |      |             | .34*                     | .50*              | .29*     | .24*        | .30*               | .33*     |
| <b>Asking Child to Set Goal</b>   |              |      |             |                          | .28*              | .32*     | .27*        | .44*               | .39*     |
| <b>Child Involved – FV, PA</b>    |              |      |             |                          |                   | .56*     | .57*        | .33*               | .49*     |
| <b>Child Involved – Shopping</b>  |              |      |             |                          |                   |          | .44*        | .38*               | .42*     |
| <b>Child Planning –FV</b>         |              |      |             |                          |                   |          |             | .33*               | .43*     |
| <b>Non-Health Expectancy</b>      |              |      |             |                          |                   |          |             |                    | .45*     |

\*Significant at 0.01

Table 2.7: Validity Correlation (Pearson) for Phase 2: Performance Scales

|   | Self-Monitoring |      | Delay of Gratification (DG) |             |            | Compliance |
|---|-----------------|------|-----------------------------|-------------|------------|------------|
|   | PA              | ST   | Negative Emotional Control  | Positive DG | Explain DG | FV, PA, ST |
| <b>Self-Monitoring – FV</b>             | .59*            | .51* | .29*                        | .36*        | .37*       | .37*       |
| <b>Self-Monitoring – PA</b>             |                 | .53* | .20*                        | .42*        | .47*       | .34*       |
| <b>Self-Monitoring - ST</b>             |                 |      | .29*                        | .44*        | .58*       | .32*       |
| <b>Negative Emotional Control</b>       |                 |      |                             | .54*        | .40*       | .20*       |
| <b>Positive Delay of Gratification</b>  |                 |      |                             |             | .62*       | .42*       |
| <b>n Explain Delay of Gratification</b> |                 |      |                             |             |            | .47*       |

\*Significant at 0.01

Table 2.8: Validity Correlation (Pearson) for Phase 3: Self-Reflection Scales

|           | PA   | ST   |
|-----------|------|------|
| <b>FV</b> | .55* | .66* |
| <b>PA</b> |      | .59* |

\*Significant at 0.01

Table 2.9: Independent t-test results between demographic items and self-regulation scales, means (SD)

|   | PARENTING PRACTICES                      | Child Weight Status |              |                | SES          |                 | Parent Weight Status |              |              | Child Ethnicity |               |              |               |
|---|--|---------------------|--------------|----------------|--------------|-----------------|----------------------|--------------|--------------|-----------------|---------------|--------------|---------------|
|   |  | Scales              | Normal       | Over/<br>Obese | p            | Not<br>Eligible | Eligible             | p            | Normal       | Obese           | p             | White        | Non-<br>White |
| 84  | PHASE 1                                  |                     |              |                |              |                 |                      |              |              |                 |               |              |               |
|   | Goal Setting - FV                        | 1.7<br>(1.9)        | 1.6<br>(1.8) | .72            | 1.5<br>(1.8) | 2.0<br>(2.0)    | .10                  | 1.6<br>(1.9) | 1.1<br>(1.5) | .05             | 1.5<br>(1.7)  | 2.0<br>(2.1) | .05           |
|   | Goal-Setting – PA                        | 3.3<br>(2.0)        | 3.3<br>(1.8) | .08            | 3.3<br>(2.0) | 3.6<br>(2.1)    | .82                  | 3.4<br>(2.1) | 3.3<br>(2.0) | .41             | 3.4<br>(2.0)  | 3.3<br>(1.9) | .30           |
|   | Goal Setting – Youth Sport               | 1.6<br>(1.7)        | 1.7<br>(1.7) | .67            | 1.6<br>(1.6) | 1.8<br>(1.9)    | .12                  | 1.6<br>(1.6) | 1.4<br>(1.6) | .50             | 1.5<br>(1.7)  | 1.8<br>(1.7) | .87           |
|   | Goal Setting – ST                        | 2.5<br>(2.1)        | 2.3<br>(2.0) | .58            | 2.4<br>(2.0) | 2.6<br>(2.2)    | .28                  | 2.6<br>(2.0) | 2.4<br>(2.1) | .77             | 2.6<br>(2.1)  | 2.2<br>(1.8) | .06           |
|   | Ask Child – PA,ST                        | 1.2<br>(1.7)        | 1.5<br>(2.0) | .04            | 1.1<br>(1.7) | 1.9<br>(2.1)    | <.01                 | 1.3<br>(1.8) | 1.1<br>(1.5) | .66             | 1.3<br>(1.8)  | 1.6<br>(1.9) | .60           |
|   | Child Involvement – FV,PA                | 4.2<br>(2.0)        | 4.3<br>(1.9) | .69            | 4.2<br>(1.9) | 4.2<br>(2.0)    | .80                  | 4.1<br>(1.8) | 4.3<br>(2.0) | .48             | 4.31<br>(1.9) | 4.1<br>(1.9) | .49           |
|   | Child Involvement – Shopping             | 2.4<br>(2.3)        | 2.3<br>(2.1) | .29            | 2.1<br>(2.1) | 3.0<br>(2.3)    | .04                  | 2.2<br>(2.1) | 2.0<br>(2.1) | .14             | 2.2<br>(2.2)  | 2.7<br>(2.2) | .81           |
|   | Child Planning – FV                      | 2.3<br>(2.0)        | 2.1<br>(1.9) | .49            | 2.2<br>(1.9) | 2.4<br>(2.1)    | .31                  | 2.1<br>(1.9) | 2.2<br>(1.8) | .69             | 2.3<br>(2.0)  | 2.3<br>(1.9) | .63           |
|   | Non-Health Related<br>Expectancy – FV,PA | 1.3<br>(2.0)        | 1.6<br>(1.9) | .80            | 1.0<br>(1.7) | 1.6<br>(2.1)    | .01                  | 1.1<br>(1.9) | 1.4<br>(2.0) | .19             | 1.1<br>(1.7)  | 2.0<br>(2.4) | <.001         |
|   | Positive Expectancy – FV                 | 3.7<br>(2.0)        | 3.7<br>(1.9) | .24            | 3.6<br>(2.0) | 3.8<br>(2.0)    | .33                  | 3.6<br>(2.1) | 3.3<br>(1.8) | .23             | 3.8<br>(2.0)  | 3.5<br>(2.0) | .35           |
|   | PHASE 2                                  |                     |              |                |              |                 |                      |              |              |                 |               |              |               |
|   | Self-Monitoring – FV                     | 3.1<br>(2.3)        | 3.1<br>(2.3) | .79            | 2.9<br>(2.2) | 3.6<br>(2.3)    | .70                  | 3.1<br>(2.3) | 3.0<br>(2.4) | .48             | 3.1<br>(2.3)  | 3.2<br>(2.3) | .72           |
|   | Self-Monitoring PA                       | 2.6<br>(2.1)        | 2.4<br>(2.2) | .71            | 2.2<br>(1.9) | 3.1<br>(2.4)    | <.01                 | 2.3<br>(2.0) | 2.9<br>(2.2) | .36             | 2.4<br>(2.1)  | 2.8<br>(2.2) | .54           |
| Self-Monitoring - ST                            | 2.4<br>(2.2)                             | 2.2<br>(2.1)        | .19          | 2.1<br>(2.0)   | 2.8<br>(2.4) | .03             | 2.5<br>(2.1)         | 2.3<br>(2.1) | .79          | 2.4<br>(2.2)    | 2.3<br>(2.1)  | .57          |               |
| Negative Emotional Control –<br>FV and activity | 2.1<br>(1.7)                             | 2.4<br>(1.5)        | .31          | 100<br>(1.6)   | 2.4<br>(1.7) | .88             | 2.2<br>(1.7)         | 1.9<br>(1.5) | .44          | 2.1<br>(1.7)    | 2.3<br>(1.6)  | .95          |               |



|  |              |              |            |              |              |                 |              |              |            |              |              |                 |
|--|--------------|--------------|------------|--------------|--------------|-----------------|--------------|--------------|------------|--------------|--------------|-----------------|
| Positive Delay of Gratification<br>– FV and activity | 1.3<br>(1.5) | 1.4<br>(1.3) | .15        | 1.2<br>(1.2) | 1.5<br>(1.7) | <b>.01</b>      | 1.4<br>(1.3) | 1.3<br>(1.3) | .90        | 1.2<br>(1.3) | 1.7<br>(1.7) | <b>&lt;.001</b> |
| Explain Delay of Gratification<br>– FV and activity  | 2.2<br>(2.1) | 2.1<br>(1.9) | .11        | 2.0<br>(1.9) | 2.4<br>(2.1) | .33             | 2.5<br>(2.1) | 2.0<br>(1.9) | .45        | 2.1<br>(2.0) | 2.3<br>(2.1) | .35             |
| Compliance – FV,PA,ST                                | 3.9<br>(1.8) | 3.8<br>(1.8) | .91        | 4.0<br>(1.8) | 3.5<br>(1.8) | .95             | 3.8<br>(1.7) | 3.7<br>(1.9) | .39        | 3.9<br>(1.8) | 3.7<br>(1.8) | .69             |
| <b>PHASE 3</b>                                       |              |              |            |              |              |                 |              |              |            |              |              |                 |
| Self-Reflection – FV                                 | 1.7<br>(2.1) | 1.7<br>(2.0) | .73        | 1.4<br>(1.9) | 2.4<br>(2.4) | <b>&lt;.01</b>  | 1.3<br>(1.8) | 1.6<br>(2.1) | .13        | 1.5<br>(1.9) | 2.0<br>(2.1) | .22             |
| Self-Reflection - PA                                 | .9<br>(1.7)  | .7<br>(1.3)  | <b>.03</b> | .7<br>(1.3)  | 1.3<br>(1.9) | <b>&lt;.001</b> | .8<br>(1.6)  | 1.0<br>(1.7) | .24        | .6<br>(1.2)  | 1.4<br>(2.0) | <b>&lt;.001</b> |
| Self-Reflection – ST                                 | 1.2<br>(1.9) | 1.1<br>(1.8) | .39        | .8<br>(1.6)  | 1.8<br>(2.4) | <b>&lt;.001</b> | .1<br>(1.7)  | 1.4<br>(2.1) | <b>.02</b> | .9<br>(1.6)  | 1.7<br>(2.2) | <b>&lt;.001</b> |

**Note:** FV – fruits and vegetables; PA – physical activity; ST – screen time

Table 2.10: Correlations between outcome measures and self-regulation scales, Pearson r

| Scales  | Child Behaviors |              |              |
|---|-----------------|--------------|--------------|
|   | FV              | ST           | PA           |
| <b>PHASE 1</b>                                    |                 |              |              |
| Goal Setting - FV                                 | <b>.20**</b>    | <b>.15*</b>  | <b>.22**</b> |
| Goal-Setting – PA                                 | <b>.20**</b>    | .05          | <b>.22**</b> |
| Goal Setting – Youth Sport                        | <b>.20**</b>    | .09          | <b>.27**</b> |
| Goal Setting – ST                                 | .05             | <b>.24**</b> | -.05         |
| Ask Child – PA,ST                                 | .09             | <b>.20**</b> | <b>.18**</b> |
| Child Involvement – FV,PA                         | <b>.41**</b>    | -.07         | <b>.13*</b>  |
| Child Involvement - Shopping                      | <b>.32**</b>    | .10          | <b>.13*</b>  |
| Child Planning – FV                               | <b>.31**</b>    | -.04         | .02          |
| Negative Expectancy – FV,PA                       | <b>.21**</b>    | <b>.24**</b> | -.03         |
| Positive Expectancy – FV                          | <b>.26**</b>    | .11          | .12          |
| Child Involvement - Shopping                      | <b>.32**</b>    | .10          | <b>.13*</b>  |
| <b>PHASE 2</b>                                    |                 |              |              |
| Self-Monitoring – FV                              | <b>.25**</b>    | .03          | .03          |
| Self-Monitoring PA                                | <b>.16*</b>     | .08          | <b>.15*</b>  |
| Self-Monitoring - ST                              | <b>.15*</b>     | <b>.21*</b>  | .001         |
| Negative Emotional Control – FV and activity      | .08             | <b>.24**</b> | .07          |
| Positive Delay of Gratification – FV and activity | <b>.20**</b>    | <b>.29**</b> | .00          |
| Explain Delay of Gratification – FV and activity  | <b>.13*</b>     | <b>.16**</b> | .02          |
| Compliance – FV,PA,ST                             | <b>.24**</b>    | -.03         | <b>.22**</b> |
| <b>PHASE 3</b>                                    |                 |              |              |
| Self-Reflection – FV                              | <b>.20**</b>    | <b>.19**</b> | .03          |
| Self-Reflection – PA                              | <b>.19**</b>    | <b>.14*</b>  | .10          |
| Self-Reflection – ST                              | .09             | <b>.33**</b> | .00          |

\*Significant at 0.05

\*\*Significant at 0.01

## **Chapter 3 - Impacting home environments through preschool settings to prevent obesity: The HOP’N Home Project**

### **Abstract**

**Background:** Studies have provided evidence that interventions to improve child care environments, as well as children’s physical activity and healthy eating behaviors while at child care, can be successful. However, there is a need to identify interventions to impact young children’s home environments.

**Purpose:** The primary aim was to evaluate the impact of the HOP’N Home intervention on the prevention of childhood obesity through changes in the physical and social home environment in preschool-aged children. HOP’N Home targeted intervention at child care settings to develop children’s asking skills for healthful home environmental change and parents skills to provide healthful home environments.

**Methods:** We conducted two studies. Study one was a clinical trial in which two full-day preschool classrooms were randomized to receive the 12-week HOP’N Home program or serve as a control. Study two was a non-randomized trial in which two child care homes and two centers received the HOP’N Home intervention. Pretest and posttest measures assessed the impact of the intervention on weight status (research assistant assessed height, weight), children’s health behavior, and parenting practices. Process evaluation assessed intervention implementation delivery, receipt and enactment.

**Results:** HOP’N Home had no impact on weight status. There were, however, positive changes to home environments, such as an increase in fruit availability. HOP’N children increased in park visits per week, decreased in screen time activities, and fast food restaurant visits per week. The intervention was well-received by children, parents and child care personnel, and was delivered with good fidelity.

**Conclusions:** Our findings suggest that children attending child care programs can be a practical way to influence the healthfulness of home environments for young children.

## Introduction

The prevalence of overweight ( $\geq 85^{\text{th}}$  percentile for age and gender) and obesity ( $\geq 95^{\text{th}}$  percentile) in preschool-aged children exceeds 20% of the U.S. population.<sup>59</sup> Children who are overweight are more likely to become overweight adults.<sup>66,76</sup> Targeting the prevention of overweight and obesity in young children may be more effective than treating obesity in later years. The early years are a critical period to influence young children's health behaviors to develop life-long habits to prevent obesity.<sup>8</sup> Thus, childhood obesity can be prevented by decreasing caloric intake and/or increased caloric expenditure.

Targeting increased physical activity and decreased sedentary behavior may be important to increase caloric expenditure. Children should be limited to two hours per day of screen-based behaviors (AAP, 2001), as higher screen-based behaviors are associated with lower physical activity and increased body fatness.<sup>23,43</sup> Children's participation in physical activity decreases with age,<sup>46,72</sup> thus, proactive versus reactive strategies are necessary to target increased physical activity. Lastly, the consumption of fruits and vegetables is associated with decreased consumption of energy dense foods, total energy intake and adiposity.<sup>10,64,74</sup> Thus, increased fruit and vegetable consumption to prevent obesity is an important public health issue.

Schools and child care programs provide an ideal setting for health promotion programs as a majority (61%) of children aged 0-6 (not yet in kindergarten) attend non-parental child care (Federal Interagency Forum on Child and Family Statistics, 2007). Much evidence exists that childcare providers can structure their programs to promote healthful environments and behaviors.<sup>6,31,55,73,78</sup> For example, Trost and colleagues (2008) developed an eight-week "Move and Learn" intervention developed to integrate physical activity opportunities into the preschool curriculum. The intervention successfully increased children's moderate-to-vigorous physical activity compared to the control group. Hip-Hop to Health, Jr., was a 14-week overweight prevention program, targeting nutrition and physical activity in African American and Latino children attending Head Start. Results showed that children in the intervention decreased in body mass index compared to control.<sup>31,32</sup> The Nutrition and Physical Activity Self-assessment for Child Care (NAP SACC) study also showed positive changes to the nutrition and physical activity environment at child care centers after a six-month intervention.<sup>6</sup> Specifically, improvements were made to the nutrition and physical activity policies and practices to enhance the child care environment. The NAP SACC intervention focused on fifteen areas including,

fruits and vegetables, meals and snacks, supporting healthful eating and activity, nutrition and physical activity education for children, active play and inactive time, television use and viewing, and the play environment. Evidence indicates that interventions to improve the child care environment as well as children's physical activity and healthy eating behaviors while at child care can be successful. However, the challenge is to reach parents and the home environment to aid in young children's prevention of obesity.

Many researchers believe that the home environment is one of many critical settings to prevent obesity in children;<sup>65</sup> however, there is a gap in the literature on how to affect home environments. One challenge to home environmental change is reaching parents, especially those most in need of intervention. Parents are gatekeepers of children's physical activity and healthy eating opportunities because they establish the home physical (availability of food, physical activity, and sedentary behavior options) and social environment (parenting practices such as modeling and limit setting).<sup>12</sup>

Public health prevention interventions have used direct and indirect strategies to target parental involvement to affect home environments to prevent obesity. Direct strategies include parents' participation in education or training sessions. Indirect strategies include provision of information that do not require a parental response (e.g., newsletters, tip sheets, etc.), invitations to parents and children to participate in events (e.g., family fun nights); and communications directed at the child and/or parent to involve parents in intervention activities (e.g., try this at home). A review of parent interventions on youth physical activity revealed that studies using direct methods were more likely to report positive or mixed results because they are likely to have more intensive intervention.<sup>58</sup> Intensive interventions with direct parent involvement have also been successful in comprehensive childhood obesity treatment programs.<sup>28,35</sup> However, it is likely that the parents who participate in these direct method studies are more motivated than most parents. Although direct methods might be more effective in highly controlled settings, they may not be able to reach parents that need intervention the most. Therefore, a major challenge in obesity prevention is to determine effective ways to encourage parents to change their home environments (especially parents who are not highly motivated).

Indirect methods may be a more effective strategy for reaching parents.<sup>40,58</sup> In a review of parent interventions, those studies that have used indirect methods by having the child engage the parent reported positive or mixed results.<sup>58</sup> Much evidence for targeting children as the route

to influence parents to impact home environments can be found in the advertising and consumer behavior literature. Over the last 30 years, corresponding to the increase in childhood obesity, there has been a dramatic change in availability of advertising through television and other new media in homes.<sup>21</sup> For example, US children spend 44.5 hours a week in front of the computer, television, and game screens, which is more than any other activity in their lives except sleeping.<sup>44</sup> Exposure to television and other media is associated with adiposity in children.<sup>18,28,33,61</sup> While exposure to television and other media may influence children's healthy lifestyle behaviors through the provision of opportunities for sedentary behavior and unhealthy eating,<sup>62,77</sup> use of television and other media also leads to exposure to marketing campaigns for unhealthy food and sedentary recreation options. Several comprehensive reviews have concluded that food advertisements impact food preferences, and knowledge, as well as attempts to influence parents' purchases, and behavior.<sup>53,60</sup> Advertisements targeting children may be effective in influencing home environments because a central strategy of these marketing campaigns is to encourage children to ask their parents to purchase unhealthy products.<sup>60</sup> These child-led communication events have been described as "purchase influence attempts" or "pestering" in the communication literature,<sup>14</sup> and can be described as exerting proxy agency (influencing others to provide valued outcomes) in the health behavior theory literature.<sup>4</sup> In summary, children's purchase influence attempts, more popularly referred to as pestering, can promote parents' purchases of unhealthy food (e.g., calorically dense processed foods) and sedentary options (e.g., televisions and video games) or can promote healthy options for the home environment. To date, a gap in the literature exists because no study has examined if an intervention can specifically increase children's purchase requests for healthful home environments to buffer the effects of media campaigns.

The Healthy Opportunities for Physical Activity and Nutrition (HOP'N) Home project is a novel approach to reach parents through child care centers to prevent childhood obesity. This approach links child care settings to home environments by developing children's asking skills for healthful home environmental change through child care activities. The intervention was designed to combat the effects of advertising that prompts children to influence parental purchases that provide unhealthy home opportunities. The purpose of this research was to evaluate the impact of the HOP'N Home project on the prevention of childhood obesity through changes in the physical and social home environment, children's asking for healthy foods and

activities, and children's eating and activity behaviors. Two studies were conducted to evaluate the HOP'N Home project. In the first study, a cluster-randomized controlled clinical trial was conducted to evaluate the effectiveness of the HOP'N Home project on child age- and gender-adjusted body mass index (BMI), and home physical and social environmental change compared to children in the control condition. The second study used a non-experimental design in which two child care homes and two centers received the HOP'N Home intervention to examine pre- and post-test child BMI and home environmental change differences. Overall, we hypothesized that children participating in the HOP'N Home intervention compared to children in the control condition would have 1) less increases in age- and gender-adjusted body mass index z-scores (BMIz) across the intervention, 2) greater increases in children's self-regulation behavior for asking for healthful home environments, 3) greater improvements in the physical and social home environment, and 4) greater increases in children's healthy eating and physical activity.

## **Methods**

### **Study 1**

#### ***Study Design and Procedures***

One child care center with two full-day classrooms was selected and agreed to participate in the 12-week HOP'N Home intervention. This study was a cluster-randomized controlled clinical trial in which two child care classrooms were randomized according to a random number generator to receive the HOP'N Home intervention or serve as the control. Children and their families participated in pretest, posttest, and follow-up assessments where children were measured on height and weight, and parents completed a survey. Child care providers participated in three intervention trainings and completed weekly checklists to assess implementation of the HOP'N Home quality elements. The research protocol received approval from the Institutional Review Board at Kansas State University.

#### ***Participants***

Children were included in the study if they were enrolled in the child care classroom, parents provided consent to allow their child to have their height, weight and waist circumference assessed, and children assented to the height and weight assessment. Children

were excluded (n=2) if they were diagnosed with a health condition, such as diabetes during the intervention and if a control child had a sibling in the intervention classroom. In both classrooms, parental informed consents, and height and weight assessments were obtained for all children (n=24, 50% male).

### ***Intervention Description***

The HOP'N Home intervention was developed based on a thorough review of the literature and through focus groups with home-based (n=7) and center-based (n=16) child care providers, and parents of preschool-aged children (n=13). This process enabled researchers to identify evidence-based strategies of family health behavior change to develop the HOP'N Home curriculum. Additionally, we were able to understand the opportunities and barriers to delivering a program targeting home environmental change at child care homes and centers.

The 12-week multi-level HOP'N Home intervention was developed from an ecologically-informed Social Cognitive Theory,<sup>4</sup> and designed to translate into practice.<sup>47</sup> The HOP'N Home intervention was developed around six quality elements based on the formative evaluation that were found to be a part of most child programs: continuous staff training, group time curriculum activities, dramatic play environment, meals, songs, and home connection activities.

The first component of the HOP'N Home intervention was continuous staff training. We developed a training model similar to other studies<sup>24-26</sup> to increase implementation of the HOP'N Home quality elements. Three two-hour child care provider trainings were conducted during the 12-week HOP'N Home project. These trainings were developed to instruct staff on the HOP'N Home intervention as well as have providers share successes and implementation challenges and brain storm to solve those challenges.

Second, providers were given the goal to implement three, 10-minute group time activities each week. The group time curriculum was based on a project-based learning approach.<sup>17,38</sup> The project-based learning approach starts by learning about a topic (healthy eating, physical activity, advertisements), investigating the topic with projects (activities), and concludes by reviewing the topic (see Table 3.1). During the learning phase, children gained knowledge on healthy and unhealthy foods, activities and advertisements. We operationally defined healthy and unhealthy foods and activities by modifying the "Traffic Light Diet"<sup>28</sup> to be developmentally appropriate for preschool-aged children. Two registered dietitians worked with



the research team to categorize foods and activities as “go” (green: all the time), or “slow” (yellow: sometimes) (Appendix A and B). For example, fresh fruits and vegetables were considered a “go”, but canned fruit in syrup was a “slow.” As part of the group time activities to assist children in learning the “go” and “slow” concept, easy to remove HOP’N Home stickers were made for children to place on foods and activities/toys to illustrate their knowledge (green stickers for go and yellow stickers for slow).

Third, providers set-up a dramatic play area (grocery store, home environment, toy store, and fast food restaurant), and provided opportunities for children to play in the area for at least 30 minutes daily. Each week, two note cards were posted in the dramatic play area to encourage child role-play and discussion about the HOP’N Home goals, specific to that week. For child role-play, prompts were written on the note cards for providers to ask the children to participate in. For provider-child discussion, prompts encouraging specific HOP’N Home topics were provided.

For the fourth component of the intervention, once per day during meals/snacks, providers were to prompt the children about “go” and “slow” foods, activities, or advertisements. Similar to the dramatic play note cards, each week a meal prompt note card was posted in the meal area to assist providers in discussion.

Fifth, three musical social narratives (songs) were created to increase children’s asking for, and knowledge of “go” and “slow” foods, activities and advertisements. A narrative is “any cohesive and coherent story with an identifiable beginning, middle, and end that provides information about scene, characters, and conflict; raises unanswered questions or unresolved conflict; and provides resolution.”<sup>41</sup> Musical social narratives are frequently used to teach a specific health behavior to children.<sup>11,36,41</sup> Musical social narratives are short stories to inform or describe a skill, concept or situation.<sup>36</sup> Each child received the lyrics and a CD to take home, to encourage children to teach their parents the songs and to sing them at home.

Finally, we targeted parents through weekly “home connection” activities and a bi-weekly newsletter. The home connection included “Questions of the Week” and a “Family Activity” related to what the children were learning each week. The question of the week was designed for parents to ask their child about what they learned related to the HOP’N Home intervention. For the family activity, children were asked to bring in an item to share (e.g., draw a picture of a visit to the grocery store), which would link the home environment to the child

care. Children also used go and slow stickers at home to apply their knowledge to their home environment and share with parents. The goal of the bi-weekly newsletter was to increase parent knowledge for “go” and “slow” foods/activities, and parenting practices to promote healthy child behaviors.

### ***Process Measures***

HOP’N Home quality element curriculum implementation was assessed via intervention delivery by providers, receipt, and enactment by families.<sup>52</sup> Delivery was assessed through child care provider weekly self-evaluation forms. Each week, using a three-point scale (fully, partially, and not covered), providers rated the degree of implementation for group time activities, dramatic play, meal prompts, and home connection activities. Parents were surveyed on whether they received and used the HOP’N Home materials, made changes in their home, and were satisfied with the program.

### ***Individual-Level Measures***

#### ***Body Mass Index***

A research assistant travelled to the child care center to assess height, weight and waist circumference. These measurements were assessed in a semi-private setting with shoes and heavy clothing removed. Height was measured to the nearest millimeter, using a portable stadiometer (Seca Corp, Model 214, Hamburg, Germany). Weight was measured to the nearest 0.1 kg using high precision digital scales (Seca Corp, Model 770, Hamburg, Germany). To ensure reliability, height and weight were measured twice and if the first two measurements differed by more than 5mm or 0.1kg, respectively, a third measure was taken. The two closest measures were averaged and used to calculate BMI. Raw BMI scores were converted to percentiles and z-scores using the Centers for Disease Control and Prevention (CDC) norm reference standards.<sup>49</sup>

#### ***Parent Survey***

Parents responded to a survey that assessed the home physical environment for the availability of fruits and vegetables, physical activity equipment, and media; child behaviors such as screen time, physical activity, and food consumption; child asking behaviors and parent

providing when child asks; parenting practices such as advertising mediation, active/passive (monitoring and limit setting) mediation for children's eating and activity; parent screen time, physical activity and fruit and vegetable consumption; and parent/child demographics. Items on the parent survey were used or adapted from existing measures and from constructs used in similar populations.

#### *Home Physical Environment*

Home fruit and vegetable availability was assessed using thirty-eight fruit (17), 100% fruit juice (4), and vegetable (17) items. Items were classified as being available (yes or no) in the home in the past week.<sup>5,20</sup> Home physical activity equipment availability was assessed using the same yes/no format, and equipment items were selected from previously validated surveys for preschool-aged children.<sup>34,75</sup> The number of media items available in the home and in the child's bedroom was chosen from several measures, including the Physical Activity and Media Inventory;<sup>68</sup> Healthy Home Survey;<sup>12</sup> and Spurrier and colleagues (2008) instrument<sup>70</sup>. Seven media availability items for the home and children's bedroom were assessed as available (yes/no) separately: television, cable, digital video recorder, DVD player, computer internet, and video game systems.

#### *Child Behaviors*

Parent report for children's eating and activity (physical activity and screen time) was used, as evidence suggests that parents are able to accurately assess children's behavior.<sup>69</sup> Child screen time behavior was assessed using a modified SMART Questionnaire (Robinson et al., 1995). The SMART Questionnaire has been shown to be a valid instrument to assess child-reported screen time behaviors. In a sample of 80 children, observations and survey items had excellent correlations ( $r=0.94$ ). Four items assessed screen time behavior yesterday and last Saturday, and scores were averaged. Screen time behaviors included: watching television, watching movies or videos, playing video games, and playing on a computer. Appropriate examples were provided for each screen time behavior. Responses were given on a 9-point scale from none, 15 min, 30 min, 1 hour, 2 hours to 6 or more hours.

Child physical activity was assessed using two items developed as part of the Eating and Physical Activity Questionnaire (EPAQ). The average of two items were used to assess the frequency of park visits last week and during a usual week.<sup>7</sup> An example item is, last week, how many times did you or a family member take your child to a playground, park, swimming pool,

dance class or other place for physical activity? Child food and beverage intake yesterday was assessed using the EPAQ.<sup>7</sup> Parents were provided descriptions and examples of each of the foods and beverages, and serving sizes were provided. Seven items assessed children's food and beverage intake yesterday, including, 100% fruit juice, soft drinks, vegetables, packaged snacks (chips, granola bar), fruit, candy and/or chocolate, and cake, doughnuts, and muffins. Responses were given on a seven-point scale ranging from "none" to "six or more".

Child asking for foods and activities were modified from two scales, Chamberlain and colleagues (2006) child-reported purchase requests scale, and Cullen and colleagues (2000), child shopping influence subscale.<sup>20</sup> Parents reported during a usual week, how often their child asked for seven food or beverages and four activities. The same food and beverage items that measured children's consumption were used for child asking. Activities included television and/or movies, computer and/or computer games, video games and playing outside. Activities were chosen from the SMART Questionnaire and EPAQ. Responses were given on a six-point scale, never, less than one time per week, 1-2 times per week, 3-4 times per week, 5-6 times per week and daily. Parents providing after their child asked was assessed using the same 11 foods and activities. Parents responded to the frequency of how often they provide (% of time your child asks), on a five-point scale: "never," "25% of the time," "50% of the time," "75% of the time," and "100% of the time."

#### *Parenting Practices*

Buijzen (2009) advertising mediation scale was used to assess parental active (alpha = .94) and restrictive (alpha = .73) mediation, and concept-oriented (alpha = .88) and socio-oriented (alpha = .87) consumer communication (22 items).<sup>13</sup> Responses were given on a six-point scale from "never" to "daily." An example active mediation item, "How often do you tell your child that advertising does not always tell the truth?" A restriction mediation example item is, "How often do you tell your child to turn off the television when s(he) is watching commercials."

Parental passive (monitoring) and active (limit setting) mediation for children's eating and activity behaviors (screen time and physical activity), were assessed. Five items assessed monitoring (alpha = .82) for five child behaviors, screen time, sugar-sweetened beverages, servings of fruit, servings of vegetables, and physical activity or sports. An example item is, "How often do you keep track of the servings of fruits your child is eating?" Five items assessed

limit setting ( $\alpha = .75$ ) for the same five child behaviors, such as, “How often do you place limits on the sugar-sweetened beverages that your child drinks?” Monitoring and limit setting are commonly assessed parenting practices.<sup>3,9,48,50,56</sup> Six-point response scales that ranged from “never” to “daily” were used.

#### *Parent Behaviors*

Parent habitual moderate-to-vigorous physical activity behavior was assessed with four items from the Behavioral Risk Factor Surveillance System (BRFSS).<sup>57</sup> Parent fruit consumption was assessed by one item, “on a typical day, how many servings of fruit do you eat?” A five-point response scale from “none” to “four or more servings” was used. The same format was used for a single-item for parent vegetable consumption.<sup>57</sup> Parents were provided a definition and common examples of frequently eaten fruits and vegetables, as well as examples of what represents one serving. Parents self-reported their height and weight in feet, inches, and pounds to calculate their BMI.

#### *Demographics*

To capture parent and child demographic information, the BRFSS questionnaire was formatted. These questions included parent gender, marital status, parent and child race/ethnicity, and socioeconomic status.

#### *Statistical Analysis*

We conducted an analysis of covariance (ANCOVA) examining the effect of condition (HOP’N Home or Control) on change scores (post-test minus pre-test; follow-up minus pre-test) for raw BMI, BMIz and parent survey variables. For raw BMI and parent survey variables we controlled for the baseline score, child gender, SES, and child race/ethnicity. For BMIz we controlled for baseline BMIz, SES and child race/ethnicity. Data were analyzed two ways: complete case and intent to treat analyses. There were no meaningful differences for BMI and BMIz between the two analyses, and data are reported for the complete case analysis. For parent survey variables, several differences between the complete case and intent to treat analysis resulted, however, due to the small sample size, only subjects with complete data at pretest, posttest and follow-up were reported. All data were analyzed using SPSS Version 17.0. All tests were conducted at  $p < 0.05$ .

## **Study 2**

### ***Study Design and Procedures***

Study 2 was a non-randomized trial that used a pretest-posttest design with two full-day home-based child care and two full-day center-based child care sites (n=4). Child care homes and centers responded to emails to participate in the study and were chosen if they met the inclusion criteria of a minimum of four and 15 preschool-aged children in the child care homes and centers, respectively. Children and families participated in the same pretest and posttest assessments as in study 1, without the four-month follow-up. Based on parent and provider qualitative feedback in study one, there were minor changes to the curriculum, activities, and trainings to increase family involvement. Similarly, child care providers participated in three, 150-minute (versus 120-minute) trainings and completed weekly checklists to assess implementation of the HOP’N Home quality elements. The research protocol received approval from the Institutional Review Board at Kansas State University.

### ***Participants***

To meet inclusion criteria, children were enrolled full-time in child care, and parents provided consent to allow their child to have their height, weight and waist circumference assessed. In all classrooms, parental informed consents were obtained for most children (n=52, 58% male).

### ***Intervention Description***

The intervention is described in Study 1. However, as previously mentioned, minor changes were made to the curriculum to increase family involvement. First, children tracked their participation in the weekly home connection activities using a chart and HOP’N Home stickers (frogs). Second, each week children would wear a neon yellow sticker home to remind parents to help them participate in the HOP’N Home connection activity. For example, “May I bring a...go and slow food?”

To increase implementation of the HOP’N Home quality elements by the child care providers, researchers sent a weekly email to remind providers what needed to be sent home, what children needed to bring in, helpful tips about the curriculum, and general support and encouragement.

### ***Individual-Level and Process Measures***

The same child outcome and process measures from study 1 were used in study 2. Additionally, a brief 13-item survey was given to child care providers after trainings to assess their perception of the quality of the training, whether participants gained knowledge about the HOP’N Home curriculum, their self-efficacy to implement curriculum quality elements, their connectedness to the HOP’N Home group, and their overall excitement for the program.

### ***Statistical Analysis***

Paired t-tests were used to compare pretest and posttest means for BMI, BMIz and parent survey variables. Similar to study 1, BMI and parent survey variables were analyzed two ways: complete case and intent to treat analysis. Both analyses resulted in the same results, and results are reported from the complete case analysis. All data were analyzed using SPSS Version 17.0. All significance level tests were conducted at  $p < 0.05$ .

## **Results**

### **Study 1**

#### ***Participant Information***

Figure 3.1 provides the CONSORT diagram of participant flow through the study. All parents consented for their child to participate. Two children were excluded (one from control and intervention) for health reasons and one child’s sibling was in the intervention classroom. Only one child dropped out between height and weight posttest and follow-up. Eight children in each condition completed parent measures at all three time points (pretest, posttest, follow-up). Table 3.2 provides descriptive characteristics at pretest for all children and by intervention and control conditions. There were no statistically significant differences in baseline participant characteristics by condition. Briefly, mean age was 3.5 years, 45.5% were male, 68.2% non-Hispanic Caucasian, 4.5% eligible for free or reduced lunch, 81.8% were normal weight.

#### ***Process Measures***

Provider implementation of the intervention quality elements are given in Table 3.3. Overall, high frequency of the quality elements were implemented: 98% of group time activities

(3x/week); 100% of dramatic play (5x/week); and 100% of meal prompts (5x/week). Within the dramatic play activities, the physical environment (foods, toys, set-up) and teacher prompts were also highly implemented at 92.7% and 93.3%, respectively. However, child role-playing during dramatic play was not as well implemented (38.7%). For the family component, children had poor participation (16.7%) in the home connection activities by bringing in an item each week. Although, providers still discussed the home connection activities 45.5% of the time after children were to bring the items in.

Parent evaluations for the HOP’N Home program are provided in Table 3.4. Overall, parents were satisfied with the HOP’N Home program (90.9%) and made changes in their home (90.9%). Parents received and read the newsletter, 100% and 81.8% of the time, and participated in the newsletter family activity 36.4% of the time. For the home connection, parents received and read 81.8% and 72.8% of the time, respectively. Parents asked their child questions and did the home connection activity 72.8% and 36.4% of the time, respectively. Only 36.4% always brought an item to school. For the HOP’N Home music CD, 72.7% received it, and 90.9% and 63.7% listened to the CD and sang the songs at least one time per week, respectively.

### ***Child Body Mass Index***

Table 3.5 illustrates adjusted mean differences between intervention and control children. A significant raw BMI and BMIz difference existed from posttest to pretest, where control children’s BMI decreased overtime compared to intervention. This effect was no longer significant at follow-up compared to pretest.

### ***Parent Survey***

Table 3.6 illustrates home environment, child behavior, parenting practices and parent behavior adjusted change difference between intervention and control. Compared to control children, intervention children significantly increased in asking to play outside from pretest to posttest. Additionally, there was a trend for a decrease in parent self-reported BMI ( $p=0.08$ ) in intervention parents compared to control. From pretest to follow-up, HOP’N Home children significantly increased in asking for packaged snacks, and parents decreased in limiting television compared to control site children.



## **Study 2**

### ***Participant Information***

Of those children with parental consent (n=52), two children dropped out (left child care) prior to posttest height and weight assessment (96% retention rate). Thirty-nine parents (75%) participated in both parent survey assessments and were included in the analysis. Table 3.7 provides descriptive characteristics at pretest for all children and by child care. There were statistically significant differences in baseline participant characteristics by type of child care. Children attending child care homes were younger (3.4 versus 4.3), of lower socioeconomic status (41.7% versus 92.5%), and had higher BMI z-scores (.98 versus .30).

### ***Process Measures***

Participation in the HOP'N Home trainings was very high (93%). Of the nine providers participating in the intervention, seven attended all three trainings, and two providers attended two trainings. Providers evaluated the HOP'N Home trainings (Table 3.8), and all the providers felt excited about the intervention and a part of the HOP'N Home group. Providers reported that they understood how to implement the various quality elements for group time (86%), dramatic play (71%), songs (100%), meal prompts (100%), home connection (100%). Similarly, the same scale assessed their confidence to implement each quality element: group time (86%), dramatic play (86%), song (86%), meal prompts (100%), home connection (87%).

Provider implementation of the intervention quality elements are given in Table 3.3. Overall, high frequency of the quality elements were implemented: 92.9% of group time activities (3x/week); 97.6% of dramatic play (5x/week); and 85.7% of meal prompts (5x/week). Within the dramatic play activities, the physical environment (foods, toys, set-up) and teacher prompts were also highly implemented at 96.1% and 71.7%, respectively. However, child role-playing during dramatic play was not well implemented (43.4%). For the family component, children had moderate participation (36.9%) in the home connection activities by bringing in an item each week. Providers discussed the home connection activities with the children 100% of the time.

Parent evaluations for the HOP'N Home program are provided in Table 3.4. Overall, parents were satisfied with the HOP'N Home program (97.4%) and made changes in their home

(76.9%). Parents received and read the newsletter, 76.6% and 67.6% of the time, and participated in the newsletter family activity 46.2% of the time. For the home connection, parents received and read 78.9% and 71.1% of the time, respectively. Parents asked their child questions and did the home connection activity 47.4% and 44.7% of the time, respectively. Only 47.4% always brought an item to school. For the HOP'N Home music CD, 86.5% received it, and 67.6% and 70.3% listened to the CD and sang the songs at least one time per week, respectively.

### ***Child Body Mass Index***

Table 3.9 illustrates child BMI and BMI z mean differences. There were no statistically significant differences from pretest to posttest.

### ***Parent Survey***

Mean differences for the home environment, child behavior, parenting practices and parent behavior for all sites and by child care are shown in Table 3.10. Across all sites from pretest to posttest, home environments significantly increased in fruit availability, children increased in park visits per week, decreased in screen time minutes per day, and decreased in frequency of fast food restaurant visits per week. Child asking behaviors increased for playing outside and decreased for television and video games. Unexpectedly, child asking for vegetables decreased pretest to posttest. After children asked for foods and activities, the percent of time parents provided those items increased for playing outside and decreased for candy and/or chocolate. There were no statistically significant differences for advertising mediation, parent monitoring, parent limit setting or parent variables (BMI, physical activity, fruit and vegetable consumption).

## **Discussion**

The HOP'N Home intervention was a novel approach to impact home environments through preschool settings. Two studies were conducted; the first was a cluster-randomized clinical trial in which classrooms were randomized to intervention or control. Based on the results and process evaluation of study one, changes were made to the intervention and the HOP'N Home program was implemented in four additional child care sites (Study 2). The purpose of both studies was to evaluate the effectiveness of the HOP'N Home project on age-

and gender-specific body mass index z-scores pre- and post-intervention. The second purpose was to improve children's asking, eating, physical activity, and screen time behaviors; and children's physical and social home environments. Specifically, we hypothesized that children participating in the HOP'N Home intervention compared to children in the control condition would have 1) less increases in age- and gender-adjusted body mass index z-scores across the intervention, 2) greater increases in children's self-regulation behavior for asking for healthful home environments, 3) greater improvements in the physical and social home environment, and 4) greater increases in children's healthy eating and physical activity.

Results from both studies did not show a change in body mass index in children participating in the HOP'N Home project compared to control. However, post-intervention children in the intervention significantly increased in their asking for physical activities and decreased asking for screen time activities. Additionally, there was greater fruit availability in the home. Finally, children increased in health behaviors, such as increased child park visits per week, decreased screen time activities, and decreased fast food restaurant visits per week.

Children participating in the HOP'N Home intervention did not show less increases in body mass index compared to children in control. A recent systematic review examined the effectiveness of preschool interventions to prevent obesity in children.<sup>54</sup> Results showed that only four randomized controlled trials have been carried out in preschool settings to prevent childhood obesity, and none had an effect on overweight and obesity. Similarly, Hesketh and Campbell (2010) carried out a review on interventions to prevent obesity in children under the age of five.<sup>39</sup> Results from the preschool/childcare interventions showed only one study had significant improvements in body mass index for intervention children compared to control.<sup>32</sup> The Hip-Hop to Health Jr. intervention was conducted in 12 Head Start sites and was successful in reducing the increase of obesity in intervention children compared to control. The 14-week intervention consisted of three, 40-minute healthy eating and exercise sessions each week. During each session, children participated in a 20-minute lesson teaching children about healthy eating, being active, and reducing television viewing, as well as 20-minutes of ongoing physical activity. Unlike the Hip-Hop to Health Jr. intervention, the HOP'N Home intervention did not decrease child overweight or obesity. Our inability to impact overweight and obesity in children participating in the HOP'N Home intervention may be due to a less-intensive intervention compared to Hip-Hop to Health Jr. The primary goal of the HOP'N Home intervention was not

to change the preschool environment, such that children were participating in more physical activity or healthy eating opportunities at preschool. Rather, our intervention focused on changes in the home environment, children's self-regulation to ask for healthful home environments and children's eating and activity behaviors. Additionally, the rate of child overweight and obesity in the Hip-Hop to Health Jr. intervention was much higher than children in study 1 of the HOP'N Home intervention (31.5% versus 9.1%), but not for children in study 2 (30.8%). In study one, we may have been limited by the small number of children who were overweight and obese which may be why we were unable to achieve an improvement to body mass index. Perhaps, future interventions should target increased healthful eating and physical activity at child care and at home to prevent obesity. Additionally, both the HOP'N Home and Hip-Hop to Health Jr interventions were of similar duration (12 and 14 weeks), it may be that longer interventions (e.g., 6 or 12 months) are necessary to impact body mass index.

Virtually all child care programs offer opportunities for physical activity, healthy eating and a health-education curriculum.<sup>45</sup> However, traditional child care programs fail to teach behavioral skills that help children to limit screen time, to be active and to eat healthfully in other settings, such as the home. Our second hypothesis targeted building children's skills for self-regulation behavior for asking for fruits and vegetables, physical activity and decreased asking for screen time activities and calorically-dense foods to improve the healthfulness of children's home environments. The HOP'N Home project was successful at increasing children's asking for physical activity and decreasing asking for screen time activities. However, increases in child asking for fruits and vegetables were not found. We targeted child asking behaviors to increase the availability of fruits and vegetables, physically active toys, and decreased media equipment in the home. However, only increases in home fruit availability were significant. Thus, child asking did not result in vast improvements to the physical home environment. It may be that the intervention was successful at increasing children's self-regulation for behavior (eating and activity), but not for availability of foods and physical activity equipment/toys since that would require parents purchasing those items since they are the gatekeepers of the physical home environment.<sup>65</sup> This may be explained through evidence from the advertising and consumer literature, such that preschool-aged children as a cohort pester their parents more than any other age group while shopping or watching advertisements.<sup>1</sup> Additionally, the majority of child pestering is for calorically-dense foods (snacks, desserts, sugary cereal, fast foods).<sup>42</sup>

Similarly, the more frequently children see advertisements, the more children want to buy those items.<sup>71</sup> Thus, parents in our intervention were most likely accustomed to their child asking for foods and activities, and may have their own strategies to deal with child pestering by not purchasing the product, which would explain why we did not find large improvements to increases in home availability. However, it may be that parents were more willing to allow their child to participate in healthful behaviors (i.e., physical activity) that did not require them to purchase new equipment as a result of the intervention. For instance, parents increased in allowing their child to play outside and decreased in providing candy and/or chocolate after their child asked. To our knowledge, the HOP’N Home project is the first preschool-based intervention targeting increased child self-regulation for asking for healthy behaviors to improve the healthfulness of the home environment.

For our third hypothesis we expected children in the HOP’N Home intervention to have greater improvements in their physical and social home environments. To impact the home environment, our study used indirect strategies rather than direct strategies to target changes to the home environment via child care intervention. Although the changes to children’s home environments were modest, these changes are encouraging because this was an initial attempt to reach the entire preschool population without intensive intervention in the home. We hypothesized that the physical home environment would be improved, such that there would be an increase in the availability of fruits and vegetables, physical activity equipment, and a decrease in screen time equipment. In study two, there was a significant increase in home fruit availability, but contrary to our hypothesis, physical home environments were not significantly improved. This could be due to the already high availability of 100% fruit juice, fruit, vegetable, and physical activity equipment present in the home at pretest. In regards to home media availability, it is unlikely that parents would remove expensive media items from the home based on our intervention.

For the social home environment, intervention parents significantly increased in allowing their child to play outside and decreased in allowing their child to eat candy and/or chocolate after their child asked for those behaviors. However, the HOP’N Home project was not successful at impacting parent’s active and restrictive mediation, monitoring and limit setting of their child’s eating, physical activity and screen time behaviors. Several factors may have led to these null findings. First, the parent component may not have been intensive enough as only a

one-page bi-weekly newsletter (six total) was sent home targeting these parenting practices. The weekly home connection activities were not targeted towards parenting practices, and rather home environment change and child participation in improving the healthfulness of the home environment. Second, parental active mediation, monitoring and limit setting were high at pretest, thus, making significant improvements would be difficult. Last, the only “family night” or “direct contact” activity was at the end of the 12-week curriculum. This family night was a HOP’N Home “celebration,” in which children demonstrated their knowledge and activities they participated in during the previous 12 weeks. Perhaps, more “direct contact” activities were needed to improve the social home environment. However, the evidence for family participation in direct school-based activities is a challenge and participation is typically low.<sup>19,51</sup>

From a public health perspective, the ability to impact home environments through young children’s asking behaviors and child care settings is of great importance to decrease population obesity. Few studies have attempted to impact home environments through preschool-aged children at child care, and most only assess child BMI and child behaviors, and not the home environment.<sup>30,32</sup> Similar to our study, the Hip-Hop to Health Jr. preschool overweight prevention program also included a parent component, however they were unsuccessful in improving intervention children’s dietary intake (total fat, saturated fat, fiber) or activity (television viewing, exercise frequency, exercise intensity) behaviors. Unlike the Hip-Hop to Health Jr. intervention, HOP’N Home parents did not receive a monetary incentive for participating in the home activities. In the HOP’N Home project, children tracked their own progress by receiving a HOP’N Home stamp to put on the home connection participation chart. Children’s participation in the home connection activities was lower than anticipated, however based on the additions to the curriculum in study two, family participation increased compared to study one. Perhaps, if parents received monetary incentive to participate each week, participation may have been higher, however it is not realistic to expect child care providers to offer monetary incentives to parents for participation.

Last, we hypothesized that children in the HOP’N Home intervention would have greater increases in their healthy eating and physical activity behaviors. Children significantly increased in park visits per week and decreased in screen time and fast food restaurant visits per week. There were no changes to children’s fruit and vegetable consumption. This is an important result, as it demonstrates that the HOP’N Home intervention significantly improved behaviors

associated with child obesity. These findings are encouraging, such that a longer or more intensive intervention may have greater increases in healthful behaviors and greater decreases in unhealthful behaviors, which may impact child obesity.

An important aspect of this study is that we examined children attending both home- and center-based child care providers. In study 1, we evaluated the HOP'N Home program in one center, and in study 2, we recruited both homes and centers. There were several family demographic differences between child care sites. Children who attended home-based care were younger, of lower socioeconomic status, and a greater percentage were overweight or obese. The difference in socioeconomic status between our two studies may help to explain the positive result in study 2 compared to study 1. The intervention may have been able to overcome some of the healthy eating and physical activity disparities<sup>15,67</sup> in families of lower socioeconomic households.

Finally, the HOP'N Home intervention was a public health effectiveness study that had limited direct investigator team contact and child care providers were responsible for 100% implementation of the intervention. Unlike efficacy models, our intervention can be easily implemented without considerable involvement by experts and without the investment of additional child care staff. Child care providers were successful at implementing the HOP'N Home group time activities, dramatic play activities, and meal prompts. However, having children role-play HOP'N Home quality elements proved more challenging. The curriculum was developed around activities already a part of a child care routine: group time activities, dramatic play activities, songs, home activities, and meal prompts. Thus, this intervention could be easily adopted and implemented by a majority of child care providers, potentially leading to a great public health impact. Additionally, future use of this curriculum could include child care providers getting continuing education credit for their participation, and using online modules for training to increase dissemination. Much research has been conducted with efficacy studies, such that the research team was involved in direct implementation at the child care site. For example, the Brocodile the Crocodile health promotion curriculum<sup>22</sup> was a 1-hour a week intervention implemented by research staff. The HOP'N Home project was developed to be minimally invasive to child care providers, so that it could be easily and successfully implemented.

This was a small pilot study with several strengths and limitations. Strengths included the diversity of the children participating in study two, and the use of objective height and weight measurements and valid survey items. The intervention was developed to be minimally invasive, easy to implement, and highly disseminated, with the potential to make a public health impact. Additionally, very low drop-out of children for pretest and posttest height and weight assessments, as well as 75% return rate on parent surveys. Limitations included parental report of their child's screen time and physical activity behaviors, dietary intake, and child asking behaviors. It is possible that parents in the HOP'N Home intervention might have felt more pressure to report socially desired behaviors. We do not have evidence of this, and the fact that so many behaviors did not change over time leads us to believe that this was not the case. Last, this was a small pilot study and both studies had relatively small sample sizes.

Despite the modest findings in our study, the program was very well-received by children, parents, and child care personnel. Child care personnel easily implemented the HOP'N Home project and incorporated it into their child care curriculum. The 12-week HOP'N Home project has potential to impact childhood obesity, children's health behaviors and the home environment. Our findings suggest that children attending child care programs can be a practical way to influence the healthfulness of home environments for young children.

The HOP'N Home intervention was a novel study targeting young children's self-regulation skills to ask parents for healthful home environments. Future research should examine interventions targeting both child care and home environments to prevent obesity. It may be that more intensive interventions are necessary; however, in developing more intensive interventions, it is important to maintain high implementation fidelity. Additionally, this intervention targeted active and restrictive parenting practices, but future research may be necessary to identify the most important parenting practices that can be targeted by interventions to provide healthful options and build children's skills to promote healthful behavior to prevent obesity. Furthermore, preventing childhood obesity is an important public health concern, and targeting parents and adults may be one way to stop the increase of child obesity.

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## References

1. Aktas Arnas Y. The effects of television food advertisement on children's food purchasing requests. *Pediatr Int*. 2006;48(2):138-145.
2. American Academy of Pediatrics. Children, adolescents, and television. *Pediatrics*. 2001;107(2):423-426.
3. Arredondo EM, Elder JP, Ayala GX, Campbell N, Baquero B, Dueksen S. Is parenting style related to children's healthy eating and physical activity in Latino families? *Health Educ Res*. 2006;21(6):862-871.
4. Bandura A. The primacy of self-regulation in health promotion. *Applied Psychology*. 2005;54(20):245. *Appl Psychol*. 2005;54(2):245
5. Baranowski T, Missagian M, Watson K, Broadfoot A, Cullen K, Nicklas T, Fisher J, O'Donnell S. Home fruit, juice, and vegetable pantry management and availability scales: a validation. *Appetite*. 2008;50(2-3):266-277.
6. Benjamin SE, Ammerman A, Sommers J, Dodds J, Neelon B, Ward DS. Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC): Results from a pilot intervention. *J Nutr Educ Behav*. 2007;39(3):142-149.
7. Bennett C, de Silva-Sanigorski AM, Nichols M, Bell AC, Swinburn BA. Assessing the intake of obesity-related foods and beverages in young children: comparison of a simple population survey with 24 hr-recall. *Int J Behav Nutr Phys*. 2009;6(71).
8. Birch LL, Fisher JO. Development of eating behaviors among children and adolescents. *Pediatrics*. 1998;101(3 Pt 2):539-549.
9. Birch LL, Fisher JO, Grimm-Thomas K, Markey CN, Sawyer R, Johnson SL. Confirmatory factor analysis of the Child Feeding Questionnaire: a measure of parental attitudes, beliefs and practices about child feeding and obesity proneness. *Appetite*. 2001;36(3):201-210.
10. Bradlee ML, Singer MR, Qureshi MM, Moore LL. Food group intake and central obesity among children and adolescents in the Third National Health and Nutrition Examination Survey (NHANES III). *Public Health Nutr*. 2009;13(6):797-805.
11. Brownell MD. Musically adapted Social Stories to modify behaviors in students with autism: four case studies. *J Music Ther*. 2002;29:117-144.
12. Bryant MJ, Ward DS, Hales D, Vaughn A, Tabak RG, Stevens J. Reliability and validity of the Healthy Home Survey: A tool to measure factors within homes hypothesized to relate to overweight in children. *Int J Behav Nutr Phys Act*. 2008;5(23).
13. Buijzen M. The effectiveness of parental communication in modifying the relation between food advertising and children's consumption behavior. *Br J Dev Psychol*. 2009;27(Pt 1):105-121.

14. Buijzen M, Valkenburg PM. Observing purchase-related parent-child communication in retail environments: A developmental and socialization perspective. *Hum Commun Res.* 2008;34(1):50.
15. Cassady D, Jetter KM, Culp J. Is price a barrier to eating more fruits and vegetables for low-income families? *J Am Diet Assoc.* 2007;107(11):1909-1915.
16. Chamberlain LJ, Wang Y, Robinson T. Does children's screen time predict requests for advertised products? Cross-sectional and prospective analyses. *Arch Pediatr Adolesc Med.* 2006;160(4):363-368.
17. Chard SC. *The project approach: making curriculum come alive.* New York, N.Y.; 1998.
18. Crespo CJ, Smit E, Troiano RP, Bartlett SJ, Macera CA, Andersen RE. Television watching, energy intake, and obesity in US children: Results from the third national health and nutrition examination survey, 1988-1994. *Arch Pediatr Adolesc Med.* 2001;155(3):360-365.
19. Crockett SJ, Mullis RM, Perry CL. Parent nutrition education: a conceptual model. *J Sch Health.* 1988;58(2):53-57.
20. Cullen KW, Baranowski T, Owens E, Marsh T, Rittenberry L, de Moor C. Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children's dietary behavior. *Health Educ Behav.* 2003;30(5):615-626.
21. Desrochers DM, Holt DJ. Children's exposure to television advertising: implications for childhood obesity. *J Public Policy Mark.* 2007;26(2):182-201.
22. Dennison BA, Russo TJ, Burdick P, Jenkins PL. An intervention to reduce television viewing by preschool children. *Arch Pediatr Adolesc Med.* 2004;158(2):170-176.
23. DuRant RH, Baranowski T, Johnson M, Thompson WO. The relationship among television watching, physical activity, and body composition of young children. *Pediatrics.* 1994;94(4 Pt 1):449-455.
24. Dziewaltowski DA, Estabrooks PA, Johnston JA. Healthy youth places promoting nutrition and physical activity. *Health Educ Res.* 2002;17(5):541-551.
25. Dziewaltowski DA, Estabrooks PA, Welk G, Hill J, Milliken G, Karteroliotis K, Johnston JA. Healthy Youth Places: a randomized controlled trial to determine the effectiveness of facilitating adult and youth leaders to promote physical activity and fruit and vegetable consumption in middle schools. *Health Educ Behav.* 2009;36(3):583-600.
26. Dziewaltowski DA, Rosenkranz RR, Geller KS, et al. HOP'N after-school project: an obesity prevention randomized controlled trial. *IJBNPA.* 2010;7(10).
27. Epstein LH, Roemmich JN, Robinson FL, Paluch RA, Winiewicz DD, Fuerch JH, Robinson TN. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Arch Pediatr Adolesc Med.* 2008;162(3):239-245.
28. Epstein LH, Wing RR, Steranchak L, Dickson B, Michelson J. Comparison of family-based behavior modification and nutrition education for childhood obesity. *J Pediatr Psychol.* 1980;5(1):25-36.
29. Federal Interagency Forum on Child and Family Statistics. America's children: key national indicators of well-being, 2007. Washington (DC): U.S. Government Printing Office; 2007.

30. Fitzgibbon ML, Stolley MR, Dyer AR, VanHorn L, KauferChristoffel K. A community-based obesity prevention program for minority children: rationale and study design for Hip-Hop to Health Jr. *Prev Med.* 2002;34(2):289-297.
31. Fitzgibbon ML, Stolley MR, Schiffer L, Van Horn L, KauferChristoffel K, Dyer A. Two-year follow-up results for Hip-Hop to Health Jr.: a randomized controlled trial for overweight prevention in preschool minority children. *J Pediatr.* 2005;146(5):618-625.
32. Fitzgibbon ML, Stolley MR, Schiffer L, Van Horn L, KauferChristoffel K, Dyer A. Hip-Hop to Health Jr. for Latino preschool children. *Obesity.* 2006;14(9):1616-1625.
33. Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, Laird N. Reducing obesity via a school-based interdisciplinary intervention among youth: *Planet Health.* *Arch Pediatr Adolesc Med.* 1999;153(4):409-418.
34. Gattshall ML, Shoup JA, Marshall JA, Crane LA, Estabrooks PA. Validation of a survey instrument to assess home environments for physical activity and healthy eating in overweight children. *In J Behav Nutr Phys Act.* 2008;5(3).
35. Golan M, Kaufman V, Shahar DR. Childhood obesity treatment: Targeting parents exclusively v. parents and children. *Br J Nutr.* 2006;95(5):1008-1015.
36. Graetz JE, Mastropieri MA, Scruggs TE. Decreasing inappropriate behaviors for adolescents with autism spectrum disorders using modified Social Stories. *Educ Train Dev Disab.* 2009;44:91-104
37. Gray C. (1995). *Writing social stories with Carol Gray.* Arlington, TX: Future Horizon.
38. Helm JH, Katz GL. *Young investigator: The project approach in the early years.* New York and London: Teacher Collage Pres, 2001.
39. Hesketh KD, Campbell KJ. Interventions to prevent obesity in 0-5 year olds: an updated systematic review of the literature. *Obesity.* 2010;18(Suppl1):S27-S35.
40. Hingle MD, O'Connor TM, Dave JM, Baranowski T. Parental involvement in interventions to improve child dietary intake: A systematic review. *Prev Med.* 2010;51(2):103-111.
41. Hinyard LJ, Kreuter MW. Using narrative communication as a tool for health behavior change: a conceptual, theoretical, and empirical overview. *Health Educ Behav.* 2007;34(5):777-792.
42. Isler L, Popper HT, Ward S. Children's purchase requests and parental responses: results from a diary study. *J Advert Res.* 1987;27:28-39.
43. Jackson DM, Dzafarian K, Stewart J, Speakman JR. Increased television viewing is associated with elevated body fatness but not with lower total energy expenditure in children. *Am J Clin Nutr.* 2009;89(4):1031-1036.
44. Kaiser Family Foundation, 2006
45. Kaphinst KM, Story M. Child care as an untapped setting for obesity prevention: state child care licensing regulations related to nutrition, physical activity, and media use for preschool-aged children in the United States. *Prev Chronic Dis.* 2009;6(1):A11.

46. Kimm, SYS, Barton BA, Obarzanek E, McMahon RP, Kronsberg SS, Wacławski MA, Morrison JA, Schreiber GB, Sabry ZI, Daniels SR. Obesity development during adolescence in a biracial cohort: the HNLBI growth and health study. *Pediatrics*. 2002;110(e54).
47. Klesgest LM, Dziewaltowski DA, Glasgow RE. Review of external validity reporting in childhood obesity prevention research. *Am J Prev Med*. 2008;34(3):216-213.
48. Kroll K, Warschburger P. Maternal feeding strategies and child's food intake: considering weight and demographic influences using structural equation modeling. *Int J Behav Nutr Phys Act*. 2009;6(78).
49. Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, Flegal KM, Guo SS, Wei R, Mei Z, Curtin LR, Roche AF, Johnson CL. CDC growth charts: United States. *Advance Data*. 2000;8(314):1-27.
50. Larios SE, Ayala GX, Arredondo EM, Baquero B, Elder J. Development and validation of a scale to measure Latino parenting strategies related to children's obesogenic behaviors. The parenting strategies for eating and activity scale (PEAS). *Appetite*. 2009;52(1):166-172.
51. Leupker RV, Perry CL, McKinlay SM, Nader PR, Parcel GS, Stone EJ, Webber LS, Elder JP, Feldman HA, Johnson CC, et al. Outcomes of a field trial to improve children's dietary patterns and physical activity. *JAMA*. 1996;275(10):768-776.
52. Lichstein K, Riedel B, Grieve R. Fair tests of clinical trials – a treatment implementation model. *Adv Behav Res Ther*. 1994;16(1):1-29.
53. McDermott L, O'Sullivan T, Stead M, Hastings G. International food advertising, pester power and its effects. *Int J Advert*. 2006;25(4):513-539.
54. Monasta L, Batty GD, Macaluso A, Ronfani L, Luje V, Bavar A, van Lenthe FJ, Brug J, Cattaneo A. Interventions for the prevention of overweight and obesity in preschool children: a systematic review of randomized controlled trials. *Obes Rev*. 2011;12(5):107-118.
55. Mo-suwan L, Pongprapai S, Junjana C, Puetpaiboon A. Effects of a controlled trial of a school-based exercise program on the obesity indexes of preschool children. *Am J Clin Nutr*. 1998;68(5):1006-1011.
56. Musher-Eizenman D, Holub S. Comprehensive Feeding Practices Questionnaire: validation of a new measure of parental feeding practices. *J Pediatr Psychol*. 2007;32(8):960-972.
57. Nelson DE, Hlotzman D, Bolen J, Stanwyck CA, Mack KA. Reliability and validity of measures from the Behavioral Risk Factor Surveillance System (BRFSS). *Soz Präventivmed*. 2001;(46 Suppl 1):S3-42.
58. O'Connor TM, Jago R, Baranowski T. Engaging parents to increase youth physical activity: a systematic review. *Am J Prev Med*. 2009;37(2):141-149.
59. Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA*. 2008;303(3):242-292.
60. Powell LM, Szczypka G, Chaloupka FJ. Trends in exposure to television food advertisements among children and adolescents in the United States. *Arch Pediatr Adolesc Med*. 2010;164(9):794-802.

61. Robinson TN. Reducing children's television viewing to prevent obesity: A randomized controlled trial. *JAMA*. 1999;282(16):1561-1567.
62. Robinson TN. Television viewing and childhood obesity. *Pediatr Clin North Am*. 2001;48(4):1017-1025.
63. Robinson TN, Killen JD. Ethnic and gender differences in the relationships between television viewing and obesity, physical activity, and dietary fat intake. *J Health Educ*. 1995;26:S91-S98.
64. Rolls BJ, Allo-Martin JA, Carlton Tohill B. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? *Nutr Rev*. 2004;62(1):1-17.
65. Rosenkranz RR, Dziewaltowski DA. Model of the home food environment pertaining to childhood obesity. *Nutr Rev*. 2008;66(3):123-140.
66. Serdula MK, Ivery D, Coates RJ, Freedman DS, Williamson DF, Byers T. Do obese children become obese adults? A review of the literature. *Prev Med*. 1993;22(2):167-177.
67. Sheldon M, Gans KM, Tai R, George T, Lawson E, Pearlman DN. Availability, affordability, and accessibility of a healthful diet in a low-income community, Central Falls, Rhode Island, 2007-2008. *Prev Chronic Dis*. 2010;7(2):A43.
68. Sirard JR, Nelson MC, Pereira MA, Lytle LA. Validity and reliability of a home environment inventory for physical activity and media equipment. *Int J Behav Nutr Phys*. 2008;5(24).
69. Sithole F, Veugelers PJ. Parent and child reports of children's activity. *Health Rep*. 2008;19(3):19-24.
70. Spurrier NJ, Magarey AA, Golley R, Curnow F, Sawyer MG. Relationships between the home environment and physical activity and dietary patterns of preschool children: a cross-sectional study. *Int J Behav Nutr Phys Act*. 2008;5(31).
71. Taras HL, Sallis JF, Patterson TL, Nader PR, Nelson JA. Television's influence in children's diet and physical activity. *J Dev Behav Pediatr*. 1989;10(4):176-80.
72. Taylor RW, Murdoch L, Carter P, Gerrard DF, Williams SH, Taylor BJ. Longitudinal study of physical activity and inactivity in preschoolers: the FLAME study. *Med Sci Sports Exerc*. 2009;41(1):96-102.
73. Trost SG, Fees B, Dziewaltowski D. Feasibility and efficacy of a "Move and Learn" physical curriculum in preschool children. *J Phys Act Health*. 2008;5(1):88-103.
74. Wang Y, Ge K, Popkin BM. Why do some overweight children remain overweight, whereas others do not? *Public Health Nutr*. 2003;6:549-558.
75. Ward D, Hales D, Haverly K, Marks J, Benjamin S, Ball S, Trost S. An instrument to assess the obesogenic environment of child care centers. *Am J Health Behav*. 2008;32(4):380-386.

76. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med.* 1997;337(13):869-873.
77. Wiecha JL, Peterson KE, Ludwig DS, Kim J, Sobol A, Gortmaker SL. When children eat what they watch: Impact of television viewing on dietary intake in youth. *Arch Pediatr Adolesc Med.* 2006;160(4):436.
78. Williams CL, Carter BJ, Kibbe DL, Dennison D. Increasing physical activity in preschool: A pilot study to evaluate Animal Trackers. *J Nutr Educ Behav.* 2009;41(1):47-52.

## Figures and Tables

Figure 3.1: CONSORT diagram of participant flow through the randomized trial (Study 1)

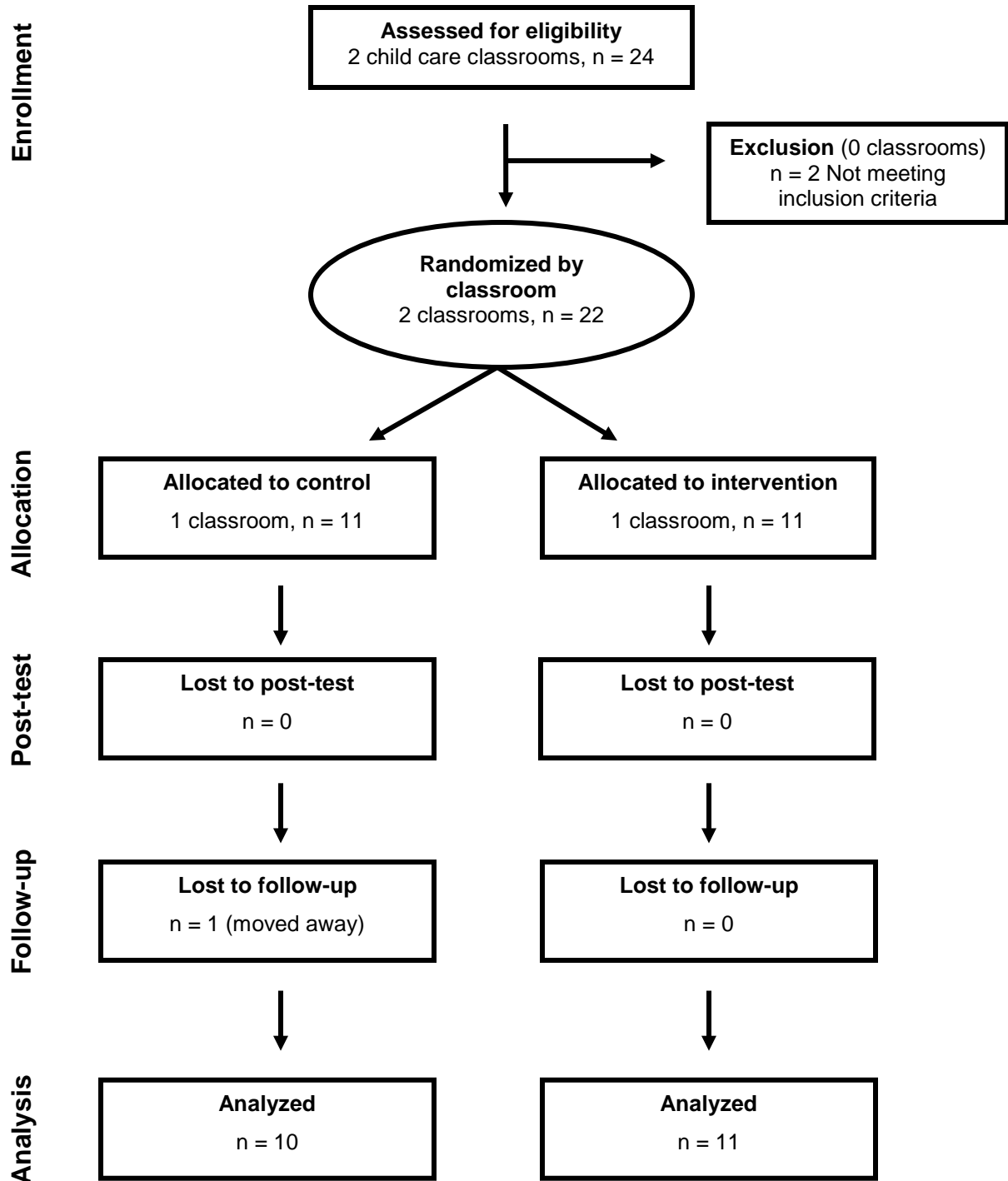




Table 3.1: Theoretical constructs underlying HOP'N Home Intervention

### HOP'N Home Intervention – Modules

**PHASE 1 – The Topic Emerges.** Children complete topic webs on what information they already know about the topic and what they want to learn (Group Time). Information about the topic will also be learned during Dramatic Play, Lunch/Snack, & Home Connection)

- Child Outcome = Ask parent for Go Foods & Activities; Distinguish what a commercial is and when being advertised to
- Parent Outcome = Provide Go Foods & Activities to Child (Available & Accessible)

| Session | Module                | Learning Objective   | Strategies / Activities  |
|---------|-----------------------|--|--|
| 1       | Go & Slow Foods       | <ul style="list-style-type: none"> <li>• What does child know about Go &amp; Slow Foods?</li> <li>• What does child want to learn about Go &amp; Slow Foods?</li> <li>• Child learns Go &amp; Slow Foods</li> <li>• Child asks parent for Go Foods</li> <li>• Parent provides Go Foods at home (Available &amp; Accessible)</li> </ul>                                   | <ul style="list-style-type: none"> <li>• Knowledge of healthy and unhealthy foods goals/standards</li> <li>• Active mastery experience and verbal persuasion to eat healthful foods</li> <li>• Link to home and parents</li> </ul>                                 |
| 2       | Go & Slow Activities  | <ul style="list-style-type: none"> <li>• What does child know about Go &amp; Slow Activities?</li> <li>• What does child want to learn about Go &amp; Slow Activities?</li> <li>• Child learns Go &amp; Slow Activities</li> <li>• Child asks parent for Go Activities</li> <li>• Parent provides Go Activities at home (Available &amp; Accessible)</li> </ul>          | <ul style="list-style-type: none"> <li>• Knowledge of healthy and unhealthy physical activity goals/standards</li> <li>• Environmental scan</li> <li>• Active mastery experience and verbal persuasion to be active</li> <li>• Link to home and parents</li> </ul> |
| 3       | Go & Slow Advertising | <ul style="list-style-type: none"> <li>• What does child know about Advertising?</li> <li>• What does child want to learn about Advertising?</li> <li>• Child learns advertising for Go &amp; Slow Foods &amp; Activities</li> <li>• Child can distinguish an advertisement from other forms of media (can distinguish Go/Slow Foods &amp; PA in Advertising)</li> </ul> | <ul style="list-style-type: none"> <li>• Knowledge of advertising for healthy &amp; unhealthy foods and activities</li> <li>• Environmental scan</li> </ul>  |



**PHASE 2 – Investigate the Topic with Projects.** Children conduct an in-depth investigation of the topic. Children investigate the topic during group time, dramatic play, lunch/snack and home. After investigation, children will represent what they learned through group time, dramatic play, lunch/snack and home. Projects will be based on home routines for Go & Slow Foods, Activities and Advertising. Ideally, teachers document the children’s learning process with pictures/photographs to assist in the review process in Phase 3.

| Session | Module   | Learning Objective   | Strategies   |
|---------|--|--|--|
| 4, 5    | Go & Slow Foods at Home                              | <ul style="list-style-type: none"> <li>• Child learns Go &amp; Slow Foods during home routines</li> <li>• Child asks parent, “Is it a Go, Is it a Slow? Is it healthy, yes or no?”</li> <li>• Child asks parent for Go foods at home</li> <li>• Child is aware of home health environment</li> <li>• Influence parent for support</li> <li>• Develop &amp; practice asking skills</li> </ul>           | <ul style="list-style-type: none"> <li>• Verbal persuasion to eat healthful foods</li> <li>• Link to home and parents</li> <li>• Environmental scan</li> <li>• Self-assessment &amp; self-monitor</li> <li>• Active learning</li> </ul>  |
| 6, 7, 8 | Go & Slow Activities at Home                         | <ul style="list-style-type: none"> <li>• Child learns Go &amp; Slow Activities during home routines</li> <li>• Child asks parent, “Is it a Go, Is it a Slow? Is it healthy, yes or no?”</li> <li>• Child asks parent for Go activities at home</li> <li>• Child is aware of home health environment</li> <li>• Influence parent for support</li> <li>• Develop &amp; practice asking skills</li> </ul> | <ul style="list-style-type: none"> <li>• Verbal persuasion to do healthy activities</li> <li>• Link to home and parents</li> <li>• Environmental scan</li> <li>• Self-assessment &amp; self-monitoring</li> <li>• Knowledge of ways to increase Go activities at home; overcome barriers</li> </ul>                |
| 9, 10   | Go & Slow Foods, Activities & Advertisements at Home | <ul style="list-style-type: none"> <li>• Child learns Go &amp; Slow Advertisements at home</li> <li>• Child understands Go &amp; Slow foods and activities at home</li> <li>• Child practices asking skills for Go foods and activities</li> <li>• Child asks parent, “Is it a Go, Is it a Slow? Is it healthy, yes or no?”</li> </ul>   | <ul style="list-style-type: none"> <li>• Verbal persuasion to do healthy activities and eat healthful foods</li> <li>• Link to home and parents</li> <li>• Self-assessment</li> <li>• Active learning</li> <li>• Provide children control over their choices for PA and foods to increase self-efficacy</li> </ul> |

**PHASE 3 – Concluding the Topic.** Children review their topic webs from Week 1 (what they know & what they wanted to learn) and summarize what they’ve learned. Children will then share their new knowledge with their parents during the final project. Typically in phase 3, children construct something to demonstrate their acquired knowledge.

| Session | Module                                       | Learning Objective  | Strategies   |
|---------|--|---|--|
| 11      | Wrap-Up<br>& FINAL<br>PROJECT<br>PREPERATION | <ul style="list-style-type: none"> <li>• Child creates advertisements for Go foods and activities</li> <li>• Child role-plays asking parent for Go foods and activities</li> <li>• Child learned GO &amp; Slow foods &amp; activities during home routines</li> <li>• Child is aware of home health environment</li> <li>• Influence parents for support</li> <li>• Practice asking skills</li> </ul> | <ul style="list-style-type: none"> <li>• Verbal persuasion to eat healthful foods and be active</li> <li>• Link to home and parents</li> <li>• Self-assessment</li> <li>• Active learning</li> </ul> |
| 12      | Conclusion<br>& FINAL<br>PROJECT             | <ul style="list-style-type: none"> <li>• Child will assist in HOP’N Home celebration planning</li> <li>• Nutritional awareness: child will help make snacks for celebration</li> <li>• HOP’N Home grocery bag</li> </ul>  | <ul style="list-style-type: none"> <li>• Mastery learning</li> <li>• Building preparation skills</li> <li>• Link to home and parents</li> </ul>  |

Table 3.2: Baseline characteristics of participants in Study 1

| Demographic Variables                    | Study 1     |             |             |
|--|-------------|-------------|-------------|
|  | ALL         | HOP'N Home  | Control     |
| <b>Child Care Facilities, n</b>          | 2           | 1           | 1           |
| <b>Participants, n</b>                   | 22          | 11          | 11          |
| <b>Gender, % (n)</b>                     |             |             |             |
| Male                                     | 45.5 (10)   | 45.5 (5)    | 45.5 (5)    |
| Female                                   | 54.5 (12)   | 54.5 (6)    | 54.5 (6)    |
| <b>SES, % (n)</b>                        |             |             |             |
| Not eligible                             | 95.5 (21)   | 100 (11)    | 90.9 (10)   |
| Free/Reduced                             | 4.5 (1)     | 0 (0)       | 9.1 (1)     |
| <b>Race/Ethnicity, % (n)</b>             |             |             |             |
| Non-Hispanic Caucasian                   | 68.2 (15)   | 81.8 (9)    | 54.5 (6)    |
| Racial/ethnic minority                   | 31.8 (7)    | 18.2 (2)    | 45.5 (5)    |
| <b>Age, Years (SD)</b>                   | 3.50(.51)   | 3.64 (.51)  | 3.36 (.51)  |
| <b>Child Body Mass Index</b>             |             |             |             |
| Child BMI, kg/m <sup>2</sup> (SD)        | 16.1 (.96)  | 16.0 (1.02) | 16.2 (.93)  |
| Child BMI-Z (SD)                         | .43 (.65)   | .38 (.69)   | .49 (.64)   |
| <b>Child Weight Status, % (n)</b>        |             |             |             |
| Normal                                   | 81.8 (18)   | 90.9 (10)   | 72.7 (8)    |
| Overweight                               | 13.6 (3)    | 0 (0)       | 27.3 (3)    |
| Obese                                    | 4.5 (1)     | 9.1 (1)     | 0 (0)       |
| Overweight/Obese                         | 18.2 (4)    | 9.1 (1)     | 27.3 (3)    |
| <b>Child Waist Circumference,% (n)</b>   |             |             |             |
| Normal                                   | 77.3 (17)   | 81.8 (9)    | 72.7 (8)    |
| High trunk fat mass                      | 22.7 (5)    | 18.2 (2)    | 27.3 (3)    |
| <b>Parent BMI, kg/m<sup>2</sup> (SD)</b> | 25.3 (4.72) | 24.9 (3.75) | 25.7 (5.68) |
| <b>Parent BMI, % (n)</b>                 |             |             |             |
| Normal                                   | 50 (11)     | 54.5 (6)    | 45.5 (5)    |
| Overweight                               | 36.4 (8)    | 36.4 (4)    | 36.4 (4)    |
| Obese                                    | 13.6 (3)    | 8.3 (1)     | 18.2 (2)    |
| Overweight/Obese                         | 50 (11)     | 45.5 (5)    | 54.5 (6)    |

Table 3.3: Weekly Checklist Implementation of HOP’N Home Quality Elements (Study 1 and 2)

| Parent Survey, %                          | Study 1    |           |             | Study 2    |           |             |
|---|------------|-----------|-------------|------------|-----------|-------------|
|   | 100%       | 50%       | Not Covered | 100%       | 50%       | Not Covered |
| <b>Group Time Activities (3x/week)</b>    | 98         | 2         | 0           | 92.9       | 0         | 7.1         |
| <b>Dramatic Play Activities (5x/week)</b> | 100        | 0         | 0           | 97.6       | 0         | 2.4         |
| Physical DP Environment                   | 92.7       | 2.4       | 4.9         | 96.1       | 1.4       | 2.5         |
| Teacher Prompts                           | 93.3       | 6.7       | 0           | 71.7       | 25.4      | 2.9         |
| Child Role-Playing                        | 38.7       | 38.7      | 22.6        | 43.4       | 45.1      | 11.5        |
| <b>Meal Prompts (5x/week)</b>             | 100        | 0         | 0           | 85.7       | 0         | 14.3        |
|   | <b>YES</b> | <b>NO</b> |             | <b>YES</b> | <b>NO</b> |             |
| <b>HOP’N Home Connection</b>              |            |           |             |            |           |             |
| % of children that brought in item        | 16.7       | 83.3      |             | 36.9       | 63.1      |             |
| Discuss Home Connection                   | 45.5       | 54.5      |             | 100        | 0         |             |

Table 3.4: Process Evaluation of Parent HOP’N Home Participants (Study 1 and 2)

| Parent Survey, % (n)         | Study 1 (n=11)          |                        |              | Study 2 (n=39)          |                        |              |
|------------------------------|-------------------------|------------------------|--------------|-------------------------|------------------------|--------------|
|                              | Always                  | Some-times             | Never        | Always                  | Some-times             | Never        |
| <b>HOP’N Home Program</b>    |                         |                        |              |                         |                        |              |
| Satisfied with HOP’N Home    | 63.7 (7)                | 27.3 (3)               | 9.1 (1)      | 84.2 (32)               | 13.2 (5)               | 2.6 (1)      |
| Made changes in home         | 27.3 (3)                | 63.6 (7)               | 9.1 (1)      | 17.9 (7)                | 59.0 (23)              | 23.1 (9)     |
| <b>Newsletter</b>            |                         |                        |              |                         |                        |              |
| Received                     | 100 (11)                | 0                      | 0            | 76.3 (29)               | 10.5 (4)               | 13.2 (5)     |
| Read                         | 81.8 (9)                | 9.1 (1)                | 9.1 (1)      | 67.6 (25)               | 13.5 (5)               | 18.9 (7)     |
| Did family activity          | 36.4 (4)                | 45.5 (5)               | 18.2 (2)     | 46.2 (18)               | 25.6 (10)              | 28.2 (11)    |
| <b>HOP’N Home Connection</b> |                         |                        |              |                         |                        |              |
| Received                     | 81.8 (9)                | 18.2 (2)               | 0            | 78.9 (30)               | 7.9 (3)                | 13.2 (5)     |
| Read                         | 72.8 (8)                | 18.2 (2)               | 9.1 (1)      | 71.1 (27)               | 7.9 (3)                | 21.1 (8)     |
| Asked child questions        | 72.8 (8)                | 18.2 (2)               | 9.1 (1)      | 47.4 (18)               | 28.9 (11)              | 23.7 (9)     |
| Did family activity          | 36.4 (4)                | 45.5 (5)               | 18.2 (2)     | 44.7 (17)               | 26.3 (10)              | 28.9 (11)    |
| Brought in item to school    | 36.4 (4)                | 18.2 (2)               | 45.5 (5)     | 47.4 (18)               | 21.1 (8)               | 31.5 (12)    |
|                              | <b>YES</b>              | <b>NO</b>              |              | <b>YES</b>              | <b>NO</b>              |              |
| <b>HOP’N Home Music CD</b>   |                         |                        |              |                         |                        |              |
| Received                     | 72.7 (8)                | 27.3 (3)               |              | 86.5 (32)               | 13.5 (5)               |              |
|                              | <b>3.5–5.5 times/wk</b> | <b>.5-1.5 times/wk</b> | <b>Never</b> | <b>3.5–5.5 times/wk</b> | <b>.5-1.5 times/wk</b> | <b>Never</b> |
| Listen to HOP’N Home CD      | 9.1 (1)                 | 63.6 (7)               | 27.3 (3)     | 13.5 (5)                | 54.1 (20)              | 32.4 (12)    |
| Child sings HOP’N songs      | 36.4 (4)                | 27.3 (3)               | 36.4 (4)     | 35.1 (13)               | 35.1 (13)              | 29.7 (11)    |

Table 3.5: Child BMI Means and Adjusted Mean Difference (SD) Pre-Test, Post-Test, and 4-month Follow-Up (Study 1):  
Complete Case Analysis

| Variable             | HOP'N Home          |                      |                           | Control             |                      |                           | Post-Pre                            |      | Follow-Up - Pre                     |     |
|----------------------|---------------------|----------------------|---------------------------|---------------------|----------------------|---------------------------|-------------------------------------|------|-------------------------------------|-----|
|                      | Pre Mean (SD), n=11 | Post Mean (SD), n=11 | Follow-Up Mean (SD), n=10 | Pre Mean (SD), n=11 | Post Mean (SD), n=11 | Follow-Up Mean (SD), n=11 | Adjusted 1-C Change Difference (SE) | p    | Adjusted 1-C Change Difference (SE) | p   |
| BMI raw <sup>1</sup> | 16.05<br>(1.02)     | 16.32<br>(1.05)      | 16.21<br>(1.07)           | 16.23<br>(.93)      | 16.11<br>(.98)       | 16.21<br>(1.09)           | .36<br>(.16)                        | .04* | .16<br>(.21)                        | .45 |
| BMI z <sup>2</sup>   | .38<br>(.69)        | .61<br>(.69)         | .55<br>(.68)              | .49<br>(.64)        | .44<br>(.71)         | .55<br>(.80)              | .27<br>(.12)                        | .04* | .130<br>(.14)                       | .37 |

**Note.** Mean Change = post – pre; \* = Significant at  $p < .05$ ; BMI=Body Mass Index; BMIz=BMI standardized for age and gender

<sup>1</sup>BMI raw means adjusted for baseline BMI, SES, gender, and race/ethnicity

<sup>2</sup>BMIz means adjusted for baseline BMIz, SES, and race/ethnicity

Table 3.6: Parent Survey Variables (Study 1): Means (SD) Pre-Test, Post-Test, 4-month Follow-Up: Complete Case Analysis

| Variable  | HOP'N Home (n=8)  |                   |                   | Control (n=8)    |                    |                   | (Post-Pre)                                   |     | Follow-up - Pre                              |     |
|---|-------------------|-------------------|-------------------|------------------|--------------------|-------------------|--|-----|--|-----|
|   | Pre-Test<br>(SD)  | Post-Test<br>(SD) | Follow-Up<br>(SD) | Pre-Test<br>(SD) | Post-Test<br>(SD)  | Follow-Up<br>(SD) | Adjusted<br>C-1 Change<br>Difference<br>(SE) | p   | Adjusted<br>C-1 Change<br>Difference<br>(SE) | p   |
| <b>Physical Home Environment:</b>   |                   |                   |                   |                  |                    |                   |  |     |  |     |
| <b>Food availability (# of items)</b>                                       |                   |                   |                   |                  |                    |                   |  |     |  |     |
| 100% Fruit Juice  | .88<br>(.99)      | 1.25<br>(.89)     | 1.25<br>(1.04)    | 2.00<br>(1.07)   | 1.25<br>(.89)      | 1.63<br>(.74)     | .50<br>(.45)                                 | .29 | .54<br>(.38)                                 | .18 |
| Fruit   | 10.38<br>(2.20)   | 8.38<br>(1.60)    | 8.00<br>(1.51)    | 9.25<br>(1.12)   | 9.13<br>(2.17)     | 8.75<br>(1.98)    | -1.47<br>(1.14)                              | .22 | -1.25<br>(.70)                               | .10 |
| Vegetable   | 8.50<br>(2.20)    | 8.88<br>(2.90)    | 8.75<br>(2.96)    | 9.13<br>(2.95)   | 9.13<br>(2.10)     | 9.50<br>(1.41)    | 1.03<br>(1.30)                               | .45 | -.15<br>(1.23)                               | .90 |
| FJV   | 19.75<br>(3.99)   | 18.50<br>(3.85)   | 18.00<br>(4.41)   | 20.37<br>(4.27)  | 19.50<br>(2.88)    | 19.88<br>(2.53)   | .101<br>(1.35)                               | .94 | -.42<br>(1.48)                               | .78 |
| <b>Physical Home Environment: PA<br/>&amp; Media Equipment (# of items)</b> |                   |                   |                   |                  |                    |                   |  |     |  |     |
| PA Equipment  | 16.88<br>(3.48)   | 19.00<br>(3.07)   | 18.00<br>(5.26)   | 15.13<br>(4.64)  | 16.25<br>(4.43)    | 16.25<br>(6.27)   | .44<br>(1.70)                                | .80 | -1.55<br>(1.42)                              | .30 |
| Media in Home   | 6.25<br>(.71)     | 6.38<br>(.74)     | 6.37<br>(.74)     | 5.25<br>(1.28)   | 5.25<br>(1.28)     | 5.37<br>(1.19)    | .17<br>(.17)                                 | .33 | .01<br>(.36)                                 | .98 |
| Media in Child Room   | .88<br>(1.25)     | .63<br>(1.19)     | .63<br>(1.19)     | .38<br>(1.06)    | .75<br>(1.49)      | .38<br>(1.06)     | -.05<br>(.33)                                | .88 | .10<br>(.34)                                 | .78 |
| <b>Child Activity Behaviors</b>   |                   |                   |                   |                  |                    |                   |  |     |  |     |
| Screen Time (min/day)   | 114.38<br>(68.12) | 96.56<br>(57.32)  | 80.63<br>(31.76)  | 73.13<br>(92.7)  | 102.19<br>(104.77) | 92.81<br>(109.20) | -20.64<br>(28.86)                            | .49 | -38.45<br>(51.09)                            | .47 |
| Physical Activity (park visits/week)  | 3.13<br>(2.08)    | 1.19<br>(1.00)    | 2.44<br>(1.57)    | 3.25<br>(1.65)   | 2.06<br>(1.15)     | 3.25<br>(1.36)    | -.62<br>(.61)                                | .34 | -.68<br>(.79)                                | .41 |
| <b>Child Eating Behaviors</b>   |                   |                   |                   |                  |                    |                   |  |     |  |     |
| Fruit   | 2.00<br>(1.07)    | 2.63<br>(1.06)    | 2.81<br>(.93)     | 3.13<br>(2.75)   | 2.00<br>(1.20)     | 2.50<br>(1.41)    | .43<br>(.63)                                 | .51 | .25<br>(.75)                                 | .74 |
| Vegetable   | 1.38<br>(1.06)    | 2.63<br>(2.07)    | 1.75<br>(.71)     | 2.75<br>(2.66)   | 1.63<br>(1.06)     | 1.50<br>(1.20)    | .96<br>(1.07)                                | .39 | .59<br>(.43)                                 | .20 |
| 100% Fruit Juice  | .75<br>(1.06)     | .63<br>(.74)      | .63<br>(.74)      | 1.88<br>(2.36)   | 1.13<br>(1.36)     | 1.13<br>(.99)     | -.27<br>(.49)                                | .60 | -.32<br>(.40)                                | .44 |
| Soft Drinks   | .00               | .00               | .13               | .38              | .13                | .13               | .00  | .99 | .10  | .53 |

|                                  |         |         |         |         |         |         |         |             |         |     |
|----------------------------------|---------|---------|---------|---------|---------|---------|---------|-------------|---------|-----|
|                                  | (.00)   | (.00)   | (.35)   | (1.06)  | (.35)   | (.35)   | (.00)   |             | (.15)   |     |
| Packaged Snacks                  | .88     | 1.38    | .88     | 1.38    | .50     | .38     | 1.12    | .33         | .44     | .13 |
|                                  | (.64)   | (2.33)  | (.35)   | (2.39)  | (.54)   | (.52)   | (1.10)  |             | (.27)   |     |
| Candy and/or Chocolate           | .38     | 1.38    | 1.25    | .13     | .38     | .63     | .00     | .99         | -.27    | .69 |
|                                  | (.52)   | (2.33)  | (1.28)  | (3.54)  | (.52)   | (.74)   | (1.18)  |             | (.66)   |     |
| Cake, doughnuts, muffins         | .38     | 1.00    | .88     | 1.00    | .38     | .75     | .64     | .58         | .32     | .48 |
|                                  | (.52)   | (2.45)  | (.84)   | (2.45)  | (.52)   | (1.04)  | (1.11)  |             | (.44)   |     |
| Fast Food (times/week)           | 1.88    | 1.50    | 1.75    | 1.50    | 1.13    | 1.50    | .17     | .72         | .55     | .24 |
|                                  | (.64)   | (.53)   | (.71)   | (1.51)  | (1.36)  | (1.20)  | (.46)   |             | (.44)   |     |
| <b>Child Asking (times/week)</b> |         |         |         |         |         |         |         |             |         |     |
| Play Outside                     | 4.56    | 4.63    | 5.69    | 5.50    | 2.56    | 6.19    | 3.18    | <b>.02*</b> | -.57    | .56 |
|                                  | (2.13)  | (2.72)  | (1.81)  | (2.04)  | (1.74)  | (1.28)  | (1.18)  |             | (.96)   |     |
| 100% Fruit Juice                 | 1.75    | 2.09    | 1.00    | 1.81    | 2.63    | 2.25    | .03     | .98         | -1.85   | .08 |
|                                  | (2.36)  | (3.07)  | (1.17)  | (2.39)  | (2.92)  | (2.33)  | (1.25)  |             | (.96)   |     |
| Soft Drinks                      | .31     | .50     | .56     | .94     | .50     | .75     | .38     | .25         | -.14    | .77 |
|                                  | (.53)   | (.65)   | (.62)   | (2.46)  | (1.22)  | (1.22)  | (.32)   |             | (.45)   |     |
| Vegetables                       | 1.50    | 2.38    | 2.06    | 2.13    | 1.44    | 3.13    | .89     | .43         | -1.28   | .25 |
|                                  | (1.75)  | (2.93)  | (2.68)  | (2.40)  | (1.74)  | (3.04)  | (1.08)  |             | (1.05)  |     |
| Packaged Snacks                  | 3.44    | 3.00    | 2.56    | 2.00    | 2.50    | 1.81    | -.51    | .52         | -.43    | .65 |
|                                  | (2.97)  | (2.60)  | (2.08)  | (1.67)  | (2.35)  | (2.39)  | (.76)   |             | (.91)   |     |
| Fruit                            | 3.75    | 4.13    | 3.44    | 4.19    | 4.88    | 4.69    | -.22    | .82         | -2.06   | .06 |
|                                  | (3.15)  | (2.88)  | (2.53)  | (3.17)  | (2.45)  | (2.58)  | (.94)   |             | (.96)   |     |
| Candy and/or Chocolate           | 3.31    | 3.31    | 2.94    | 2.69    | 3.63    | 2.81    | .03     | .99         | -.22    | .88 |
|                                  | (2.87)  | (3.08)  | (2.38)  | (2.42)  | (2.95)  | (2.31)  | (1.45)  |             | (1.42)  |     |
| Cake, Doughnuts, Muffins         | .88     | 1.38    | .75     | 1.56    | 2.75    | 1.44    | -.06    | .96         | -.31    | .66 |
|                                  | (.52)   | (1.43)  | (.65)   | (1.94)  | (2.78)  | (2.03)  | (.97)   |             | (.66)   |     |
| Television                       | 4.56    | 4.75    | 5.00    | 4.81    | 3.56    | 2.88    | 1.33    | .22         | 2.06    | .09 |
|                                  | (2.13)  | (2.52)  | (2.24)  | (2.36)  | (2.31)  | (2.71)  | (1.03)  |             | (1.09)  |     |
| Computer                         | .75     | .63     | .94     | .75     | .81     | 1.00    | -.08    | .87         | -.07    | .93 |
|                                  | (1.22)  | (.58)   | (1.21)  | (1.22)  | (1.28)  | (1.89)  | (.45)   |             | (.80)   |     |
| Video Games                      | .13     | 1.06    | .31     | .56     | .19     | .19     | .92     | .43         | .17     | .49 |
|                                  | (.23)   | (2.41)  | (.53)   | (1.21)  | (.53)   | (2.59)  | (1.12)  |             | (.24)   |     |
| <b>Parent Provides (%)</b>       |         |         |         |         |         |         |         |             |         |     |
| Play Outside                     | 84.38   | 81.25   | 78.13   | 81.25   | 75.00   | 84.38   | 3.80    | .80         | -8.21   | .37 |
|                                  | (18.60) | (17.68) | (16.02) | (17.68) | (29.88) | (12.94) | (14.71) |             | (8.68)  |     |
| Screen Time ( $\alpha=.74$ )     | 32.29   | 37.50   | 43.75   | 29.17   | 26.04   | 33.33   | 8.64    | .27         | 4.31    | .66 |
|                                  | (18.06) | (20.90) | (17.68) | (14.09) | (12.94) | (24.80) | (7.40)  |             | (9.38)  |     |
| 100% Fruit Juice                 | 56.25   | 50.00   | 56.25   | 62.50   | 46.88   | 65.63   | 10.10   | .48         | -8.92   | .47 |
|                                  | (43.81) | (40.09) | (29.12) | (29.88) | (38.82) | (32.56) | (13.81) |             | (11.82) |     |
| Soft Drinks                      | 14.29   | 12.50   | 21.88   | 21.88   | 15.63   | 25.00   | 4.55    | .65         | -12.12  | .42 |



|  |         |         |         |         |         |         |         |     |         |     |
|--|---------|---------|---------|---------|---------|---------|---------|-----|---------|-----|
|  | (24.40) | (18.90) | (29.15) | (28.15) | (29.69) | (40.09) | (9.61)  |     | (14.33) |     |
| Vegetables                               | 100     | 100     | 90.63   | 100     | 96.88   | 100     | 5.04    | .62 | -12.38  | .39 |
|  | (.00)   | (.00)   | (18.60) | (.00)   | (8.84)  | (.00)   | (9.84)  |     | (13.77) |     |
| Packaged Snacks                          | 40.63   | 40.63   | 46.88   | 43.75   | 40.63   | 28.13   | 2.91    | .74 | 19.70   | .05 |
|  | (12.94) | (12.94) | (16.02) | (32.04) | (32.56) | (28.15) | (8.41)  |     | (8.87)  |     |
| Fruit                                    | 93.75   | 100     | 87.50   | 100     | 96.88   | 93.75   | 4.40    | .26 | -5.94   | .50 |
|  | (23.15) | (.00)   | (18.90) | (.00)   | (8.84)  | (11.57) | (3.70)  |     | (8.55)  |     |
| Candy and/or Chocolate                   | 37.50   | 34.38   | 37.50   | 34.38   | 31.25   | 34.38   | 1.42    | .81 | 4.97    | .23 |
|  | (23.15) | (12.94) | (13.36) | (22.90) | (11.57) | (29.69) | (5.79)  |     | (3.91)  |     |
| Cake, Doughnuts, Muffins                 | 31.25   | 28.13   | 37.50   | 25.00   | 31.25   | 31.25   | -5.03   | .46 | .79     | .93 |
|  | (17.68) | (16.02) | (23.15) | (13.36) | (11.57) | (25.88) | (6.53)  |     | (9.24)  |     |
| Television                               | 63.13   | 50.00   | 56.25   | 50.00   | 50.00   | 50.00   | .50     | .95 | 1.17    | .88 |
|  | (20.86) | (23.15) | (11.57) | (26.73) | (26.73) | (23.15) | (6.99)  |     | (7.81)  |     |
| Computer                                 | 28.13   | 43.75   | 43.75   | 21.88   | 15.63   | 28.13   | 24.77   | .13 | 15.79   | .29 |
|  | (28.15) | (29.12) | (17.68) | (20.86) | (18.60) | (33.91) | (14.85) |     | (13.97) |     |
| Video Games                              | 15.63   | 18.75   | 31.25   | 15.63   | 12.50   | 21.88   | 2.68    | .83 | 8.54    | .60 |
|  | (18.60) | (25.88) | (34.72) | (22.90) | (18.90) | (28.15) | (11.98) |     | (15.80) |     |
| <b>Parent Advertising Mediation</b>      |         |         |         |         |         |         |         |     |         |     |
| <b>(time/wk)</b>                         |         |         |         |         |         |         |         |     |         |     |
| Active ( $\alpha=.94$ )                  | .44     | 1.03    | .71     | .33     | .53     | .88     | .56     | .16 | -.60    | .15 |
|  | (.53)   | (1.10)  | (.55)   | (.58)   | (.65)   | (1.34)  | (.37)   |     | (.39)   |     |
| Restrictive ( $\alpha=.73$ )             | .44     | .76     | .77     | .25     | .58     | .59     | -.14    | .22 | -.11    | .71 |
|  | (.96)   | (1.84)  | (1.14)  | (.71)   | (1.37)  | (1.16)  | (.11)   |     | (.28)   |     |
| Concept-Oriented ( $\alpha=.88$ )        | .41     | 1.01    | .74     | .17     | .49     | .59     | .67     | .16 | -.13    | .69 |
|  | (.59)   | (1.24)  | (.91)   | (.24)   | (.49)   | (.57)   | (.44)   |     | (.33)   |     |
| Socio-Oriented ( $\alpha=.87$ )          | .34     | .83     | 1.30    | .83     | .85     | 1.10    | -.05    | .95 | .25     | .82 |
|  | (.29)   | (.70)   | (1.78)  | (1.33)  | (1.27)  | (1.37)  | (.71)   |     | (1.07)  |     |
| <b>Parent Keeps Track (times/wk)</b>     |         |         |         |         |         |         |         |     |         |     |
| Keep Track All ( $\alpha=.82$ )          | 5.11    | 5.56    | 5.19    | 3.01    | 4.38    | 4.08    | -.47    | .54 | .10     | .96 |
|  | (2.07)  | (1.43)  | (2.16)  | (2.86)  | (3.32)  | (3.32)  | (.74)   |     | (1.76)  |     |
| Keep Track F, V, PA ( $\alpha=.87$ )     | 4.85    | 4.98    | 5.08    | 3.25    | 4.06    | 4.08    | -.30    | .77 | .53     | .74 |
|  | (2.49)  | (2.07)  | (2.01)  | (3.37)  | (2.42)  | (3.27)  | (1.00)  |     | (1.57)  |     |
| Keep Track Television                    | 5.50    | 5.88    | 5.38    | 2.69    | 4.69    | 3.75    | -1.04   | .45 | -.66    | .78 |
|  | (2.79)  | (2.15)  | (3.01)  | (3.58)  | (3.00)  | (3.51)  | (1.31)  |     | (2.27)  |     |
| Keep Track Soft Drinks                   | 5.50    | 7.00    | 5.31    | 2.63    | 5.00    | 4.38    | .41     | .70 | -.23    | .92 |
|  | (2.79)  | (.00)   | (3.13)  | (3.62)  | (2.92)  | (3.62)  | (1.01)  |     | (2.13)  |     |
| <b>Parent Limit-Setting (times/week)</b> |         |         |         |         |         |         |         |     |         |     |
| Limit All ( $\alpha=.75$ )               | 3.59    | 3.48    | 2.86    | 2.19    | 1.99    | 2.61    | 1.03    | .35 | -.43    | .77 |
|  | (1.77)  | (1.68)  | (1.64)  | (1.20)  | (.96)   | (2.13)  | (1.05)  |     | (1.42)  |     |
| Limit F, V, PA ( $\alpha=.96$ )          | 1.79    | 1.35    | 1.15    | .23     | .10     | 1.00    | 1.01    | .49 | .43     | .74 |

|                            |        |        |        |        |        |        |        |     |        |             |
|----------------------------|--------|--------|--------|--------|--------|--------|--------|-----|--------|-------------|
|                            | (2.85) | (2.58) | (1.36) | (.65)  | (.18)  | (2.44) | (1.40) |     | (1.28) |             |
| Limit Television           | 6.68   | 6.31   | 5.50   | 4.75   | 3.05   | 5.50   | 1.57   | .32 | -2.94  | <b>.01*</b> |
|                            | (1.27) | (1.94) | (2.79) | (2.74) | (3.69) | (2.79) | (1.48) |     | (.99)  |             |
| Limit Soft Drinks          | 6.19   | 7.00   | 5.38   | 5.50   | 2.46   | 4.56   | .16    | .47 | -.28   | .85         |
|                            | (2.30) | (.00)  | (3.01) | (2.79) | (5.94) | (3.40) | (.21)  |     | (1.43) |             |
| <b>Parent Variables</b>    |        |        |        |        |        |        |        |     |        |             |
| BMI (kg/m <sup>2</sup> )   | 25.32  | 23.93  | 26.35  | 26.71  | 27.08  | 26.01  | -1.85  | .08 | 1.55   | .17         |
|                            | (4.27) | (2.96) | (2.69) | (6.27) | (6.54) | (6.33) | (.96)  |     | (1.05) |             |
| MVPA (days/wk)             | 3.31   | 3.44   | 2.94   | 3.38   | 3.31   | 4.13   | .10    | .90 | -.67   | .08         |
|                            | (1.89) | (1.52) | (1.27) | (1.77) | (1.58) | (1.22) | (.74)  |     | (.51)  |             |
| Fruit and Vegetable Intake | 4.25   | 4.75   | 4.63   | 4.25   | 4.88   | 4.75   | -.53   | .39 | -.12   | .88         |
| (serv/d)                   | (1.75) | (1.39) | (1.77) | (1.98) | (2.10) | (1.75) | (.59)  |     | (.77)  |             |

**Note. Intervention minus control child differences (C-1) in change (Post – Pre; Follow-up – Pre).**

**\* = Significant at p<.05; child and home environment variables adjusted for SES, child gender, child race/ethnicity, and baseline value; parent variables adjusted for SES, parent race/ethnicity and baseline value**

Table 3.7: Baseline characteristics of participants in Study 2

| Demographic Variables                    | ALL         | Center 1    | Study 2     |             |             |
|--|-------------|-------------|-------------|-------------|-------------|
|  |             |             | Center 2    | Home 1      | Home 2      |
| <b>Participants, n</b>                   | 52          | 17          | 23          | 6           | 6           |
| <b>Gender, % (n)</b>                     |             |             |             |             |             |
| Male                                     | 57.7 (30)   | 47.1 (8)    | 65.2 (15)   | 83.3 (5)    | 33.3 (2)    |
| Female                                   | 42.3 (22)   | 52.9 (9)    | 34.8 (8)    | 16.7 (1)    | 66.7 (4)    |
| <b>SES, % (n)</b>                        |             |             |             |             |             |
| Not eligible                             | 80.8 (42)   | 100 (0)     | 82.6 (19)   | 66.7 (4)    | 50 (3)      |
| Free/Reduced                             | 19.2 (10)   | 0           | 13.0 (3)    | 33.3 (2)    | 50 (3)      |
| <b>Race/Ethnicity, % (n)</b>             |             |             |             |             |             |
| Non-Hispanic Caucasian                   | 82.7 (43)   | 88.2 (15)   | 85.7 (18)   | 100 (0)     | 66.7 (4)    |
| Racial/ethnic minority                   | 13.5 (7)    | 11.8 (2)    | 14.3 (3)    | 0           | 33.3 (2)    |
| <b>Age, Years (SD)</b>                   | 4.06 (.73)  | 4.12 (.60)  | 4.35 (.49)  | 3.67 (.82)  | 3.17 (.98)  |
| <b>Child Body Mass Index</b>             |             |             |             |             |             |
| Child BMI, kg/m <sup>2</sup> (SD)        | 16.2 (1.56) | 16.0 (1.71) | 16.0 (1.46) | 17.6 (1.14) | 16.5 (1.28) |
| Child BMI-Z (SD)                         | .46 (.94)   | .26 (.90)   | .33 (.96)   | 1.35 (.73)  | .61 (.81)   |
| <b>Child Weight Status, % (n)</b>        |             |             |             |             |             |
| Normal                                   | 69.2 (36)   | 88.2 (15)   | 73.9 (17)   | 16.7 (1)    | 50 (3)      |
| Overweight                               | 23.1 (12)   | 5.9 (1)     | 21.7 (5)    | 50.0 (3)    | 50 (3)      |
| Obese                                    | 7.7 (4)     | 5.9 (1)     | 4.3 (1)     | 33.3 (2)    | 0           |
| Overweight/Obese                         | 30.8 (16)   | 11.8 (2)    | 26.1 (6)    | 83.3 (5)    | 50 (3)      |
| <b>Child Waist Circumference,% (n)</b>   |             |             |             |             |             |
| Normal                                   | 69.2 (36)   | 82.4 (14)   | 69.6 (16)   | 50 (3)      | 50 (3)      |
| High trunk fat mass                      | 30.8 (16)   | 17.6 (3)    | 30.4 (7)    | 50 (3)      | 50 (3)      |
| <b>Parent BMI, kg/m<sup>2</sup> (SD)</b> | 26.3 (5.0)  | 27.2 (5.46) | 24.7 (4.20) | 27.6 (6.01) | 28.9 (4.62) |
| <b>Parent BMI, % (n)</b>                 |             |             |             |             |             |
| Normal                                   | 48.1 (25)   | 35.3 (6)    | 65.2 (15)   | 50 (3)      | 16.7 (1)    |
| Overweight                               | 26.9 (14)   | 29.4 (5)    | 21.7 (5)    | 16.7 (1)    | 50.0 (3)    |
| Obese                                    | 25.0 (13)   | 35.3 (6)    | 13.0 (3)    | 33.3 (2)    | 33.3 (2)    |
| Overweight/Obese                         | 54.9 (27)   | 64.7 (11)   | 34.7 (8)    | 50 (3)      | 83.3 (5)    |

Table 3.8: Participant evaluations of the HOP’N Home Training (Study 2)

| Training Items  | Study 2 (n=7) |                    |  |                 |
|---|---------------|--------------------|--|-----------------|
|   | Mean (SD)     | Disagree,<br>% (n) | Neither<br>Agree nor<br>Disagree,<br>% (n) | Agree,<br>% (n) |
| Information provided at an appropriate pace                     | 4.7 (.49)     | 0 (0)              | 0 (0)                                      | 100 (7)         |
| I understand how to implement HOP’N Home Group Time             | 4.7 (.76)     | 0 (0)              | 14.3 (1)                                   | 85.7 (6)        |
| I understand how to implement HOP’N Home Dramatic Play          | 4.4 (.79)     | 0 (0)              | 28.6 (2)                                   | 71.4 (5)        |
| I understand how to implement HOP’N Home Songs                  | 4.7 (.49)     | 0 (0)              | 0 (0)                                      | 100 (7)         |
| I understand how to implement the HOP’N Home Meal Prompts       | 4.8 (.38)     | 0 (0)              | 0 (0)                                      | 100 (7)         |
| I understand how to implement the HOP’N Home Connection         | 4.7 (.49)     | 0 (0)              | 0 (0)                                      | 100 (7)         |
| I am confident that I can implement HOP’N Home Group Time       | 4.6 (.79)     | 0 (0)              | 14.3 (1)                                   | 85.7 (6)        |
| I am confident that I can implement HOP’N Home Dramatic Play    | 4.4 (.79)     | 0 (0)              | 14.3 (1)                                   | 85.6 (6)        |
| I am confident that I can implement HOP’N Home Songs            | 4.7 (.76)     | 0 (0)              | 14.3 (1)                                   | 85.6 (6)        |
| I am confident that I can implement the HOP’N Home Meal Prompts | 4.6 (.49)     | 0 (0)              | 0 (0)                                      | 100 (7)         |
| I am confident that I can implement the HOP’N Home Connection   | 4.3 (1.25)    | 0 (0)              | 14.3 (1)                                   | 85.6 (6)        |
| I feel excited about the HOP’N Home program                     | 5.0 (0)       | 0 (0)              | 0 (0)                                      | 100 (7)         |
| I feel a part of the HOP’N Home group                           | 4.8 (.38)     | 0 (0)              | 0 (0)                                      | 100 (7)         |

**Note.** Scale: 1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree (disagree= 1 and 2; agree = 4 and 5)

Table 3.9: BMI Paired T-Test Results Combined and by Site (Study 2) – Complete Case Analysis (n=50)

|          | ALL (n=50)      |                  |     | Center 1 (n=17) |                  |     | Center 2 (n=22) |                  |     | Home 1 (n=5)    |                  |     | Home 2 (n=6)    |                  |     |
|----------|-----------------|------------------|-----|-----------------|------------------|-----|-----------------|------------------|-----|-----------------|------------------|-----|-----------------|------------------|-----|
| Variable | Pre Mean (SD)   | Mean Change (SD) | p   | Pre Mean (SD)   | Mean Change (SD) | p   | Pre Mean (SD)   | Mean Change (SD) | p   | Pre Mean (SD)   | Mean Change (SD) | p   | Pre Mean (SD)   | Mean Change (SD) | p   |
| BMI raw  | 16.17<br>(1.55) | -.04<br>(.47)    | .56 | 15.97<br>(1.71) | .10<br>(.39)     | .30 | 15.91<br>(1.44) | -.11<br>(.47)    | .27 | 17.55<br>(1.26) | -.41<br>(.73)    | .28 | 16.53<br>(1.28) | .13 (.28)        | .29 |
| BMI z    | .41<br>(.93)    | -.02<br>(.34)    | .65 | .26<br>(.90)    | .08<br>(.29)     | .27 | .28<br>(.94)    | -.08<br>(.34)    | .28 | 1.31<br>(.81)   | -.29<br>(.49)    | .26 | .61<br>(.81)    | .13 (.18)        | .14 |

**Note.** Mean Change = post – pre; \* = Significant at  $p < .05$ ; BMI=Body Mass Index; BMIz =BMI standardized for age and gender;

Table 3.10: Parent Survey Paired T-Test Results: Combined and by Site (Study 2) – Complete Case Analysis (n=39)

| Variable  | ALL (n=39)      |                  |       | Center 1 (n=11) |                  |      | Center 2 (n=17) |                  |     | Home 1 (n=5)    |                  |      | Home 2 (n=6)    |                  |       |
|---|-----------------|------------------|-------|-----------------|------------------|------|-----------------|------------------|-----|-----------------|------------------|------|-----------------|------------------|-------|
|   | Pre Mean (SD)   | Mean Change (SD) | p     | Pre Mean (SD)   | Mean Change (SD) | p    | Pre Mean (SD)   | Mean Change (SD) | p   | Pre Mean (SD)   | Mean Change (SD) | p    | Pre Mean (SD)   | Mean Change (SD) | p     |
| <b>Physical Home Environment: Food availability (# items)</b>   |                 |                  |       |                 |                  |      |                 |                  |     |                 |                  |      |                 |                  |       |
| 100% Fruit Juice  | 1.9<br>(1.1)    | -.05<br>(1.0)    | .75   | 2.1<br>(1.5)    | -.30<br>(1.1)    | .39  | 2.1<br>(.86)    | .12<br>(1.1)     | .65 | 1.8<br>(1.5)    | .20<br>(.84)     | .62  | 1.5<br>(1.1)    | -.33<br>(1.0)    | .47   |
| Fruit   | 7.4<br>(2.8)    | 1.5<br>(2.8)     | <.01* | 8.9<br>(1.9)    | 1.5<br>(4.1)     | .27  | 7.1<br>(3.1)    | .94<br>(2.0)     | .07 | 6.0<br>(2.2)    | 2.4<br>(2.3)     | .08  | 6.3<br>(3.2)    | 2.2<br>(2.9)     | .12   |
| Vegetable   | 10.1<br>(2.4)   | -.28<br>(2.7)    | .52   | 10.6<br>(1.8)   | -.82<br>(2.7)    | .34  | 10.1<br>(3.1)   | -.18<br>(3.0)    | .81 | 9.4<br>(1.8)    | .00<br>(3.0)     | 1.00 | 9.3<br>(1.4)    | .17<br>(1.9)     | .84   |
| FJV   | 19.4<br>(5.1)   | 1.1<br>(4.5)     | .13   | 21.5<br>(2.8)   | .27<br>(4.9)     | .86  | 19.4<br>(6.4)   | .88<br>(4.6)     | .44 | 17.2<br>(3.1)   | 2.6<br>(3.3)     | .15  | 17.2<br>(4.5)   | 2.0<br>(4.5)     | .33   |
| <b>Physical Home Enviro: PA &amp; Media Equipment (# items)</b> |                 |                  |       |                 |                  |      |                 |                  |     |                 |                  |      |                 |                  |       |
| PA Equipment  | 17.5<br>(4.1)   | .41<br>(4.7)     | .59   | 19.4<br>(4.2)   | -.09<br>(5.3)    | .96  | 17.7<br>(3.40)  | .24<br>(4.9)     | .85 | 18.0<br>(2.8)   | -1.0<br>(1.2)    | .14  | 13.2<br>(3.9)   | 3.0<br>(4.8)     | .18   |
| Media in Home   | 6.3<br>(.86)    | .00<br>(.56)     | 1.00  | 6.4<br>(.81)    | -.18<br>(.41)    | .17  | 6.6<br>(.71)    | -.06<br>(.66)    | .72 | 5.4<br>(1.1)    | .20<br>(.45)     | .37  | 6.0<br>(.63)    | .33<br>(.52)     | .18   |
| Media in Child Room   | 1.0<br>(1.5)    | .00<br>(.95)     | 1.00  | .82<br>(1.6)    | -.27<br>(.91)    | .34  | .82<br>(1.5)    | .06<br>(1.2)     | .84 | 1.8<br>(1.1)    | .40<br>(.55)     | .18  | 1.3<br>(1.5)    | .00<br>(.00)     | 1.00  |
| <b>Child Activity Behaviors</b>                                 |                 |                  |       |                 |                  |      |                 |                  |     |                 |                  |      |                 |                  |       |
| Screen Time (min/day)   | 150.6<br>(68.3) | -21.2<br>(60.3)  | .03*  | 135.0<br>(47.9) | -25.9<br>(28.3)  | .01* | 167.2<br>(82.5) | -24.3<br>(65.0)  | .14 | 148.5<br>(52.1) | -19.5<br>(59.4)  | .50  | 133.8<br>(71.7) | -5.0<br>(96.2)   | .90   |
| PA (park visits/wk)   | 1.0<br>(1.7)    | .76<br>(1.8)     | .01*  | 2.9<br>(1.8)    | .66<br>(2.6)     | .42  | 1.9<br>(1.7)    | .32<br>(1.3)     | .33 | 1.1<br>(1.8)    | 1.3<br>(2.0)     | .24  | 1.2<br>(.82)    | 1.8<br>(.84)     | <.01* |
| <b>Child Eating Behaviors</b>                                   |                 |                  |       |                 |                  |      |                 |                  |     |                 |                  |      |                 |                  |       |
| Fruit   | 2.1<br>(.93)    | -.13<br>(1.1)    | .48   | 2.4<br>(.7)     | -.09<br>(1.04)   | .78  | 1.76<br>(.90)   | -.29<br>(1.1)    | .29 | 2.0<br>(.71)    | .20<br>(1.5)     | .78  | 2.4<br>(1.5)    | .00<br>(1.4)     | 1.00  |
| Vegetable   | 1.7<br>(1.0)    | -.03<br>(.85)    | .85   | 2.4<br>(.81)    | -.27<br>(.65)    | .19  | 1.18<br>(.64)   | .29<br>(.85)     | .17 | 1.8<br>(1.5)    | .20<br>(1.1)     | .70  | 2.2<br>(1.1)    | -.80<br>(.45)    | .01*  |
| 100% Fruit Juice  | 1.4<br>(1.0)    | .00<br>(1.1)     | 1.00  | 1.6<br>(1.1)    | -.45<br>(.69)    | .053 | 1.41<br>(1.0)   | -.06<br>(1.1)    | .83 | 1.2<br>(.84)    | 1.2<br>(1.3)     | .11  | 1.2<br>(1.3)    | .00<br>(1.0)     | 1.00  |
| Soft Drinks   | .18<br>(.46)    | .05<br>(.66)     | .62   | .18<br>(.40)    | -.09<br>(.54)    | .59  | .18<br>(.53)    | .06<br>(.75)     | .75 | .40<br>(.55)    | .20<br>(.84)     | .62  | .00<br>(.00)    | .20<br>(.45)     | .37   |
| Packaged Snacks   | 1.1<br>(1.3)    | -.05<br>(1.4)    | .82   | .64<br>(.50)    | .09<br>(.83)     | .72  | 1.5<br>(1.7)    | -.24<br>(1.8)    | .60 | .60<br>(.89)    | .40<br>(1.1)     | .48  | .80<br>(.84)    | -.20<br>(1.3)    | .75   |

|                                      |                |                |                 |                |                 |             |                |                |                 |                |                 |      |                |                  |             |
|--------------------------------------|----------------|----------------|-----------------|----------------|-----------------|-------------|----------------|----------------|-----------------|----------------|-----------------|------|----------------|------------------|-------------|
| Candy and/or Chocolate               | .50<br>(.60)   | -.05<br>(.70)  | .64             | .27<br>(.47)   | -.09<br>(.54)   | .59         | .47<br>(.62)   | .06<br>(.83)   | .77             | .80<br>(.45)   | -.40<br>(.55)   | .18  | .80<br>(.84)   | .00<br>(.71)     | 1.00        |
| Cake,doughnuts,muffins               | .32<br>(.47)   | .14<br>(.89)   | .36             | .36<br>(.50)   | .27<br>(1.2)    | .47         | .25<br>(.45)   | .06<br>(.57)   | .67             | .40<br>(.55)   | .20<br>(.84)    | .62  | .40<br>(.55)   | .00<br>(1.2)     | 1.00        |
| Fast Food (times/week)               | 1.9<br>(.79)   | -.23<br>(.67)  | <b>.04*</b>     | 2.1<br>(.70)   | -.45<br>(.52)   | <b>.01*</b> | 1.9<br>(.90)   | -.29<br>(.69)  | .10             | 1.4<br>(.55)   | .00<br>(.71)    | 1.00 | 2.2<br>(.75)   | .17<br>(.75)     | .61         |
| <b>Child Asking<br/>(times/week)</b> |                |                |                 |                |                 |             |                |                |                 |                |                 |      |                |                  |             |
| Play Outside                         | 5.2<br>(2.1)   | .74<br>(1.6)   | <b>&lt;.01*</b> | 5.8<br>(1.8)   | .77<br>(1.4)    | ..09        | 5.1<br>(2.2)   | .91<br>(1.9)   | .06             | 5.4<br>(2.9)   | -.60<br>(.82)   | .18  | 4.2<br>(2.1)   | 1.4<br>(1.5)     | .10         |
| 100% Fruit Juice                     | 4.1<br>(2.8)   | -.44<br>(3.1)  | .38             | 3.4<br>(3.1)   | -.36<br>(3.3)   | .73         | 4.4<br>(2.4)   | -.29<br>(2.4)  | .62             | 4.5<br>(3.5)   | .40<br>(5.1)    | .87  | 4.3<br>(3.1)   | -1.7<br>(2.7)    | .20         |
| Soft Drinks                          | 1.1<br>(1.8)   | .03<br>(1.8)   | .93             | .45<br>(.57)   | .36<br>(.71)    | .12         | 1.9<br>(2.5)   | -.85<br>(1.8)  | .069            | 1.0<br>(.58)   | 1.9<br>(3.1)    | .32  | .33<br>(.61)   | .67<br>(1.6)     | .36         |
| Vegetables                           | 3.2<br>(2.4)   | -.66<br>(1.9)  | <b>.04*</b>     | 3.4<br>(2.7)   | .41<br>(1.9)    | .49         | 2.2<br>(1.8)   | -.91<br>(1.5)  | <b>.04*</b>     | 5.0<br>(2.9)   | -1.2<br>(2.8)   | .39  | 3.8<br>(2.2)   | -1.8<br>(1.6)    | <b>.04*</b> |
| Packaged Snacks                      | 4.8<br>(2.3)   | .73<br>(5.4)   | .40             | 5.1<br>(2.4)   | -.05<br>(1.0)   | .89         | 4.8<br>(2.3)   | 1.9<br>(7.9)   | .33             | 4.9<br>(2.4)   | -1.1<br>(2.8)   | .44  | 3.9<br>(2.2)   | .25<br>(1.8)     | .75         |
| Fruit                                | 3.4<br>(2.5)   | -.06<br>(2.8)  | .89             | 3.4<br>(2.3)   | -1.1<br>(2.3)   | .13         | 4.3<br>(2.4)   | .17<br>(3.4)   | .83             | 3.1<br>(3.0)   | -.30<br>(1.9)   | .74  | 1.7<br>(.98)   | 1.4<br>(1.6)     | .09         |
| Candy and/or Chocolate               | 2.8<br>(2.5)   | -.47<br>(2.1)  | .17             | 2.1<br>(2.3)   | -.77<br>(.90)   | .23         | 3.2<br>(2.7)   | -.16<br>(1.8)  | .74             | 2.4<br>(2.9)   | -.90<br>(2.6)   | .48  | 3.4<br>(2.6)   | -.42<br>(2.9)    | .74         |
| Cake,doughnuts,muffins               | 1.6<br>(2.0)   | -.69<br>(2.5)  | <b>.01*</b>     | 1.4<br>(1.2)   | -.73<br>(.90)   | <b>.02*</b> | 1.4<br>(2.2)   | -.06<br>(3.0)  | .94             | .80<br>(.67)   | .20<br>(.76)    | .59  | 3.3<br>(2.7)   | -3.2<br>(2.8)    | .04         |
| Television                           | 5.5<br>(2.1)   | -.81<br>(1.9)  | <b>.01*</b>     | 5.1<br>(2.3)   | -.45<br>(2.5)   | .56         | 5.8<br>(1.9)   | -1.2<br>(1.5)  | <b>&lt;.01*</b> | 5.3<br>(2.3)   | -1.6<br>(2.5)   | .22  | 5.3<br>(2.8)   | .17<br>(.41)     | .36         |
| Computer                             | 1.8<br>(2.5)   | -.10<br>(2.1)  | .76             | .91<br>(1.4)   | -.09<br>(2.2)   | .89         | 2.6<br>(2.5)   | -.09<br>(2.6)  | .89             | 2.9<br>(3.8)   | -.60<br>(1.6)   | .46  | .33<br>(.61)   | .25<br>(.88)     | .52         |
| Video Games                          | 2.1<br>(2.6)   | -.93<br>(1.6)  | <b>&lt;.01*</b> | 1.4<br>(2.8)   | -.50<br>(1.6)   | .31         | 2.8<br>(2.8)   | -1.2<br>(1.8)  | <b>.01*</b>     | 2.5<br>(2.9)   | -1.4<br>(1.4)   | .09  | .92<br>(1.4)   | -.58<br>(1.3)    | .32         |
| <b>Parent Provides (%)</b>           |                |                |                 |                |                 |             |                |                |                 |                |                 |      |                |                  |             |
| Play Outside                         | 81.4<br>(18.8) | 5.8<br>(15.7)  | <b>.03*</b>     | 79.6<br>(15.1) | 6.8<br>(11.7)   | .08         | 85.3<br>(21.8) | 4.4<br>(20.2)  | .38             | 85.0<br>(13.7) | .00<br>(.00)    | 1.00 | 70.8<br>(18.8) | 12.5<br>(13.7)   | .076        |
| Screen Time ( $\alpha=.74$ )         | 41.5<br>(23.5) | 2.1<br>(24.1)  | .58             | 30.3<br>(27.9) | 4.6<br>(14.6)   | .33         | 51.5<br>(19.4) | -.98<br>(30.0) | .90             | 46.7<br>(19.2) | -13.3<br>(11.2) | .06  | 29.2<br>(18.1) | 19.4<br>(18.8) - | .052        |
| 100% Fruit Juice                     | 66.7<br>(32.6) | -4.5<br>(31.9) | .39             | 50.0<br>(38.7) | 2.3<br>(17.5)   | .68         | 79.4<br>(18.2) | -4.4<br>(33.4) | .59             | 70.0<br>(41.1) | .00<br>(39.5)   | 1.00 | 58.3<br>(37.6) | 20.8<br>(43.1)   | .29         |
| Soft Drinks                          | 16.0<br>(15.7) | 2.6<br>(16.0)  | .32             | 13.6<br>(13.1) | .00<br>(11.2)   | 1.00        | 17.6<br>(17.1) | 5.9<br>(20.8)  | .26             | 25.0<br>(17.7) | .00<br>(17.7)   | 1.00 | 8.3<br>(12.9)  | .00<br>(.00)     | 1.00        |
| Vegetables                           | 94.2<br>(13.4) | -1.3<br>(23.6) | .74             | 100.0<br>(.00) | -2.3<br>(7.5)   | .34         | 92.6<br>(14.7) | .00<br>(30.6)  | 1.00            | 90.0<br>(13.7) | -15.0<br>(22.4) | .21  | 91.7<br>(20.4) | 8.3<br>(20.4)    | .36         |
| Fruit                                | 92.9<br>(15.1) | -5.1<br>(28.2) | .26             | 97.7<br>(7.5)  | -4.56<br>(10.1) | .17         | 91.2<br>(17.5) | -2.9<br>(29.2) | .68             | 100.0<br>(.00) | -40.0<br>(33.5) | .05  | 83.3<br>(20.4) | 16.7<br>(20.4)   | .10         |
| Packaged Snacks                      | 48.7<br>(22.2) | -4.5<br>(26.8) | .30             | 47.3<br>(7.5)  | -2.3<br>(23.6)  | .76         | 48.5<br>(28.6) | 10.3<br>(29.4) | .17             | 45.0<br>(11.2) | 10.0<br>(22.4)  | .37  | 54.2<br>(29.2) | -4.2<br>(29.2)   | .74         |

|   |                |                |             |                |                |     |                |                |      |                |                 |             |                |                 |             |
|---|----------------|----------------|-------------|----------------|----------------|-----|----------------|----------------|------|----------------|-----------------|-------------|----------------|-----------------|-------------|
| Candy and/or Chocolate                        | 32.1<br>(14.0) | -5.3<br>(14.3) | <b>.03*</b> | 29.5<br>(15.2) | -6.8<br>(11.7) | .08 | 32.4<br>(14.7) | -2.9<br>(15.0) | .43  | 35.0<br>(13.7) | -5.00<br>(20.9) | .62         | 33.3<br>(12.9) | -8.3<br>(12.9)  | .18         |
| Cake,doughnuts,muffins                        | 57.2<br>(20.1) | -5.3<br>(20.3) | .12         | 27.3<br>(20.8) | -6.8<br>(16.2) | .19 | 25.0<br>(20.4) | .00<br>(25.8)  | 1.00 | 40.0<br>(13.7) | -5.0<br>(11.2)  | .37         | 29.2<br>(10.2) | -16.7<br>(12.9) | <b>.03*</b> |
| Television                                    | 34.8<br>(31.6) | -4.0<br>(19.7) | .23         | 47.7<br>(23.6) | 4.6<br>(15.1)  | .34 | 64.0<br>(18.2) | -7.8<br>(21.8) | .17  | 60.0<br>(13.7) | -20.0<br>(11.2) | <b>.02*</b> | 54.2<br>(18.8) | 4.2<br>(18.8)   | .61         |
| Computer                                      | 34.0<br>(30.6) | 5.3<br>(33.5)  | .34         | 20.5<br>(36.8) | 4.6<br>(26.9)  | .59 | 47.1<br>(26.3) | 5.9<br>(42.9)  | .58  | 40.0<br>(28.5) | -10.0<br>(13.7) | .18         | 20.0<br>(27.4) | 20.0<br>(20.9)  | .10         |
| Video Games                                   | 31.3<br>(30.9) | 2.6<br>(32.3)  | .62         | 22.7<br>(32.5) | 4.56<br>(26.9) | .59 | 45.6<br>(29.6) | -2.9<br>(39.4) | .76  | 40.0<br>(28.5) | -10.0<br>(13.7) | .18         | 16.7<br>(20.4) | 25.0<br>(22.4)  | <b>.04*</b> |
| <b>Parent Advertising Mediation (time/wk)</b> |                |                |             |                |                |     |                |                |      |                |                 |             |                |                 |             |
| Active ( $\alpha=.94$ )                       | 1.6<br>(2.3)   | .08<br>(2.2)   | .82         | 1.8<br>(2.4)   | 1.3<br>(2.1)   | .54 | 1.7<br>(2.5)   | -.75<br>(2.5)  | .25  | 2.2<br>(2.5)   | -.08<br>(2.0)   | .95         | .27<br>(.61)   | .15<br>(.60)    | .57         |
| Restrictive ( $\alpha=.73$ )                  | .33<br>(.85)   | .29<br>(1.2)   | .14         | .34<br>(.99)   | .36<br>(1.9)   | .19 | .30<br>(.87)   | .31<br>(.79)   | .12  | .63<br>(1.1)   | -.10<br>(1.1)   | .89         | .23<br>(.57)   | .32<br>(.67)    | .23         |
| Concept-Oriented ( $\alpha=.88$ )             | 1.0<br>(1.4)   | .27<br>(2.1)   | .43         | .70<br>(.75)   | .74<br>(1.7)   | .57 | 1.3<br>(1.6)   | .33<br>(2.6)   | .61  | 1.8<br>(2.7)   | -.98<br>(1.8)   | .36         | .25<br>(.25)   | .04<br>(.09)    | .39         |
| Socio-Oriented ( $\alpha=.87$ )               | 1.7<br>(1.7)   | -.15<br>(1.9)  | .64         | 1.8<br>(1.7)   | .35<br>(1.9)   | .65 | 1.7<br>(1.8)   | -.10<br>(2.1)  | .84  | 1.7<br>(2.0)   | -.44<br>(1.2)   | .53         | 1.5<br>(1.9)   | -.99<br>(1.8)   | .23         |
| <b>Parent Keeps Track (times/wk)</b>          |                |                |             |                |                |     |                |                |      |                |                 |             |                |                 |             |
| Keep Track All ( $\alpha=.82$ )               | 5.5<br>(2.0)   | -.05<br>(2.6)  | .91         | 6.2<br>(.86)   | .20<br>(1.4)   | .65 | 5.0<br>(1.9)   | .35<br>(2.9)   | .63  | 6.2<br>(1.2)   | -2.5<br>(3.6)   | .19         | 5.5<br>(1.3)   | .45<br>(.76)    | .20         |
| Keep Track F,V,PA ( $\alpha=.87$ )            | 5.3<br>(2.0)   | .08<br>(2.9)   | .87         | 5.9<br>(1.3)   | .38<br>(1.7)   | .47 | 4.7<br>(2.1)   | .54<br>(3.3)   | .51  | 6.0<br>(2.2)   | -2.4<br>(4.4)   | .29         | 5.1<br>(2.3)   | .25<br>(.88)    | .52         |
| Keep Track Television                         | 5.8<br>(2.1)   | -.35<br>(3.1)  | .49         | 5.9<br>(2.3)   | .18<br>(1.6)   | .72 | 5.5<br>(2.4)   | -.53<br>(4.0)  | .59  | 5.7<br>(1.4)   | -1.7<br>(3.4)   | .33         | 6.4<br>(1.4)   | .33<br>(1.7)    | .64         |
| Keep Track Soft Drinks                        | 6.1<br>(2.1)   | -.12<br>(3.0)  | .81         | 7.0<br>(.00)   | -.32<br>(1.1)  | .34 | 5.4<br>(2.6)   | .65<br>(3.1)   | .40  | 7.0<br>(.0)    | -3.8<br>(3.5)   | .07         | 5.8<br>(2.9)   | 1.2<br>(2.9)    | .36         |
| <b>Parent Limit-Setting (times/week)</b>      |                |                |             |                |                |     |                |                |      |                |                 |             |                |                 |             |
| Limit All ( $\alpha=.75$ )                    | 1.6<br>(.25)   | -.32<br>(2.2)  | .37         | 3.9<br>(1.8)   | -.59<br>(2.2)  | .39 | 3.2<br>(1.6)   | -.43<br>(1.9)  | .35  | 3.5<br>(1.2)   | -.12<br>(3.3)   | .94         | 3.3<br>(2.0)   | .30<br>(2.7)    | .79         |
| Limit F, V, PA ( $\alpha=.96$ )               | 1.7<br>(2.7)   | -.34<br>(3.3)  | .52         | 2.0<br>(3.2)   | -.62<br>(3.8)  | .60 | 1.5<br>(2.7)   | -.53<br>(2.4)  | .39  | 1.8<br>(1.8)   | -.10<br>(4.1)   | .96         | 1.3<br>(2.6)   | .50<br>(4.4)    | .79         |
| Limit Television                              | 5.9<br>(1.7)   | -.53<br>(3.2)  | .31         | 6.5<br>(1.7)   | -.59<br>(3.1)  | .55 | 5.7<br>(1.7)   | -.94<br>(3.4)  | .27  | 5.3<br>(1.8)   | .40<br>(4.1)    | .84         | 6.4<br>(1.4)   | .00<br>(2.2)    | 1.00        |
| Limit Soft Drinks                             | 6.4<br>(1.7)   | -.14<br>(1.8)  | .63         | 7.0<br>(.00)   | -.50<br>(1.7)  | .34 | 5.8<br>(2.3)   | .38<br>(1.8)   | .40  | 7.0<br>(.00)   | -1.3<br>(2.9)   | .37         | 6.4<br>(1.4)   | .00<br>(.00)    | 1.00        |
| <b>Parent Variables</b>                       |                |                |             |                |                |     |                |                |      |                |                 |             |                |                 |             |
| BMI (kg/m <sup>2</sup> )                      | 26.7<br>(4.7)  | -.60<br>(3.7)  | .34         | 27.7<br>(4.5)  | -.26<br>(1.0)  | .42 | 25.4<br>(4.6)  | -1.1<br>(5.7)  | .47  | 25.2<br>(5.6)  | -.05<br>(1.4)   | .95         | 28.9<br>(4.6)  | -.37<br>(1.1)   | .46         |
| MVPA (days/wk)                                | 3.8<br>(1.7)   | .12<br>(1.7)   | .68         | 4.6<br>(1.7)   | -.23<br>(1.1)  | .53 | 3.5<br>(1.5)   | .21<br>(2.2)   | .70  | 4.3<br>(1.2)   | .20<br>(1.5)    | .78         | 2.4<br>(1.6)   | .42<br>(1.7)    | .58         |



|                      |       |       |     |       |       |     |       |       |     |       |       |      |       |       |     |
|----------------------|-------|-------|-----|-------|-------|-----|-------|-------|-----|-------|-------|------|-------|-------|-----|
| FV Intake (serv/day) | 4.3   | .23   | .34 | 5.5   | -.09  | .81 | 3.7   | .12   | .73 | 4.4   | .00   | 1.00 | 4.0   | 1.33  | .12 |
|                      | (1.8) | (1.5) |     | (1.6) | (1.2) |     | (1.8) | (1.4) |     | (2.0) | (1.9) |      | (1.8) | (1.7) |     |

**Note.** *Mean Change = post – pre; \* = Significant at  $p < .05$ ;*

## **Chapter 4 - Influence of adult leader participation on physical activity in children**

### **Abstract**

The purpose of this study was to examine the influence of adult leader participation (LP) compared to no LP on physical activity (PA) levels among children participating in active games. Children (n=14) participated in four active games across two consecutive days. Each day, children participated in two 16-minute games, divided into four-minute intervals, alternating between LP and no LP. Each child wore an Actigraph GT1M accelerometer and activity counts were transformed into time spent in moderate-to-vigorous PA (MVPA), vigorous PA (VPA), and sedentary behavior (SB). Condition-by-game repeated-measures ANCOVAs indicated there were no differences in MVPA, VPA, and SB by LP and no LP conditions. Children participated in MVPA 53.1% of game time during no LP and 51.4% during LP.

### **Introduction**

Childhood obesity prevalence has increased dramatically over the past 30 years.<sup>16</sup> Children who participate in regular physical activity (PA) are less likely to be obese and may be more likely to participate in PA as adults.<sup>15</sup> Recent recommendations suggest that youth accumulate 60 minutes or more of moderate-to-vigorous PA (MVPA) per day.<sup>28</sup> Evidence indicates that only 42% of children, and 8% of adolescents, meet recommendations.<sup>26</sup> Thus, a need exists to identify evidence-based strategies that increase children's PA.

Group PA settings, such as physical education, recess, and out-of-school programs offer PA opportunities.<sup>9</sup> These settings, according to Social Cognitive Theory,<sup>2</sup> are physical and social environments that reciprocally interact with personal factors to determine PA. Several studies have examined the social and physical environment influences on habitual child PA,<sup>18</sup> and how to increase PA by making changes in the physical environment.<sup>3</sup> However, few studies have examined social environmental influences in group PA settings.

Adults organizing PA sessions, according to Social Cognitive Theory,<sup>2</sup> can provide direct reinforcement and vicarious experiences to increase learning and motivation for health

behaviors. A particular focus of this study was the provision of vicarious experiences to increase self-efficacy. Self-efficacy, defined as a child's confidence in using their skills and capabilities to perform PA at a level to attain a desired outcome, has been associated with PA.<sup>22</sup> Increased self-efficacy can be developed vicariously through the process of observing adult and child models performing health behaviors, such as PA. In settings where groups of children engage in active play, one potential strategy to achieve increased self-efficacy is through adult leaders modeling PA during active game-play.

There is some evidence for the hypothesis that adult modeling influences children's PA.<sup>7</sup> For example, Sallis and colleagues (1992) examined the association between parental behavior and their fourth grade child's PA. Parental participation in PA or playing sports with their child (sons only) was a positive predictor of child PA. This study suggests that parents who participate in PA with their children are more likely to have children who are physically active. Furthermore, the greater parents' reported social support the more likely their children were to engage in PA daily.<sup>29</sup> Although this study suggested that parental support for PA influences their child's PA, it is not certain that parental participation in PA with or without the children was a key variable.

Contrary to these findings, one study did not show an association between adult participation and children's MVPA.<sup>17</sup> This study examined the effects of parent participation on 7-8 year olds MVPA and use of the Dance Dance Revolution (DDR) video game. Results showed that parental encouragement was more frequent than parental participation (5-6 days vs. 2 days per week). Parental encouragement and participation were not associated with child participation in MVPA or DDR.<sup>17</sup>

In addition to parental influences on their children's PA, adults other than parents may be able to influence children's PA. Very few studies have examined the relationship between adult participation and child PA in children's group PA sessions. Donnelly and colleagues (2009) developed a randomized controlled trial to increase PA through teacher delivery of PA academic lessons. Observational results showed that, compared with teachers who were less active during academic PA lessons, teachers who were more active during the academic PA lessons had students who were more active. In contrast, a study involving preschool-aged children found that children were more than three times more likely to participate in MVPA alone during outdoor play compared to when an adult was participating.<sup>4</sup> This study suggested that preschool-aged

children are more active without adult participation in free-play PA, whereas previously discussed studies illustrated that school-age children benefit from adult participation.

Current research has provided inconclusive evidence as to whether or not adults can influence children's PA by participating in the activity. The purpose of this study was to examine the effects of adult LP compared to no adult leader participation (no LP) among children playing organized active games on their sedentary behavior (SB), MVPA, and vigorous PA (VPA). Based on Social Cognitive Theory, and previous evidence, we hypothesized that children would be more active with adult participation compared to no adult participation.

## **Methods**

### ***Settings and Participants:***

Research assistants delivered a one-week summer day camp at a Midwest University community fitness center for three-hours each day. The camp exposed children entering grades four through six (9 – 11 years old) to a variety of active and non-active games, as well as nutrition education activities. Children were recruited during the summer of 2008 through community organizations and public announcements.

All children (n =16) enrolled in the day camp were eligible to participate in this study, which was conducted during the third and fourth days of the camp. Informed consent was obtained from the parent or guardian along with the written assent of the child. Fourteen of the 16 children participated in the study and were included in the final sample. One child was excluded due to absence and another child was excluded due to age. This study was approved by the Institutional Review Board at the research team's university.

### ***Experimental Conditions:***

Over the two data collection days, children participated in two 16-minute organized, active games with a 10-minute break separating the games. Each game was divided into four-minute intervals alternating between a condition of LP or no LP. The sequence of exposure to LP or no LP was counter-balanced across the two days. During LP, the roles of leaders were to model playing the games by: being active participants; being enthusiastic; making games fun for children; and keeping all children active and involved in the games. Depending on the game, leaders would chase and tag children, throw balls, do jumping jacks or other movements, etc.

One female and one male leader participated in the games during the LP condition. During no LP, the adult leaders stood outside the playing area and did not participate in game play. Verbal encouragement was controlled in both conditions (LP and no LP), such that every minute, adult leaders encouraged the children to be active following a list of verbal (e.g., good job, keep up the good work) and physical prompts (e.g., clapping)

Children participated in four organized, active games (adapted from the CATCH program) across two consecutive days. The CATCH physical education objectives included: involvement of at least 30 minutes of daily PA, involvement in MVPA for at least 40% of total PA time, providing children with many opportunities to participate and practice skills, and providing children with a variety of enjoyable activities.<sup>14</sup> On day one, the games chosen were *Dragon's Tail*, and *Hospital Tag*; on day two, games were *Everybody's It Dodge-ball*, and *Foxes, Trees, and Squirrels*. Children were exposed to all four games on the camp days preceding the study to familiarize the children with the rules and expectations for the study. The games were played in a fitness facility on an aerobic class' hardwood floor. The playing area was marked off with cones, measuring 11 x 10 yards.

### ***Measures:***

Adiposity was measured using Dual-Energy X-Ray Absorptiometry and children were categorized as normal weight (<85<sup>th</sup> percentile) or overweight/obese (≥85<sup>th</sup>) according to body fat percentile curves adjusted for age and gender.<sup>25</sup>

Physical activity levels were objectively measured using the Actigraph GT1M accelerometer (Shalimar, FL). The Actigraph GT1M accelerometer has been found to be a valid and reliable measure of PA in youth.<sup>27</sup> Children wore the accelerometer around their waist at the right hip, secured by an adjustable elastic belt, for the total duration (three hours) each day of the camp. Activity counts were collected using 15-second epochs. SB was defined as less than 200 counts per minute.<sup>13</sup> Time spent in light (200 counts to <4 METS), moderate PA (4 to <7 METS), VPA (≥7 METS), and MVPA (≥4 METS) was determined by Freedson's MET prediction equation.<sup>11</sup> The cutpoints chosen for the intensity levels are commonly used in children.<sup>26,10</sup>

Parents completed a brief survey prior to their child's participation in the camp. The parent survey captured demographic information such as age, gender, socioeconomic status,

ethnicity, and child PA. Child PA was assessed prior to the week-long camp using the PACE + PA measure.<sup>19</sup> Parental report of child PA has been shown to more accurately assess child PA than child self-report in this age group.<sup>23</sup> Children were categorized as meeting guidelines if they performed MVPA five or more days per week for at least 60 minutes.

### ***Data Analysis:***

We conducted within-subjects ANCOVAs examining the effect of condition (LP or no LP) on PA and SB, while controlling for the type of game and the order of receiving the counter-balanced condition. To aid in interpretation of the results, we report descriptive data as percent time in each activity intensity, during each condition. All data were analyzed using SPSS Version 17.0. All tests were conducted at  $p < 0.05$ .

## **Results**

Table 1 describes the demographic and anthropometric characteristics of the participants. Of the 14 participants, six were male (42.9%), seven were white (50%), six were overweight/obese (42.9%), and nine met PA guidelines (64.3%).<sup>19</sup>

Children participated in MVPA 52.2% (SE=0.042) of game time across all games, 53.1% (SE=0.042) during no LP and 51.4% (SE=0.043) during LP. Percent of time spent in VPA during LP and no LP was 20.8% (SE=0.032) and 19.6% (SE=0.032), respectively. Percent of time in SB, during LP and no LP was 14.5% (SE=0.032) and 15.5% (SE=0.030), respectively. Leader participation and no LP conditions were not significantly different for MVPA ( $p=0.40$ ), VPA ( $p=0.53$ ), or SB ( $p=0.59$ ). There were also no differences in MVPA, VPA and SB by gender ( $p > 0.05$ ), weight status ( $p > 0.05$ ), or ethnicity ( $p > 0.05$ ). Means and standard errors for percent time in PA and SB are presented in Table 2.

## **Discussion**

The primary aim of this study was to examine the impact of LP or no LP during organized, active games on children's PA levels. Results showed no effect of LP on PA in children during active games. It may be that LP did not increase PA because the children were already exhibiting high levels of MVPA during game play. Children in both LP and No LP participated in MVPA for more than 50% of the time during all game-play, exceeding the CATCH recommendations for PA during game-play.<sup>14</sup>

Based on the Social Cognitive Theory, we hypothesized that children's level of PA would be higher during LP compared to no LP due to modeling. However, our results did not support this hypothesis. Most research on the Social Cognitive Theory constructs and children's PA examines parent or peer social support and modeling of PA on individual children's habitual PA levels (not during specific organized active games). For example, Prochaska, Rogers & Sallis (2002) examined children's self-reported peer and parent PA social support on their habitual PA levels (meeting PA recommendations or not). Results showed that parent and peer support for child PA was associated with increased child self-reported PA, but not for objectively measured child PA. However, our study was very different, in that we examined a group of children engaged in organized active games with leaders participating during game play.

To our knowledge, this is the first study to examine adult LP and objective child PA in organized active game sessions. As previously mentioned, children in both conditions (LP and no LP) exhibited high levels of MVPA during game play. It may be that for games or settings with activity levels less than 40% of the total time, LP could have been effective at increasing children's MVPA levels. For instance, schools have long been regarded as ideal settings for the promotion of PA, as that's where children spend a majority of their time. However, children are not meeting the CATCH recommendations of engaging in 40% MVPA during PA sessions, such as recess.<sup>24</sup> Although, LP did not increase children's MVPA or decrease sedentary behavior in our study, future studies could examine the effect of LP on children's PA during recess or free play in children that do not engage in MVPA for at least 40% of the time.

Coleman, Geller, Rosenkranz, and Dzewaltowski (2008) examined children's PA levels and leader behavior during organized and free play PA sessions, in the after-school environment via systematic observation. Overall, children exhibited greater levels of MVPA in free play compared to organized PA sessions. However, there was greater encouragement (verbal and physical) during organized compared to free play PA. These data suggests that children are most active during free play, and most free play occurs with no LP. To relate these results to our study, it is possible that adult LP during organized games is common and the continuous verbal encouragement during LP and no LP in our study was enough to maintain high PA levels in the children.

Providing vicarious experiences, such as modeling, to increase motivation is a strategy teachers could use to promote PA. Cullen and colleagues (2001) examined modeling of fruit and

vegetable (FV) consumption by parents and peers and found that modeling by both parents and peers is correlated with children's FV intake. Although this study was conducted via survey instruments rather than direct observation of children and peers/parents eating together, it presents an argument that modeling increases healthy behaviors. Similarly, Hendy & Raudenbush (2000) observed three methods of modeling to encourage food acceptance by preschool children. Results found that a silent teacher model was ineffective in children's eating of modeled foods; however enthusiastic teacher modeling was successful in children's new food acceptance. Conversely, when a competing peer was present, the enthusiastic teacher model was no longer successful in children's new food acceptance. Comparing our results to Hendy & Raudenbush (2000), there are several similarities. Since children were introduced to all four games prior to our study, the "newness" or the excitement of the games may have diminished any potential modeling effect. Perhaps because our adult models were silent other than verbal encouragement every minute, more verbal cues were necessary to increase PA during LP. Or it could be that the peer models were more effective than teacher models in increasing PA during LP since there were not PA differences during LP and no LP.

The verbal encouragement provided under both conditions (LP and No LP) may have negated the effect of LP. Verbal encouragement was used to imitate a typical organized game session such as in a PA class or an organized youth sport, where leaders typically would not remain silent during the entire game play. It is possible that the verbal encouragement provided each minute was sufficient by itself to maintain the activity levels of the children playing the game, thus a ceiling effect occurred and LP (modeling game play and being active participants) was unable to increase the already high levels of PA exhibited. A follow-up study should include the effects of verbal encouragement on PA levels.

There are important limitations to this study. First, the influence of LP on PA may be moderated by factors not examined in this study, such as gender and weight status. Second, two different games were played each day. Thus, it is unknown whether playing the same two games each day would have similar results. Third, there could have been carryover from previous experiences that were not taken into account by the counterbalanced design. Maybe intermittent LP was all it took to ensure adequate MVPA. Last, children did not complete questionnaires about their self-efficacy and enjoyment of the games, thus we are unsure if children prefer active games with LP or no LP.



An important strength of this study was measuring objective PA using accelerometers. To our knowledge, this is the first study to objectively measure PA in children to assess the impact of LP. In addition, PA was assessed using 15-second epochs, which has been shown to be a more accurate sampling method to distinguish VPA compared to 30-second epochs.<sup>1</sup> Lastly, study design, including counter-balancing LP across two days and the use of evidence-based games are important strengths.

Findings from this study indicate that adult LP does not impact PA in children in this context. Perhaps LP was not able to increase PA due to the children's strong level of MVPA during game play. However, this was only one small study, more studies are necessary to determine whether LP can increase children's PA. Future studies should examine whether LP can increase the quality and/or quantity of PA in children during other PA contexts, such as free-play and in children in other age groups and weight status categories.

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### **References**

1. Baquet G, Stratton G, Van Praagh E, Berthoin S. Improving physical activity assessment in prepubertal children with high-frequency accelerometry monitoring: a methodological issue. *Prev Med.* 2007;44(2):143-147.
2. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory.* Englewood Cliffs, NJ: Prentice Hill, 1986.
3. Brink LA, Nigg CR, Lampe SM, Kingston BA, Mootz AL, van Vliet W. Influence of schoolyard renovations on children's physical activity: the Learning Landscapes Program. *Am J Public Health.* 2010;100(9):1672-1678.
4. Brown WH, Pfeiffer KA, McIver KL, Dowda M, Addy CL, Pate RR. Social and environment factors associated with preschoolers' nonsedentary physical activity. *Child Dev.* 2009;80(1):45-58.
5. Coleman KJ, Geller KS, Rosenkranz RR, Dzewaltowski DA. Physical activity and healthy eating in the after-school environment. *J Sch Health.* 2008;78(12):633-640.
6. Cullen KW, Baranowski T, Rittenberry L, Cosart C, Hebert D, de Moor C. Child-reported family and peer influences on fruit, juice and vegetable consumption: reliability and validity of measures. *Health Educ Res.* 2001;16(2):187-200.

7. Davison KK, Jago R. Change in parent and peer support across ages 9 to 15 yr and adolescent girls' physical activity. *Med Sci Sports Exerc.* 2009;41(9):1816-1825.
8. Donnelly JE, Greene JL, Gibson CA, Smith BK, Washburn RA, Sullivan DK, Williams SL. Physical activity across the curriculum (PAAC): A randomized controlled trial to promote physical activity and diminish overweight and obesity in elementary school children. *Prev Med.* 2009;49(4):336-341.
9. Dzewaltowski DA. Community out-of-school physical activity promotion. In A. L. Smith & S. J. H. Biddle (Eds.), *Youth physical activity and sedentary behavior: Challenges and salutations* (pp. 377-401). Champaign, IL; Human Kinetics, 2008.
10. Foster KE, Behrens TK, Jager AL, Dzewaltowski DA. Effect of elimination games on physical activity and psychosocial responses in children. *J Phys Act Health.* 2010;7:475-483.
11. Freedson P, Pober D, Janz KF. Calibration of accelerometer output for children. *Med Sci Sports Exerc.* 2005;37(11 Suppl):S523-530.
12. Hendy HM, Raudenbush B. Effectiveness of teacher modeling to encourage food acceptance in preschool children. *Appetite.* 2000;34:61- 76.
13. Mattocks C, Leary S, Ness A, Deere K, Saunders J, Kirkby J, Riddoch C. Intraindividual variation of objectively measured physical activity in children. *Med Sci Sports Exerc.* 2007;39(4):622-629.
14. McKenzie TL, Strikmiller PK, Stone EJ, Woods SE, Ehlinger SS, Romero KA, Budman ST. CATCH: Physical activity process evaluation in a multicenter trial. *Health Educ Q.* 1994;Suppl 2:S73-89.
15. Nelson MC, Gordon-Larsen P, North KE, Adair LS. Body mass index gain, fast food, and physical activity: effects of shared environments over time. *Obesity.* 2006;14(4):701-709.
16. Ogden CL, Carroll MD, Curtin LR, Lam MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA.* 2010;303(3):242-249.
17. Paez S, Maloney A, Kelsey K, Wiesen C, Rosenberg A. Parental and environmental factors associated with physical activity among children participating in an active video game. *Ped Phys Ther.* 2009;21(3):245-253.
18. Patnode CD, Lytle LA, Erickson DJ, Sirard JR, Barr-Anderson D, Story M. The relative influence of demographic, individual, social, and environmental factors on physical activity among boys and girls. *Int J Behav Nutr Phys Act.* 2010;3(7):79.
19. Prochaska JJ, Sallis JF, Long B. A physical activity screening measure for use with adolescents in primary care. *Arch Pediatr Adolesc Med.* 2001;155(5):554-559.
20. Prochaska JJ, Rodgers MW, Sallis JF. Association of parent and peer support with adolescent physical activity. *Res Q Exerc Sport.* 2002;73:206-210.
21. Sallis JF, Alcaraz JE, McKenzie TL, Hovell MF, Kolody B, Nader PR. Parental behavior in relation to physical activity and fitness in 9-year-old children. *Am J Dis Child.* 1992;146(11):1383-1388.

22. Salmon J, Brown H, Hume C. Effects of strategies to promote children's physical activity on potential mediators. *Int J Obes.* 2009;33(Suppl 1):S66-73.
23. Sithole F, Veugelers PJ. Parent and child reports of children's activity. *Health Rep.* 2008;19(3):19-24.
24. Stratton G, Ridgers ND, Fairclough SJ, Richardson DJ. Physical activity levels of normal-weight and overweight girls and boys during primary school recess. *Obesity.* 2007;15(6):1513-1519.
25. Taylor RW, Jones IE, Williams SM, Goulding A. Body fat percentages measured by dual-energy X-ray absorptiometry corresponding to recently recommended body mass index cutoffs for overweight and obesity in children and adolescents aged 3-18 y. *Am J Clin Nutr.* 2002;76(6):1416-1421.
26. Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc.* 2008;40(1):181-188.
27. Trost SG, McIver KL, Pate RR. Conducting accelerometer-based activity assessments in field-based research. *Med Sci Sports Exerc.* 2005;37(11 Suppl):S531-43.
28. United States Department of Health and Human Services. (2008). Physical Activity Guidelines for Americans. <http://www.health.gov/PAGuidelines/pdf/paguide.pdf>. Accessed November 19, 2010.
29. Zecevic CA, Tremblay L, Lovsin T, Lariviere M. Parental influence on young children's physical activity. *Int J Pediatr.* 2010.

## Tables

Table 4.1: Demographic Characteristics (n=14) for children enrolled in study

| Characteristic                           | N  | Percent or Mean (SD) |
|--|----|----------------------|
| <b>Gender</b>                            |    |                      |
| Male                                     | 6  | 42.9%                |
| Female                                   | 8  | 57.1%                |
| <b>Age (years)</b>                       | 14 | 10.9 (0.68)          |
| <b>Ethnicity</b>                         |    |                      |
| White                                    | 7  | 50.0%                |
| Non-White                                | 7  | 50.0%                |
| <b>Weight Status (% Body Fat)</b>        |    |                      |
| <85 <sup>th</sup> percentile             | 8  | 57.1%                |
| ≥85 <sup>th</sup> percentile             | 6  | 42.9%                |
| <b>Meeting PA Guidelines (PACE + PA)</b> |    |                      |
| Yes                                      | 9  | 64.3%                |
| No                                       | 5  | 35.7%                |
| <b>Subsidized School Lunch</b>           |    |                      |
| Yes                                      | 2  | 14.3%                |
| No                                       | 12 | 85.7%                |
| <b>Mother's Education</b>                |    |                      |
| High School                              | 0  | 0%                   |
| Some College                             | 6  | 42.9%                |
| ≥ Bachelor's Degree                      | 8  | 57.1%                |
| <b>Father's Education</b>                |    |                      |
| High School                              | 1  | 7.1%                 |
| Some College                             | 3  | 21.4%                |
| ≥ Bachelor's Degree                      | 10 | 71.4%                |

Table 4.2: Means (SD) of sedentary behavior and physical activity expressed as percent time

| Measure     | No Leader Participation<br>Mean% (SE) | Leader Participation<br>Mean% (SE) | F-Value | P-Value |
|-------------|---------------------------------------|------------------------------------|---------|---------|
| Sedentary   | 15.5 (.030)                           | 14.5 (.032)                        | 0.30    | 0.59    |
| Light PA    | 31.4 (.021)                           | 34.1 (.025)                        | 2.29    | 0.15    |
| Moderate PA | 33.4 (.019)                           | 30.6 (.020)                        | 3.63    | 0.08    |
| Vigorous PA | 19.6 (.032)                           | 20.8 (.032)                        | 0.42    | 0.53    |
| MVPA        | 53.1 (.042)                           | 51.4 (.043)                        | 0.76    | 0.40    |

## Dissertation Conclusion

The primary aim of this dissertation was to examine parent and adult practices that contribute to the prevention of obesity in children. Chapter one reviewed the literature on parent/adult practices that may foster the development of child self-regulation. Subsequently, the literature review informed the development of a self-report measure of parenting practices that may foster child eating and activity self-regulation (Chapter two). Chapter three described the development and evaluation of the HOP'N Home intervention to develop children's self-regulation skills to ask their parents for healthful home environments, to prevent obesity. Lastly, chapter four examined whether adult participation during active games with children can increase children's physical activity compared to when adults are not participating.

Much of the literature supports the notion that a healthy home environment is necessary for children to develop healthy eating and physical activity behaviors. However, environments may also be able to afford the development of children's self-regulation skills for healthy behaviors. A shift from environmental (external) to individual (internal) psychological factors becomes increasingly more important as children age,<sup>4</sup> and make their own eating and activity decisions. A review of individual and environmental mediators for nutrition behavior discussed that behavioral (individual) influences may be more important than environmental influences for healthful eating.<sup>3</sup> However, it is widely accepted that health behaviors are influenced by an interaction between individual and environmental factors. Social Cognitive Theory is based on the premise that behaviors are determined by the interaction of individual and environmental factors.<sup>1</sup> Specifically, children need individual factors (e.g., self-regulation, self-efficacy) to engage in healthful behaviors, and also an environment that affords them the ability to engage in healthful behaviors. For example, a preschool-aged child may have high self-regulation for eating fruits and vegetables, however if there are not fruits and vegetables available in their home, they will be unable to eat fruits and vegetables. Thus, interventions that target both individual and environmental factors are necessary.

Chapter one reviewed potential psychosocial mediators for children's self-regulation of eating and activity behaviors. To understand parent and adult practices to foster young children's eating and activity self-regulation skills, we applied Zimmerman and Moylan's (2009) cyclical, three-phase model: forethought, performance, and self-reflection.<sup>5</sup> To foster children's

self-regulation, we provided several recommendations: parents and adults should adopt positive control practices, such as teaching, encouraging and guiding children's health behavior, rather than excessive control practices to prevent obesity. For example, parents can intentionally assist children in setting developmentally appropriate eating and activity goals to foster self-regulation. Second, parents/adults should plan ahead to be prepared to provide children healthy options and encourage children to make a choice based on the options provided. For instance, before going to the grocery store, parents can ask their child which healthy foods they would like the parent to purchase. Third, practices should develop children's skills to self-monitor their eating and activity behaviors. This can be done through parent-child discussion reflecting on how much the child has eaten, and how much physical activity and screen time activities they have engaged in. Last, parents/adult can assist children to self-reflect on their behaviors which can influence their continuation or improvements in their healthy behaviors. Specifically, negative self-reflection increases their motivation to change behavior.<sup>2</sup> Thus, perhaps parenting practices that promote child self-reflection are most important to increase children's healthful behaviors.

Chapter two described the development and validity of a new self-report measure of parenting practices that may foster child self-regulation. We hypothesized that parents of overweight children would use less practices to foster self-regulation compared to parents of normal weight children. Additionally, we hypothesized that parents of lower socioeconomic households would also use less practices to foster self-regulation. Within the three phases of self-regulation, 20 independent, but related constructs were identified. Only parenting practices that foster self-reflection for screen time in children was associated with child weight status. Similarly, parents of lower socioeconomic status utilized parenting practices that promoted the consumption fruits and vegetables and participating in physical activity as being associated with their child's outer appearance (i.e., beautiful or handsome). Overall, to our knowledge this was the first study to attempt to develop and validate a self-report measure of parenting practices to foster children's eating and activity self-regulation. Future research is necessary to refine the self-report measure.

The primary aim of chapter three was to develop and evaluate the HOP'N Home intervention designed to develop children's self-regulation skills to ask parents for healthful home environments. The 12-week multi-level HOP'N Home intervention was developed around six quality elements based on the formative evaluation. The first component was continuous

staff training, where child care providers attended three, two-hour trainings to instruct staff how to implement the intervention as well as how to solve implementation challenges. Second, three, 10-minute group time activities per week were to be implemented. Group time activities were developed to teach children about healthy eating, physical activity and advertisements, as well as how to ask parents for healthful home environmental change. Third, child care providers set-up a dramatic play area (grocery, store, home environment, toy store, and fast food restaurant) and provided opportunities for children to play in the area for at least 30 minutes daily. Dramatic play activities were meant to teach children to participate in role-play related to the HOP'N Home goals. Fourth, once per day during meals/snacks, providers were to ask children questions related to the foods they were eating, as well as foods and activities they participate in at home, to help foster healthful home environmental change. Fifth, three musical social narratives (songs) were created to increase children's knowledge and asking for foods, activities, and advertisements. In addition, families received a copy of the songs and lyrics and were encouraged to sing the songs at home. Last, weekly HOP'N Home connection activities and a bi-weekly newsletter were sent home. The home connection activities were developed to link the home environment to the child care. The newsletter was to increase parent knowledge of the eating and activity behaviors, as well as advertisements. Additionally, specific parenting practices to promote healthy child behaviors were discussed in the newsletter.

We hypothesized that children in the HOP'N Home intervention would have: 1) less increases in child body mass index z-scores, 2) increases in children's self-regulation behavior for asking for healthful home environments, 3) improvements in the physical and social home environment, and 4) increases in children's healthy eating and physical activity. Two studies tested these hypotheses. Study 1 was a cluster-randomized clinical trial in which one classroom was randomized to the HOP'N Home intervention and the other, control. Study 2 was a non-randomized trial that used a pretest-posttest design with two full-day home child care and two full-day center child care sites (n=4). Process evaluation measures demonstrated that participation in the HOP'N Home trainings was very high and providers felt excited about the intervention and a part of the HOP'N Home group. Overall, providers implemented the quality elements with high fidelity, however, implementing child role-play within dramatic play and getting families to participate in the weekly home connection activities were more difficult to implement compared to the other quality elements. Most of the parents were satisfied with the

HOP'N Home program and made changes in their home. The HOP'N Home intervention had no impact on child body mass index, however children's asking for healthy behaviors increased (e.g., play outside) and asking for unhealthy behaviors decreased (e.g., cake, television). However, there were positive changes to the physical home environment, such as increased fruit availability, and positive changes to the social home environment, such as parents providing their child to play outside increased and providing candy and/or chocolate decreased. However, there were no changes in monitoring or limit setting parenting practices. Children's health behaviors improved, such that park visits per week increased, and screen time activities, and fast food restaurant visits decreased. Overall, the intervention was well-received by children, parents and child care personnel. The HOP'N Home intervention demonstrated that targeting child care programs may be a practical way to influence the healthfulness of home environments for young children.

Lastly, chapter four examined the effects of adult participation on children's physical activity during structured, active games. Children participated in four active games across two consecutive days. Each day, children participated in two 16-minute games, divided into four-minute intervals, alternating between adult participation and no adult participation. Children wore an Actigraph GT1M accelerometer to objectively measure physical activity and sedentary behavior. Unexpectedly, there were no differences in physical activity or sedentary behavior between the conditions (adult versus no adult participating). It may be that adult participation could not increase physical activity because the children were already exhibiting high levels of moderate-to-vigorous physical activity.

In conclusion, this dissertation provides preliminary evidence that parents and other adults play an important role in the development of healthy eating and physical activity in children. Most research examines the home physical environment and parenting practices to increase children's healthy behaviors, however it may be just as important to target children's self-regulation for asking behaviors to improve children's healthful behaviors to prevent obesity. This dissertation provides preliminary evidence that both individual and environmental factors may be necessary to prevent childhood obesity. For example, the HOP'N Home intervention targeted young children's self-regulation skills to ask parents for healthful home environments. Results showed that children improved in their healthy behaviors, however only modest changes to the home physical and social environment were found. Perhaps if greater improvements



occurred in the home environment we would have had significant decreases in childhood obesity. Future interventions should target both individual and environmental factors to prevent obesity. Future research is also necessary to identify the most important parent/adult practices that can be targeted by interventions to provide healthful options and build children's skills to promote healthful behavior to prevent obesity. Furthermore, preventing childhood obesity is an important public health concern, and targeting parents and adults may be one way to stop the increase of child obesity.

## References

1. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice Hill, 1986.
2. Bandura A, Cervone D. Differential engagement of self-reactive influences in cognitive motivation. *Organ Behav Hum Dec*. 1986;38:92-113.
3. Brug J, Kremers SP, van Lenthe F, Ball K, Crawford D. Environmental determinants of healthy eating: in need of theory and evidence. *Proc Nutr Soc*. 2008;67(3):307-316.
4. Kopp C. The antecedents of self-regulation: A developmental perspective. *Dev Psychol*. 1982;18:199-214.
5. Zimmerman BJ, Moylan AR. *Self-Regulation: Where metacognition and motivation intersect*. In: Hacker DJ, Dunlosky J, Graesser AC, eds. *Handbook of metacognition in education*. New York: Taylor & Francis Group, 2009.

## Appendix A - Go & Slow Foods









### GO & SLOW FOODS




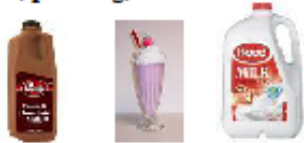


Preschool-Aged Children (3 – 5 year olds)

**GO Foods** – Great to eat anytime (Most often). They are lowest in fat and sugar; relatively low in calories; “nutrient dense” (rich in vitamins, minerals, and other nutrients important to health)

**SLOW Foods** – To be eaten sometimes (Less often or not at all). They are higher in fat, added sugar, and calories.

| Food Group  | GO Foods<br>(all the time)   | SLOW Foods<br>(sometimes)  |
|---|--|--|
| <b>FRUITS</b><br><br><b>Recommend: 1 – 1.5 cups daily</b><br>(1 cup = 1 cup of fruit or 100% fruit juice; ½ cup dried fruit)                                  | <ul style="list-style-type: none"> <li>• All fresh, frozen, or canned fruits without added fat or sugar</li> <li>• 100% fruit juice</li> <li>• Frozen 100% fruit juice bars</li> <li>• Dried fruit (raisins, dates, apricots, plums, figs)</li> </ul>  | <ul style="list-style-type: none"> <li>• Fruits canned in light or heavy syrup</li> <li>• Fruits with added sugar</li> <li>• Sherbet, sorbet</li> <li>• Fruit roll-ups</li> <li>• Dried fruit with added sugar</li> <li>• Fruit beverages and fruit drinks with added sugar</li> </ul>  |
| <b>VEGETABLES</b><br><br><b>Recommend: 1 – 1.5 cups daily</b><br>(1 cup = 1 cup of cooked or raw vegetables or 100% vegetable juice; 2 cups raw leafy greens) | <ul style="list-style-type: none"> <li>• All fresh, frozen, or canned vegetables without added sugar or fat</li> <li>• 100% vegetable juice</li> </ul>    | <ul style="list-style-type: none"> <li>• Vegetables with added oil, butter, margarine, cheese sauce</li> <li>• Fried potatoes, French fries and hash browns</li> </ul>   |
| <b>BEVERAGES</b>  | <ul style="list-style-type: none"> <li>• Water</li> <li>• Milk and juice as above</li> </ul>   | <ul style="list-style-type: none"> <li>• Soft drinks (regular and diet)</li> <li>• Sweetened tea and sports drinks</li> <li>• Beverages with added sugar</li> </ul>   |

Adapted from CATCH: Coordinated Approach to Child Health, 4<sup>th</sup> Grade Curriculum, University of California and Flaghouse, Inc., 2002. & We Can: Ways to Enhance Children's Activity & Nutrition and MyPyramid.gov

| Food Group  | GO Foods<br>(all the time)   | SLOW Foods<br>(sometimes)   |
|---|--|---|
| <p align="center"><b>GRAINS</b></p> <p>Recommend: 3-4 ounces daily<br/>(1 ounce = 1 slice of bread; 1 cup dry cereal; ½ cup cooked rice, cooked pasta or cooked cereal)</p>                                     | <ul style="list-style-type: none"> <li>• Whole-grain bread, buns, rolls, bagels, tortillas, pita bread</li> <li>• Whole-grain pasta</li> <li>• Brown rice</li> <li>• Baked tortilla chips</li> <li>• Air-popped popcorn</li> </ul>   | <ul style="list-style-type: none"> <li>• White (refined flour) bread, buns, rolls, bagels, tortillas, pita bread</li> <li>• Sweet rolls, doughnuts, croissants</li> <li>• Pasta made with refined flour; instant noodle soups</li> <li>• Fried rice</li> <li>• Tortilla chips, potato chips, pretzels</li> <li>• Animal crackers, cookies</li> <li>• Popcorn with butter</li> </ul>  |
| <p align="center"><b>MILK &amp; DAIRY</b></p> <p>Recommend: 2 cups daily<br/>(1 cup = 1 cup of milk or yogurt; 1.5 ounces of natural cheese)</p>  | <ul style="list-style-type: none"> <li>• Fat-free and 1% milk &amp; soy milk</li> <li>• Fortified rice milk</li> <li>• Low-fat yogurt</li> <li>• Part-skim natural cheese</li> <li>• Low-fat string, cottage &amp; soy cheese</li> </ul>    | <ul style="list-style-type: none"> <li>• 2% and whole milk</li> <li>• 2% soy milk</li> <li>• Flavored whole or 2% milk</li> <li>• Milkshakes</li> <li>• Ice cream, pudding, cheesecake</li> </ul>   |
| <p align="center"><b>MEAT &amp; BEANS</b></p> <p>Recommend: 2 – 3 ounces per day<br/>(1 ounce = 1 ounce of meat, poultry or fish; ¼ cup cooked dry beans; 1 egg, ½ ounce nuts/seeds; 1 ounce peanut butter)</p> | <ul style="list-style-type: none"> <li>• Beans (i.e., pinto, black, red, black-eyed peas, garbanzo)</li> <li>• Low-fat refried and baked beans</li> <li>• Lean meat and poultry</li> <li>• Eggs</li> <li>• Fish, shellfish, tuna canned in water; salmon</li> <li>• Nuts and seeds (as child is able to chew)</li> <li>• Natural peanut butter</li> </ul>  | <ul style="list-style-type: none"> <li>• Eggs fried in fat</li> <li>• Breaded fish and fish sticks</li> <li>• Fried chicken and chicken nuggets</li> <li>• Regular cuts of beef</li> <li>• Ham, bacon, pork roast</li> <li>• Hot dogs, sausage, lunch meats</li> </ul>   |



## Appendix B – Go & Slow Activities



### GO & SLOW ACTIVITIES

**GO Activities** – Get your body moving (most often). They get your heart beating fast and should be done daily as much as a child wants. Examples are when your child is up and around moving.

**SLOW Activities** – Require little or no body movement. They should be done less often and limited as much as possible. Examples are when your child is sitting on the floor playing.

| <b>GO Activities<br/>(all the time)</b>  | <b>SLOW Activities<br/>(sometimes)</b>  |
|--|---|
| • Jumping rope and bean bag play   | • Watching television   |
| • Playing on the playground (swing set, sandbox, slide)                              | • Watching movies   |
| • Playing sports (basketball, baseball)  | • Playing with video games (including Leapster®)                                      |
| • Riding toys (tricycle, cars, scooters)   | • Laying down (excluding night time, napping or when ill)                             |
| • Playing with balls   | • Sitting on the playground not moving  |
| • Pull or push toys (wagon, lawn mower, etc.)  | • Playing with blocks and LEGO® toys (unless moving around)                           |
| • Movement exploration (stairs, climbing, tunnels, parachute, hula hoop, bean bags)  | • Playing with puzzles  |
| • Dancing  | • Playing board games   |
| • Balance surfaces (balance beams, boards)   |   |
| • Twirling play equipment (ribbons, scarves, batons)                                 |   |
| • Sand/water play  |   |
| • Bowling  |   |
| • Flying a kite  |   |
|  |  |