

FAMILIES MOVING TOGETHER: INCREASING PHYSICAL ACTIVITY BY
TARGETING PARENTS EXCLUSIVELY VERSUS PARENTS
TOGETHER WITH CHILDREN

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FAMILIES MOVING TOGETHER: INCREASING PHYSICAL ACTIVITY BY
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ABSTRACT

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The “Families Moving Together” study was a community-based education intervention designed to help parents work with their children to live a healthier lifestyle. The “WeCan!” curriculum, a community specific program offered by NIH, was chosen for this study because of the theoretical framework and alignment to Social Cognitive Theory. Sixteen families participated in an 11-week education intervention, which included four sessions designed to increase physical activity levels and improve exercise self-efficacy. Families were assigned to a treatment

group, either the parents-only group (POG, n= 29), or the parents-children group (PCG, n= 35). Only parents attended the education session in the POG, while children and parents attended in the PCG. During baseline and post-assessment, participants: 1) completed self-efficacy instruments and self report activity questionnaires, 2) were measured for height and weight, and 3) were given a pedometer. The outcome variables for participants in the study included physical activity, body weight, and exercise self-efficacy. No intervention effects were detected for changes in self-report physical activity data, while the paired samples t-test revealed a small decrease in the pedometer readings from pre- to post-test for all participants. Independent samples t-test revealed no statistically significant change in pedometer readings for children in either group, and a small but statistically significant change in pedometer readings for adults between the two treatment groups. With regards to weight change, the children increased in weight from pre- to post-test while the parents' weight status did not change. There were no significant changes in exercise self-efficacy for either group. Although results were disappointing, findings suggest that a family-based intervention may be effective for promoting increases in physical activity and weight maintenance in participating adults. The information obtained from this study can contribute to the development of sound strategies for family-based interventions. The increasing prevalence of problems related to low physical activity levels, including obesity and related diseases, suggest the continued need for research in this area. Limitations of the study included a small sample size, the short time frame of the intervention, and a lack of father involvement.

CHAPTER I

INTRODUCTION

Introduction

Approximately 16% of all deaths are related to modifiable lifestyle behaviors such as physical inactivity (Mokdad, Marks, Stroup, & Gerberding, 2004). Research indicates that participating in regular physical activity provides significant health benefits, such as prevention and control of chronic diseases and positive mental health (U.S. Department of Health and Human Services, 1996). Regular exercise contributes to decreased risk for coronary heart disease (Fogelholm, 2008; Lee, Sesso, & Paffenbarger, 2000; Sesso, Paffenbarger, & Lee, 2000), some cancers (Slattery et al., 2003), the prevention of type 2 diabetes (Kriska et al., 2003), and improved weight control and obesity prevention (Fogelholm, 2008; Hill & Wyatt, 2005). Moreover, participation in regular physical activity (PA) has been associated with reduced stress and anxiety (Taylor, 2000), fewer emotional problems (Wiles, et al., 2008), positive moods (Brosse, Sheets, Lett, & Blomethal, 2002), improvement in physical self-concept (Schneider, Dunton, & Cooper, 2008), and increases in self-esteem (Fox, 2000; Spence, McGannon, & Poon, 2005). Despite evidence that participation in regular physical activity helps to prevent and control chronic diseases and has a positive effect on mental health, the majority of Americans do

not engage in the recommended amount of physical activity (Centers for Disease Control (CDC), 2007; CDC, 2008). Recommended activity for adults is defined as at least 150 minutes each week of moderate intensity aerobic activity or at least 75 minutes each week of vigorous intensity aerobic activity (USDHHS, 2008). According to the CDC (2007), 51.2% of American adults were found to be either inactive and/or did not meet physical activity guidelines. Comparatively, 24.9% of American children aged 9-13 did not participate in 60 or more minutes of physical activity on any day, and only 30.3% went to physical education class an average of 5 days per week (CDC, 2008). These numbers are alarming given that it is recommended that children and adolescents get 60 minutes or more of physical activity each day (USDHHS, 2008). Given the lack of physical activity, effective strategies to promote PA in children and adults are imperative.

Aside from troubling reports that children are not meeting physical activity recommendations, research has identified an even greater decline in physical activity levels during adolescence (CDC, 2010; Findlay, Garner, & Kohen, 2009; Nader, Bradley, Houts, McRitchie, & O'Brien, 2008). In a survey study among 9-12th grade students, there was a decrease in the percentage of students meeting recommended physical activity levels from 21.3% of ninth-grade students to 15.3% of twelfth-grade students (CDC, 2010). In a longitudinal study to determine physical activity patterns among youth, researchers tracked participants from age nine to fifteen. Over the seven-year study the moderate-to-vigorous physical activity levels decreased as the youth aged. At nine years old the children engaged in approximately three hours of moderate-to-vigorous

physical activity (MVPA) per day including both weekdays and weekends, but by 15-years of age they were only engaging in 49 minutes of MVPA on weekdays and 35 minutes per weekend day (Nader et al., 2008). Similarly, Findlay et al. (2009) reported that physical activity declined in both boys and girls from the age of four to 17 years. Survey data, collected over 10 years, revealed that the most significant decrease occurred in adolescence.

Evidence supports that physical activity behaviors in adulthood are commonly established during childhood and adolescence (Fogelholm, 2008; Friedman et al., 2008; Tammelin, Nayha, Hills, & Jarvelin, 2003; Telama et al., 2005). In one longitudinal study to determine the lifelong patterns of physical activity, childhood energy levels and physical activity levels had significant associations across six decades as the active children continued to lead active and energetic lives into and throughout adulthood (Friedman et al., 2008). Similar results were shown in a 21-year study tracking the stability of physical activity from childhood to adulthood (Telama et al., 2005), and a study investigating the relationship between adolescents participation in sport and their physical activity behaviors as adults (Tammelin et al., 2003). Males and females who were physically active with some consistency, or active several years in a row during their youth, were more likely to be active as adults (Telama et al., 2005). With regard to sports, adults reported higher levels of physical activity and participation in endurance sports if they participated in sport one or more days a week during their youth compared with their peers who participated less than one day a week as youth (Tammelin et al., 2003). The alarming evidence associating

youth physical activity behaviors with adult physical activity behaviors may be further substantiated because there is evidence suggesting that childhood physical fitness contributes to reduced risks of high blood pressure and obesity during young adulthood (Kvaavik, Klepp, Tell, Meyer, & Batty, 2009).

Given the fact that children, adolescents, and adults are not meeting physical activity recommendations (CDC 2007, 2008), efforts have been directed toward the development and implementation of interventions aimed at targeting children, youth and their families (Ward et al., 2007). While research is limited and discordant regarding physical activity interventions involving youth (O'Connor, Jago & Baranowski, 2009; van Sluijs, McMinn & Griffin, 2007), there is evidence that interventions involving the family have the greatest potential for changing children's exercise behaviors (Kitzmann & Beech, 2006; Ward et al., 2007). Reciprocal determinism, a construct of Social Cognitive Theory, suggests that behaviors are a dynamic of the individual and the environment. The construct implies that interventions cannot focus on changing behaviors alone, and that the environment is an avenue for the development of healthy behaviors (Baranowski, Perry, & Parcel, 2002). Based on this construct, Baranowski (1997) proposed the model of family reciprocal determinism, which seeks to elucidate the complex and dynamic relationships within the family environment that forms the basis of health-related behaviors and beliefs. Within the framework of family reciprocal determinism, a variety of theories and concepts are integrated to understand behavior change within the individual, family, social environment, and community. The model suggests that family members' behaviors, skills,

knowledge, and attitudes interact to create an emergent family environment related to health behaviors.

Research shows that the learning of health behaviors, including physical activity, occurs within the family (Davison & Birch, 2001; Tinsley, 2002), and that the environment is an essential factor in modifying physical activity behaviors (Sherwood & Jeffery, 2000). Parental engagement has been documented as the strongest predictor of adolescent physical activity (Ornelas, Perreira, & Ayala, 2007), and parent role modeling is significantly associated with higher levels of physical activity in girls (Davison, Cutting, & Birch, 2003) and in sports (Cleland, Venn, Fryer, Dwyer, & Blizzard, 2005). Longitudinal research examining parent physical activity behaviors substantiates these trends. A recent longitudinal study, following children from birth, found that parent physical activity when the child is at 21 months is associated with their child's physical activity levels at 11-12 years of age (Mattocks et al., 2008). Children at 21 months who had either one or both active parents had higher levels of physical activity at 11 years of age, when compared to the 21 month olds with no active parents (Mattocks et al., 2008). In another longitudinal analysis examining parental and child physical activity, it was reported that children are 5.8 times more likely to be active if both parents are active (Moore, Lombardi, & White, 1991).

In addition to serving as role models, parents' support for their children's involvement in physical activities can lead to higher levels of child participation in physical activity (Gustafson & Rhodes, 2006). After investigating parent physical activity correlates in an ethnically diverse sample, researchers concluded that

parental encouragement or the adolescents' perception of encouragement was related to adolescents' physical activity behaviors (McGuire, Hannan, Neumark-Sztainer, Cossrow, & Story, 2002). As parents' encouragement increased, the adolescents' reported physical activity levels increased, and the correlation was stronger in the male adolescents (McGuire et al., 2002). Another study finding a direct relationship between parental support and girls' participation in physical activity concluded that the percentage of girls participating in high levels of physical activity increased from 32% when neither parent provided support to 70% when both parents provided support (Davison et al., 2003). In light of the compelling evidence that supports the role of parents in the development of children's health behaviors, more research needs to focus on the family environment for improving physical activity levels.

A popular setting for physical activity interventions involving children and adolescents has been the school; however, reviews of these studies have shown inconclusive evidence on the effectiveness of school-based interventions (Katz, 2009; Marcus et al., 2006; van Sluijs, McMinn, & Griffin, 2007). An increasing number of the school-based interventions do include parental involvement, though thus far the studies have yielded inconclusive results for the effectiveness of including parents (Caballero et al., 2003; Jurg, Kremers, Candel, Van der Wal, & De Meij, 2006; Manios, Kafatos, Kafatos, & Team PMaMCR, 2006; Nader et al., 1996; Sallis et al., 1997; Warren, Henry, Lightowler, Bradshaw, & Perwaiz, 2003; van Sluijs et al., 2007). Another approach for implementing physical activity interventions has been to target community-based programs such as

recreational groups, after-school programs, and summer camps (Jago et al., 2006; Kelder et al., 2005; Marcus et al., 2006; Pate et al., 2003; Reilly et al., 2006). Many of the community-based interventions involve parents and include at-home components, yet evidence for effectiveness is disparate among studies. While the best strategy for increasing physical activity is still unknown, the use of family based interventions is one strategy that has been shown to achieve positive results. Interventions including a family component have been effective at increasing children's participation in physical activity (Nader et al., 1996; Saakslanti et al., 2004), produced significant changes in body mass index in children (Epstein, Paluch, Gordy, & Dorn, 2000) and lead to parent's increased levels of physical activity or weight loss (Golan et al., 1998; Grey et al., 2004). Therefore, it is imperative to provide effective interventions for increasing parent involvement.

Interventions targeting the family are still novel, but the general consensus is that interventions for the treatment and prevention of childhood obesity involving the parents show compelling, long-lasting effects (Epstein, Paluch, Kilanowski, & Raynor, 2004; Golan, Kaufman, & Shahar, 2006; Kitzmann & Beech, 2006). It appears that the majority of family-based interventions to date have targeted mostly overweight and obese children and their families, with the intention of weight loss by targeting both physical activity and eating behaviors. In a research study comparing a parents-child treatment group with a parents-only treatment group both groups increased physical activity and reduced time spent in sedentary behaviors. Group differences were found for weight loss, as

weight reduction in the children from the parents-only group decreased by 9.5% compared to a 2.4% decrease in the parents-children group (Golan et al., 2006). In another family-based intervention attempting to reduce sedentary behavior in children, parents were used as mediators for stimulus and reinforcement. Children in the stimulus control group were rewarded for recording targeted sedentary behaviors and rules were established regarding sedentary behaviors (i.e. designated amount of time for watching television). Children in the reinforcement group were rewarded for reducing sedentary behaviors and meeting physical activity goals. Children in both the stimulus control and reinforcement control groups reduced sedentary behaviors and increased moderate to vigorous physical activity (Epstein et al., 2004).

While family interventions for overweight and obese children have shown promise in weight reduction, few interventions have included children of normal weight, or have aimed at increasing physical activity for obesity prevention. A few of the interventions involving family support showed promising results for increasing levels of physical activity and increasing time spent playing outdoors (Ford et al., 2002; Ransdell et al., 2003; Ransdell et al., 2004; Saakslanti et al., 2004), as well as changing behaviors (e.g. physical activity, diet) (Nader et al., 1983; Ransdell et al., 2003). More importantly, Ransdell et al. (2003) concluded that a home-based physical activity program, engaging mothers, is as effective as a community-based physical activity program, engaging mothers, for increasing physical activity. The home-based program activities were completed by mothers and daughters in their own home, while the community-based

program activities were completed at a community fitness facility. Currently, there is mixed evidence regarding the overall success of targeting families to promote physical activity as a consequence from a lack of homogeneity in study design and outcome measures used (O'Connor, Jago, & Baranowski, 2009). In conclusion, more evidence is needed for drawing conclusions about the success of family physical activity interventions.

One possible method for improving family physical activity interventions is by grounding interventions in theory. The use of behavior change theory is essential for promoting the adoption and maintenance of behaviors (Berry, Sheehan, Heschel, Knal, Melkus, & Grey, 2004), and has led to the development of successful interventions for children and youth (Ward et al., 2007), yet few intervention studies have examined mediators of behavior change (Lubans, Foster, & Biddle, 2008). Social Cognitive Theory plays an important role given that it offers a framework for shaping the family environment related to health behaviors. Social Cognitive Theory (SCT) is one of the most widely used theories in physical activity interventions (Marcus et al., 2006; Ward et al., 2007). One particular construct of SCT, self-efficacy, has been a consistent predictor of success for maintaining health behavior changes (Baranowski et al., 2002), and is considered the strongest predictor of physical activity behavior (Sherwood & Jeffery, 2000). Self-efficacy has been identified as being associated with the adoption and maintenance of physical activity behaviors in adult, child, and adolescent populations (Ashford, Edmunds, & French, 2010; Ward et al., 2007). Furthermore, parent self-efficacy has been recognized as a factor

influencing the time that children spend in physical activity (Smith, Grunseit, Hardy, King, Wolfenden, & Milat, 2010), and it has been reported that support offered by parents is a mediating factor for child exercise self-efficacy (Trost et al., 2003). Unfortunately, few interventions have assessed the changes in self-efficacy as a result of an intervention (Caballero et al., 2003; Harrison et al., 2006). More evidence is needed in order to improve our understanding of physical activity behavior changes in the family environment.

In light of previous research, it appears that family involvement can improve intervention success (Epstein et al., 2000; Golan et al., 1998; Nader et al., 1996; Ransdell et al., 2003; Saakslahiti et al., 2004; Salmon, Booth, Phongsavan, Murphy, & Timperio, 2007). It can be assumed that including parent participation is a more effective method versus working with the children alone (Golan et al., 1998; Grey et al., 2004). Although previous research has focused on environmental approaches to improving physical activity behaviors in children, to date it appears that most studies exclusively targeting families are limited and inconclusive. The purposes of the current study were to use the conceptual framework of social cognitive theory and family reciprocal determinism to implement and evaluate the use of a family education intervention to increase physical activity of all participants in the study and determine which treatment is 1) better for increasing the levels of physical activity (the parent-only treatment group, or the parents-children treatment group), and 2) more effective for improving exercise self-efficacy in all participants. Results of this study will add to the existing literature and highlight the usefulness of targeting families in physical

activity interventions. Furthermore, the comparison of the parent-only treatment group with the parent-child treatment group will assess the benefits and feasibility of using one group over the other.

Research Questions

The following research questions were developed to guide the evaluation of the education interventions:

1. Can an education intervention targeting only the parents successfully increase the levels of physical activity for all participants?
2. Can an education intervention aimed at both parents and children successfully increase the levels of physical activity for all participants?
3. Are there significant differences in changes of physical activity levels between those participating in the parents-only treatment group versus the parents-children treatment group?
4. Can an education intervention targeting only parents successfully improve exercise self-efficacy for all participants?
5. Can an education intervention aimed at parents and children successfully improve exercise self-efficacy for all participants?
6. Are there significant differences in changes of exercise self-efficacy between those participating in the parents-only treatment group versus the parents-children treatment group?

Study Hypotheses

The specific hypotheses were tested:

Hypothesis 1: Physical activity levels assessed by objective and subjective measures will be significantly and positively associated with parent-only involvement in the education intervention.

Hypothesis 2: Physical activity levels assessed by objective and subjective measures will be significantly and positively associated with parent-child involvement in the education intervention.

Hypothesis 3: The parent-only treatment group will have a greater effect on physical activity levels assessed by objective and subjective measures.

Hypothesis 4: Participants in the parent-only treatment group will have positive changes in exercise self-efficacy.

Hypothesis 5: Participants in the parent-child treatment group will have positive changes in exercise self-efficacy.

Hypothesis 6: The parent-only treatment group will have a greater effect on exercise self-efficacy assessed by questionnaires.

Operational Definitions

For the purpose of this research, the following terms apply:

Barriers to Exercise: Cognitive factors influencing participation in physical activity (e.g. time constraints, social support, and affordable and accessible activities). (Lox et al., 2003).

Benefits of Exercise: Universally recognized primary benefits associated with physical activity include: the reduction in the risk for cardiovascular disease,

some cancers, and diabetes; the development of a positive mood and reduction in the feelings of depression, anxiety, and general negative moods; improvement in body image and self-esteem; weight control; healthy bones, muscles, and joints; enhanced ability in the performance of daily activities; and opportunities for social contacts, relationships, and support (Lox et al., 2003).

Family Reciprocal Determinism: Proposed by Baranowski (1997), the model seeks to elucidate the complex and dynamic relationships within the family environment that form the basis of health-related behaviors and beliefs.

Morbidity: A state of illness or disease (Jenkins, 2005).

Mortality: A population's death rate (Jenkins, 2005).

Obesity: The presence of excess body fat in the body, which is associated with increased mortality and morbidity at all ages (Jenkins, 2005). Body weight is 20% to 25% above skeletal and physical requirements for a male, and 30% to 35% for a female (Anshel, 1991).

Overweight: Weighing over 10% more than the weight accepted for one's structural capacities (Anshel, 1991).

Physical Activity: Physical activity can be defined as "movement of the human body that results in the expenditure of energy at a level above the resting metabolic rate" (Anshel, 1991, p. 113).

Reciprocal Determinism: A construct of social cognitive theory, suggests that behaviors are a dynamic of the individual and the environment, and the construct implies that interventions cannot focus on changing behaviors alone, and that the

environment is an avenue for the development of healthy behaviors (Baranowski, Perry, & Parcel, 2002).

Self-efficacy: A construct of SCT, self-efficacy can be defined as “the confidence a person feels about performing a particular activity, including confidence in overcoming the barriers to performing that behavior” (Baranowski et al., 2002, p. 173).

Social Cognitive Theory: A theory of human behavior which elucidates the psychosocial functioning in terms of a triadic reciprocal causation. Within the social environment, observational learning occurs providing a means for self evaluation, motivation for behavior through reinforcement and praise, and various types of social support (Bandura, 1986).

CHAPTER II

REVIEW OF THE LITERATURE

Research suggests that regular physical activity can provide multiple and various health benefits, including the prevention of many chronic diseases (Fogelholm, 2008; Kriska et al., 2003; Slattery et al., 2003; Williams, Hayman & Daniels, 2002) and improvement in mental health (Brosse et al., 2002; Fox, 2000; Schneider et al., 2008; Spence et al., 2005). Furthermore, there is evidence that physical activity is an essential factor in weight control and obesity prevention (Fogelholm, 2008; Hill & Wyatt, 2005).

Despite the evidence, physical inactivity is a considerable problem in both children and adults alike. According to recent reports from the Centers for Disease Control and Prevention (CDC, 2007, 2008), more than half of American adults and a quarter of American youth are not meeting recommended physical activity guidelines. Consequently, a variety of physical activity interventions have been developed to increase levels of physical activity and provide health benefits, especially with regard to youth. However, few of these focused on the family as a unit. The purpose of this literature review was to summarize Social Cognitive Theory and to identify the strengths and weaknesses of the existing family intervention studies.

Social Cognitive Theory and Family Reciprocal Determinism

The use of theory, specifically those taking into account individual intention as well as environmental influences, have led to the development of successful physical activity interventions for children and youth (Ward et al., 2007). Social Cognitive Theory (SCT) and Social Learning Theory (SLT) are the most widely used theories in physical activity interventions (Marcus, et al., 2006; Ward et al., 2007).

Social Cognitive Theory

SCT has its foundation in the discipline of psychology, with its early establishment by behavioral and social psychologists. SCT evolved from a group of psychological theories intended to explain why people behave in relation to the environment around them. Albert Bandura advanced the efforts on cognitive concepts of Social Learning Theory (SLT), which was the preliminary endeavor into what we now know as Social Cognitive Theory (Bandura, 1977).

SLT explains the learning of observed behaviors, and the reciprocal relationship between environment and behavior. Contributors to SLT discussed the idea that an individual's behavior could serve as a stimulus for the adoption of behavior by others (Miller & Dollard, 2000). Bandura's research, concentrated on cognitive concepts, developed new beliefs as they related to SLT, and he later renamed his version Social Cognitive Theory (Bandura, 1986).

The foundation of Bandura's social cognitive theory is found in the reciprocal interactions between the person, the environment, and the behavior itself, better known as reciprocal determinism (Baranowski et al., 2002).

Bandura's model operates on the notion that determinants of behavior are created by the interrelation of the person, behavior, and environment, which are inseparable. Equality among the three influences on behavior is not inferred in this model and the relative influence of each factor depends upon the nature of the behavior, differences within the individual, environment, and circumstances involved with the behavior (Bandura, 1986).

Bandura identified several fundamental determinants that influence the model of reciprocal determinism, including knowledge, perceived self-efficacy, outcome expectations, goals, perceived facilitators, and social and structural impediments, with self-efficacy being the primary construct (Bandura, 2004; Baranowski et al., 2002). According to Bandura's SCT (Bandura, 1986, 1994; Bandura, Adams, & Beyer, 1977), perceived self-efficacy is defined as a person's belief that they can successfully execute the behavior required to produce a certain outcome in events that affect their lives. Those with a high self-efficacy or confidence approach difficult tasks as challenges to achieve, unlike those with low confidence who have doubts about their capabilities and are likely unwilling to attempt difficult tasks. There are four proposed primary sources of self-efficacy: mastery experience, vicarious experiences, social persuasion, and physiological and affective states (Bandura, 1994). Mastery experiences refer to past experiences with a particular situation, and boost confidence in capabilities and provide a sense of resilience. It is likely that an exerciser's past experience with physical activity will have a strong influence on future exercise behavior. Vicarious experience is the successful modeling of behavior or skills by someone

else, typically those with similar capabilities (Bandura et al., 1977). The repeated observations of successful performance lead to a boost in the observer's confidence in their own capacities to succeed. Social persuasion is the use of verbal and non-verbal cues to increase self-efficacy. These types of cues can be positive statements, and/or conversations. Finally, negative physical and emotional states, which may lead to altered levels of arousal, may affect behavior. Giving consideration to persons' negative emotional proclivities can lead to a reduction in stress and a boost in self-efficacy (Bandura, 1994).

Self-efficacy is considered the primary construct in SCT because it has the most impact on health behavior through both direct and indirect influences. Self-efficacy has been considered the strongest and most consistent predictor of exercise behavior, and leads to higher adherence to habitual exercise (Sherwood & Jeffery, 2000). Self-efficacy also indirectly affects health behavior through its influence on the other determinants; knowledge, outcome expectations, goals, perceived facilitators, and social and structural impediments (Bandura, 2004). Knowledge refers to a person's familiarity with the health risks and benefits and how daily habits shape their health. This knowledge may give a person reason to change their lifestyle habits. Outcome expectation is the belief in the likely effect that actions will generate. Outcome expectations happen differently for each person through physical results, social stimulus, and self-evaluative responses. The presence of personal goals can provide a course for personal change through motivation. Goals can provide incentives and means for people to recognize how habit changes are in their self-interest. It is best for people to set

short-term attainable goals for soliciting effort and directing action (Bandura, 2004). Regardless of exercise intentions, there is substantial evidence relating benefits and barriers to physical activity behavior change (Nahas & Goldfine, 2003). The perceived facilitators and obstacles are a determinant of SCT (Bandura, 2004).

Model of Family Reciprocal Determinism

The model of family reciprocal determinism was proposed by Baranowski (1997) to explain further the intricacy of the familial environment, which is an integral construct of Social Cognitive Theory (SCT). In SCT, behavior is stimulated by the environment in which a person exists, including both social and physical surroundings (Baranowski et al., 2002). Specifically, the construct of reciprocal determinism suggests that a person's behavior and environment are in constant interaction with one another, equally influencing the other. Behavior is modified and developed by constant interactions and adaptations within the person, behavior, and interactive environment (Bandura, 1986). In his theory of family reciprocal determinism, Baranowski (1997) was most interested in examining the influence of the familial environment on health behaviors. Baranowski (1997) initially used the model of family reciprocal determinism to examine familial influences on dietary practices, but recognized the theoretical application with regard to a variety of health behaviors. The consequent family environment is the result of continual interaction of each member's behaviors, skills, and knowledge acquisition.

Although family reciprocal determinism has been recognized as a model for change (Baranowski et al., 2002), it appears that there is a lack of physical activity intervention research utilizing the theory. Nevertheless, empirical studies examining the influence of family in the development of physical activity behaviors have become more abundant in the literature in recent years. Among children and adolescents, there is empirical evidence that parental social support is a significant determinant of participation in all forms of physical activity (Davison et al., 2003; McGuire et al., 2002; Sallis, Prochaska, Taylor, Hill, & Geraci, 1999; Trost et al., 2003). In addition, there is evidence to suggest that parental modeling may positively influence the child's participation levels (Davison et al., 2003; Ornelas et al., 2007; Trost, Kerr, Ward, & Pate, 2001).

Physical Activity Patterns in Parents and Children

In an examination of the research assessing environmental correlates of physical activity patterns in children, adolescents and adults, inclusively, the research suggests that parents have a fundamental role in the development of children's health behaviors by modeling positive examples and creating an environment supportive of health habits (Burg, J., van Lenthe, F.J., & Kremers, S.P.J., 2006). To date, there is incongruity in the literature in reporting a positive correlation between parental engagement in physical activity and the activity levels of their children. Although more prospective evidence is needed, positive associations have been found with physical activity and parental physical activity (Van Der Horst, Paw, Twisk, & Van Mechelen, 2007). Two of the stronger prospective studies include the Avon longitudinal study (Mattocks et al., 2008)

and the Framingham Children's Study (Moore et al., 1991). Tracking physical activity using an accelerometer in children aged 11-12 years, Mattocks and colleagues (2008) concluded that although modest, there is a positive linear association with physical activity and parental physical activity during the child's early years. Specifically, in the model adjusted for age, sex, maternal education, and social class, a significant difference in counts per minute of physical activity was reported in children with no active parents versus those with either one active parent or both parents active. Also using accelerometer tracking of physical activity, Moore et al. (1991) found evidence favorable for concluding that active parents can provide an environment supportive for raising active children. It was concluded that children of active mothers and active fathers were respectively 2.0 times as likely and 3.5 times as likely to be active when compared with children of inactive mothers. Furthermore, children having two active parents were 5.8 times more likely to be active when compared to their peers with no active parents. Using longitudinal data from a nationally representative sample of seventh to twelfth graders, Ornelas et al. (2007) examined parental engagement by counting the number of activities they participated in with their adolescent. In the logit model, parental engagement was the strongest predictor of moderate to vigorous physical activity (MVPA) levels in both boys and girls. Cross-sectional studies examining parental influence have also found positive correlations, especially in younger children. For example, a Danish study of 8-10 and 14-16 year olds using a linear regression analysis to compare accelerometer data reported that activity levels in children, ages 8-10,

are significantly associated with mother's physical activity level, increased parental participation and facilitation, and father's reported activity level (McMinn, van Sluijs, Wedderkopp, Froberg, & Griffin, 2008). In their study of 9-year old, non-Hispanic white girls and their parents, Davison et al. (2003) found that fathers' support of physical activity through explicit modeling was associated with their daughters' higher levels of physical activity. Explicit modeling in this study was defined as parent motivation to be active and the use of parent behavior to encourage an active lifestyle for their daughter. Using the child's' perception of parental physical activity as a variable, Trost et al. (2003) determined that obese middle school children were less likely to report a physically active male parent or guardian in comparison to their non-obese counterparts.

In contrast, some studies have concluded that child physical activity behaviors are not related to parent behaviors or modeling (McGuire et al., 2002; Trost, Pate, Ward, Saunders, & Riner, 1999). Although physical activity time differed across ethnicity, McGuire et al. (2002) found no significant relationship between parental levels of physical activity and adolescent time spent in physical activity. In their model of parental influence on child physical activity, Trost et al. (1999) concluded child physical activity was not directly influenced by parental physical activity. One possible explanation for the disparities in the literature could be related to age-related differences. In a review of parenting roles for preventing childhood obesity, it is suggested that school-aged children may be less influenced by parental actions due to their growing independence (Lindsay, Sussner, Kim, & Gortmaker, 2006). One particular study supported this

assumption, by comparing regression models across three age groups by grade; 4-6, 7-9, and 10-12. (Sallis et al.,1999). Of the three models, the parental physical activity variable was significant only for the 4-6th grade model.

Although social support may vary due to age and gender, family support is crucial to physical activity participation across all ages in both males and females. In a systematic review of 34 studies looking at parental correlates and child physical activity, parental support was significantly correlated to child physical activity level (Gustafson & Rhodes, 2006). For example, in a survey of 10 year old children and their parents, in the model parental influence accounted for 20% in the variance of physical activity levels and the main effects for parental support were evident for children receiving more support (Welk, Wood, & Morss, 2003). Trost et al. (2003) evaluated a model of parental influence on physical activity, noting that parental support is an important correlate to youth physical activity levels, with direct relation to self-efficacy. Parental perceived importance of physical activity had the strongest association with parental support, suggesting that parents' judgment of physical activity influences promotion for participation in physical activity. Davison et al. (2003) examined parent influences in relation to girls' participation in physical activity. Results indicated that parental support was related to higher levels of physical activity. They found that mothers and fathers reported support through different methods. Mothers reported more logistic support, such as enrolling their daughters in sports or attending sporting events. Fathers reported more explicit modeling, for example, leading the family in an activity. Furthermore, high levels of physical

activity increased from 56% when one parent provided support, to 70% when both parents provided support. McGuire et al. (2002) investigated parental correlates of physical activity using an ethnically diverse adolescent sample. They reported that parental encouragement for physical activity was related to adolescents' physical activity behaviors. Likewise, Sallis, and colleagues (1999) found that family support for physical activity was a significant predictor of child's physical activity level, across groups from 4th to 12th grade.

Research addressing the impact children may have on their parent's physical activity levels is sparse, but the results of the existing literature are promising. Parents can be inspired by their children, participating in an intervention, to improve physical activity participation (Grey et al., 2004). By actively participating along with their child during an intervention, fathers lost weight themselves (Golan et al., 1998).

Family support has been documented as a major source of social support on physical activity (Carron, Hausenblaus, & Mack, 1996; Hooper & Veneziano, 1995), and the environment is an essential factor in modifying physical activity levels (Sherwood & Jeffery, 2000). Environments can be modified through increasing the promotion of physical activity, encouraging approaches to reduce sedentary behaviors, and fostering knowledge of physical activity.

Interventions to Increase Physical Activity

The literature regarding interventions to increase physical activity in children is somewhat limited with discordant results (O'Connor et al., 2009; van Sluijs et al., 2007). Few studies have focused on the family as an intervention

unit (O'Connor et al., 2009). Furthermore, most intervention studies have assessed physical activity using subjective methods, such as self report questionnaires or checklists (Caballero et al., 2003; Ford et al., 2002; French et al., 2005; Harrison, et al., 2006; Jurg et al., 2006; Manios et al., 2006; Nader et al., 1996; Saakslanti et al., 2004).

School Programs

The school health and physical education classrooms are the most commonly used setting for implementing programs to increase physical activity (Caballero et al., 2003; Harrison et al., 2006; Hopper et al., 2005; Jurg et al., 2006; Manios et al., 2006; Nader et al., 1996; Paradis et al., 2005; Sallis et al., 1997; Warren et al., 2003). Trained classroom and physical education teachers typically administer instructional strategies. Results of these studies suggest that well-designed physical activity interventions conducted in the physical education class are effective at increasing children's activity levels (CDC, 1999). Many of the interventions, targeting elementary children also supplemented the school program with an at-home element (Caballero et al., 2003; Harrison et al., 2006; Hopper et al., 2005; Jurg et al., 2006; Manios et al., 2006; Nader et al., 1996; Paradis et al., 2005; Sallis et al., 1997; Warren et al., 2003), but only some of these studies resulted in significant changes in children's activity levels at-home (Harrison et al., 2006; Jurg et al., 2006; Manios et al., 2006; Nader et al., 1996). The interventions that were successful at increasing physical activity levels cited the use of at-home activity packets (Nader et al., 1996), activity diaries (Harrison et al., 2006), and games (Jurg et al., 2006) to raise awareness on the importance

of increased knowledge about physical activity behaviors for both the youth and parents. Disparately, one family fitness program reported no significant results after using exercise and nutrition packets and rewards for completing activities at home (Hopper et al., 2005). One potential reason for lack of success was moderate parent participation in the home program. Other less successful interventions typically used weekly messages or newsletters targeted to parents, or homework for students as the at home materials (Sallis et al., 1997; Warren et al., 2003). Furthermore, many of the unsuccessful interventions included nutrition education along with physical activity, typically putting more emphasis on the nutrition component (Caballero et al., 2003; Hopper et al., 2005; Warren et al., 2003).

As the literature reveals, elementary school-based intervention studies have shown inconsistent results for increased physical activity levels of children (Caballero et al., 2003; Harrison et al., 2006; Hopper et al., 2005; Jurg et al., 2006; Manios et al., 2006; Nader et al., 1996; Paradis et al., 2005; Sallis et al., 1997; Warren et al., 2003). Although, many school-based interventions include the at-home environment, they are not seeing positive results, possibly limiting the maintenance of physical activity outside of school (Marcus et al., 2006). Nevertheless, some of the aforementioned studies made use of components that may increase parental participation and engagement. Providing at-home activity games and ideas, playing fun games with the participants, and encouraging activity diaries show promising results for increasing physical activity.

Community Programs

Other intervention studies have extended efforts to increase physical activity into the community, working with certain recreational groups or targeted populations. Studies include programs that were part of an after-school group (Kelder et al., 2005), Boy Scout troops (Jago et al., 2006), Girl Scout troops (French et al., 2005), an after-school and summer program intervention (Pate et al., 2003), and summer camp (Baranowski et al., 2003).

Most of the studies showed positive results for improving physical activity levels in the participants. The CATCH kids' club after-school program significantly increased children's moderate-to-vigorous physical activity levels (Kelder et al., 2005). Children at the intervention sites met physical activity requirements and were more engaged in physical activity when compared to non-intervention sites. The after-school program had a strong foundation in Social Cognitive Theory, including special components for modeling, monitoring, goal setting, contracting, skill training, practice, and reinforcement. The education modules focused on the children's' knowledge, skills, self-efficacy, and intentions. The Boy Scout badge program did not directly target families, but a study website was provided for goal setting and behavior change (Jago et al., 2006). The distinguishing aspects of this study were the 20 minutes of weekly direct involvement for the boys and the use of multi-media programming. Through these two channels, results showed slight increases in low intensity physical activity, and decreases in sedentary behavior (Jago et al., 2006). The Cal-Girls study, a behavioral intervention with 5th grade Girl Scout troops,

included both website activities and home-based activities. The girls were encouraged to participate in bone building activities with their families and to discuss nutrition and physical activity with family members (French et al., 2005). In the Cal-Girls study, there was an increase in weight-bearing physical activity over a two-year period, although there were no significant differences in the control and intervention groups (French et al., 2005).

Disparately, two studies using community-based interventions failed to significantly increase physical activity levels (Baranowski et al., 2003; Pate et al., 2003). The community after-school and camp program (Active Winners) showed no significant increases in physical activity levels (Pate et al., 2003). Although the program had four components, including an after-school program, summer camps, active home, and active community, it was suggested that the program was not implemented as planned and did not reach the intended participants (Pate et al., 2003). The Baylor GEMS summer camp, targeted 8-year-old African-American girls to attend a day camp and to participate in an internet program. Although no statistically significant changes were seen in either the treatment or control groups, results of the Baylor GEMS summer camp date revealed a trend in lowering BMI for the treatment groups. Eight-year old girls participating in the Baylor GEMS summer camp did not significantly improve physical activity levels at the end of the 12-week intervention, and the at-home internet program for both girl participants and parents was rarely utilized (Baranowski et al., 2003). Although results are dissonant, there is empirical evidence suggesting that interventions taking place in the community can successfully influence the

physical activity behaviors of children. Even though not all of the community interventions had statistically significant changes or similar components for comparison, each intervention demonstrated trends in positive improvements among the children. It appears that encouraging at-home activities and family participation can lead to increases in physical activity for children.

Family Based Interventions

Exclusive family based-interventions with children are sparse in the research literature. Of those that do exist, a majority are focused on pediatric obesity, with a major focus on weight loss through both changes in physical activity behaviors and changes in diet (Kitzmann & Beech, 2006). In two different studies examining the level of parental involvement necessary for positive change, it was concluded that it may be best to work with parents only when treating childhood obesity (Golan et al., 2006; Golan & Crow, 2004). In both studies reduction in weight was greater in the parent-only groups, but in an analysis of behavior change both groups increased physical activity and decreased time spent in sedentary behavior (Golan et al., 2006). In another family-based pediatric obesity study significant changes were reported in both groups (Epstein et al., 2000). Participants were taught positive reinforcement techniques for targeted behaviors, including physical activity in one treatment group and sedentary behaviors in the other. Both children and parents showed significant decreases in body weight from baseline to the trial completion. At the end of 2 years, children showed a 10.9% reduction of weight, while parents decreased percent body fat by approximately 4.4%. The participants also

reported increases in activity minutes and decreases in sedentary time. In a similar study, focusing on the reduction of sedentary behaviors, children reduced sedentary behavior and increased moderate to vigorous physical activity (Epstein et al., 2004). Parents were the mediators of either a stimulus or reinforcement for sedentary behaviors during the intervention, and it was reported that both methods were effective treatments for changes in behaviors and body mass index.

Of the reviewed interventions to increase physical activity in children and other family members, the child may be the major focus, a pair or dyad within the family may be the focus, or the entire family may be targeted. When the child was the major focus, with caregivers as supporters and monitors, physical activity levels improved (Saakslahti et al., 2004; Taggart, Taggart, & Siedentop, 1986) or time spent in sedentary behaviors was reduced (Ford et al., 2002). In a three-year intervention, parents participated in yearly meetings, received education materials, received activity posters and board games including parent-child activities and games, and participated in demonstrations and practical field experiences about appropriate activities (Saakslahti et al., 2004). As a result of the three-year intervention, children in the intervention group played more outside and increased their time spent in high-activity play. Furthermore, it was concluded that parents in the study were persuaded to have concern for their children's physical activity levels and were stimulated to encourage physical activity for their children. One of the family studies was concentrated on television viewing, although physical activity behaviors were

assessed (Ford et al., 2002). In this study looking at behavioral interventions to decrease television time, significant increases were reported for physical activity and slight increases for outdoor play-time in the behavior intervention group (Ford et al., 2002). Family participation was heavily encouraged through counseling sessions, discussions on television viewing, and television time-management skills training.

Generational dyads are a more recent, innovative approach suggested for physical activity interventions (Marcus et al., 2006). This type of intervention targets pairs within the family, such as mothers and daughters. Although limited research exists in this area, it is suggested that targeting intergenerational dyads may be feasible for intervention exploration. The BOUNCE program for Latino mother-daughter pairs appears to be the only intervention targeted toward grade school girls (Olvera, 2008). Only process evaluation results have been published and they reported that seventy-six percent of the participants completed the program. Based on a midway survey, acceptability of the program activities was very high for participants and instructors. Furthermore, the authors identified two significant barriers during the process; the need for child care of siblings, and the level of literacy among mothers. In a 12-week program targeting mother-daughter pairs, significant increases were reported in the participation of aerobic, muscular strength, and flexibility activities as well as significant improvements in the measured health related components (Ransdell et al., 2003). Furthermore, the authors concluded that a home-based program was as effective as a community-

based program for increasing physical activity and improving health-related fitness.

Physical activity interventions, focusing on all family members, were rarely documented in the literature. To date, only a few studies cited direct engagement of the parents as part of a family participatory program (O'Connor et al., 2009). Targeting the entire family through a community center-program was not a promising intervention for African-American families in Texas (Baranowski et al., 1990). Participation levels were low, and the experimental group participants did not increase habitual aerobic activity. The barriers to participation, mostly work and family conflicts, in the center-program were a strong contributor to program failure. In an earlier Family Health Project (Nader et al., 1983), twenty-four families, participated in a cardiovascular risk reduction education program over a three-month span. Families were educated on ways to make changes in nutrition and increase aerobic exercise. No main effects were reported for minutes of exercise, and there were no significant group differences in the physiological measures such as weight, blood pressure, fitness testing and blood lipid testing. However, perceived changes in exercise were higher in the experimental group when compared with the control group, and significant increases in the experimental group were seen in behavior changes related to support for exercise and dietary changes, suggesting mutual family support was increasing as a result of the treatment.

Based on the limited research for the effectiveness of family involvement in interventions promoting physical activity more research is needed to provide a

clearer understanding of what approaches and methods work. The prevention and treatment of childhood obesity is a public health priority, prompting the need for such programs.

Theory

Many of the intervention studies were based on theoretical models, while only a few of the reviewed, successful interventions named Social Cognitive Theory as the model for planning (Harrison et al., 2006; Kelder et al., 2005; Nader et al., 1996). In the “Switch Off-Get Active” program, the specific components targeting the particular constructs of SCT were listed, including budgeting screen time and addressing barriers for self-control (Harrison et al., 2006). Although they were unable to effect screen time, the program was effective for increasing physical activity and improving self-efficacy in primary school children. The Child and Adolescent Trial for Cardiovascular Health (CATCH) study home/family component was also based on the conceptual model of SCT (Nader et al., 1996). They provided “take-home” packets through the school that children completed outside of school. The packets were specified for each grade level and contained stories followed by a series of activities to be completed at home. Children, along with adult participants, documented and returned the activities they completed and received incentives for doing so. Students returned about 66% of their activity cards, yet dietary knowledge was the only measure that increased in the intervention group. Still, they found many positive effects as adult participation increased, including physical activity self-efficacy in minority students, and positive support for physical activity. The

CATCH Kids Club education component was also based on SCT constructs, including modeling, monitoring, goal setting, and practice and reinforcement (Kelder et al., 2005). Results were unanimously positive, and moderate to vigorous physical activity was significantly increased, however, only one of the psychosocial variables targeted, knowledge of food, reached statistical significance. Although some physical activity intervention studies define SCT as the framework for the intervention, details of how the theory constructs were operationalized is not always addressed.

Physical Activity and Assessment

Physical activity can be defined as “bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure” (Whaley, Brubaker, & Otto, 2006, p.3). Physical activity is a comprehensive behavior, because it includes exercise, sport athletic activities, occupational activities, household activities, and leisure or recreational activities (The Oxford Dictionary of Sports Science and Medicine, 2007), which can be achieved across a wide range of intensities. Typically, the benefits of physical activity are most advantageous at moderate to vigorous intensity. This study is designed to determine if families can influence one another’s physical activity overall, with little emphasis on intensity.

Subjective assessment. Most commonly, researchers use subjective assessment measures to determine physical activity in free-living individuals, which is also the case in the aforementioned intervention studies. Subjective assessment tools vary in subject and researcher involvedness, as well as time

frame. Independent subjective measures of physical activity, such as the questionnaire, may not be the most appropriate means for enumerating lower intensity, unstructured, lifestyle activities and the use of self-reported questionnaires tends to be complex for young children (Ward et al., 2007). Furthermore, the erratic nature of a child's activity participation may be difficult to evoke, compute, and categorize (Bailey et al., 1995). In all populations, it is sometimes difficult to assess lower intensity physical activities through the use of a questionnaire (Tudor-Locke & Myers, 2001). Lower intensity activities are difficult to recall, or may not be thought of as activity (Papaopoulou et al., 2003). Additionally, some questionnaires evaluate activity short term, or throughout a day while others evaluate activity long term, recalling activity over a year. Short-term questionnaires may fail to truly represent usual behavior, whereas long term questionnaires are more likely to promote recall bias.

Benefits exist for short-term and long-term questionnaires. Short-term questionnaires help reduce recall bias and validate well with objective measures. Long-term questionnaires correspond more accurately with usual activity and account for changes in season, illness, or other possible barriers (Kriska, & Caspersen, 1997).

Self-report instruments are most commonly used for collecting physical activity data, due to the low cost and large number of subjects that can be tested (Sallis & Saelens, 2000; Ward et al., 2007). In a thorough assessment of studies using self-report instruments for children, adults, and older adults, Sallis and Saelens (2000) concluded that several pre-existing instruments have reliability,

content validity, and relative criterion validity. Although results for self-report measures and objective measures in children have only moderate correlations, these types of instruments can be appropriate according to the research question, practicality, and importance of accuracy. Evaluating general activity habits through self-report measures is appropriate for determining whether a child is active or inactive. Also, combining self-report measures with objective measures may be acceptable for producing more accurate results (Welk, Corbin, & Dale, 2000).

Another concern of using self-report measures is the methodological issues that emerge if the instrument is used in a cross-cultural setting. Masse (2000) advocates that cultural appropriateness should be a construct at all levels of research. The addition of group specific-activities can strengthen instruments and better capture physical activity behaviors. Furthermore, validity increases when samples are equally distributed with similar variability across groups.

The activity diary is a reasonably accurate assessment of physical activity, and can provide a clear depiction of the activities completed (Harvey, 2002; Matthews, 2002; Williams, Klesges, Hanson, & Eck, 1989). Both objective and subjective circumstances, sometimes overlooked in other collection methods, can be captured using activity diary data and the contextual information can enhance the validity and reliability of the data (Harvey, 2002). It is recommended that journaling procedures for recalling physical activity with children should be conducted within two to three days, and that children can report activities and the

length of time they participated in physical activity (Ward et al., 2007). It is assumed that children can utilize daily physical activity diaries successfully.

Self-monitoring is a technique used to heighten awareness of personal physical activity behavior, thus augmenting behavior change. As people self-monitor, they identify patterns in activity or inactivity, which may lead to the identification of barriers limiting their participation in physical activity. Identifying barriers to physical activity initiates problem solving approaches for overcoming the lack of engaging in a physically active lifestyle. They also identify benefits of being active by determining cost benefits of physical activity by weighting barriers to benefits (Leermakers, Dunn, & Blair, 2000).

The vast majority of intervention research to date used a subjective measure of physical activity such as self report questionnaires or checklists (Baranowski et al., 2003; Caballero et al., 2003; Ford et al., 2002; Harrison, et al., 2006; Jurg et al., 2006; Nader et al., 1983; Nader et al., 1996; Paradis et al., 2005; Pate et al., 2003; Saakslahiti et al., 2004; Sallis et al., 1997; Warren et al., 2003), activity interviews (Baranowski et al., 1990; French et al., 2005; Manios et al., 2006), and activity diaries (Saakslahiti et al., 2004). In some studies, parents were responsible for recalling or reporting children's physical activity levels (Ford et al., 2002; Manios et al., 2006; Saakslahiti et al., 2004; Warren et al., 2003). Over half of the reviewed intervention studies used subjective measures to show positive increases in physical activity levels in participating children (Caballero et al., 2003; Ford et al., 2002; French et al., 2005; Harrison, et al., 2006; Jurg et al., 2006; Manios et al., 2006; Nader et al., 1996; Saakslahiti et al., 2004), with the

highest percentage of positive results for those who used interviews and diaries (French et al., 2005; Manios et al., 2006; Saakslanti et al., 2004). However, results from some of these studies did not completely fulfill goals set forth by the intervention. For instance, Jurg and colleagues (2006) included children in grades 4, 5, and 6 in the intervention, but only students in grade 6 had significant increases in physical activity levels. In another school-based intervention, physical activity increases were primarily seen in boys, with no significant changes for girls (Manios et al., 2006). In one of the community-based studies, utilizing Girl Scout troops, there were overall increases in physical activity levels, but there were no differences across the intervention and control group (French et al., 2005). Two of these studies mentioned self-report measures as a potential weakness or limitation (French et al., 2005; Jurg et al., 2006).

Objective assessment. In recent years, objective measures of physical activity have been developed and more widely used. Electronic devices, such as pedometers and accelerometers, have been cited as having the capability to provide considerable benefits when compared with subjective measures, such as self-report (Carron, Hausenblas, & Estabrooks, 2003). Objective measures have been useful in providing quantitative data about physical activity behaviors.

Pedometers are an inexpensive, simple digital apparatus that can provide accurate, objective measures of walking behaviors. Pedometers provide data on the number of steps taken or distance walked, which then must be reported by the user. Numerous studies have been conducted in support of the validity of the pedometer (Bassett et al., 2000; Behrens & Dinger, 2005; Rowe, Mahar,

Raedeke, & Lore, 2004; Schmidt, Blizzard, Venn, Cochrane, & Dwyer, 2007; Tudor-Locke, Williams, Reis, & Pluto, 2004). Studies have shown the correlation of pedometers to walking, accelerometer data (Bassett et al., 2000), heat-rate estimated energy expenditure (Eston, Rowlands, & Ingledew, 1998), and indirect calorimetry (Crouter, Schneider, Karabulut, & Basset, 2003). After reviewing multiple studies on pedometers as a motivational tool, Bravata and colleagues (2007) concluded that short term changes in physical activity, body mass index, and blood pressure can result from the use of a pedometer and step goals.

On the other hand, the use of a pedometer to measure physical activity is not without limitations. Pedometers do not produce data on patterns of activity, nor can a pedometer determine exercise intensity. Pedometers accurately count steps, but cannot differentiate between walking and running. Therefore, the pedometer does not allow a person to determine intensity or energy expenditure (Bassett, 2000). Pedometers cannot measure activity during activities such as cycling, weight lifting, and swimming (Storti, 2007).

Although limitations do exist, pedometers have been documented as appropriate for use in epidemiological studies (Bassett, 2000). When using pedometers in large population interventions, data errors can be lessened with consistent data collection and interpretation. Schmidt and colleagues (2007) suggested the following means for addressing methodological issues and improving the validity of heart rate data: (a) determining a minimum acceptable wear time, (b) clearly publishing and advertising the wear time, and (c)

thoroughly explain how extremely high and low step values are treated in a study to resolve unidentified error issues.

Few of the examined intervention studies chose to utilize objective measurements of physical activity behaviors, but the accelerometer was consistently the chosen electronic device (Baranowski et al., 2003; Cabllero et al., 2003; Jago et al., 2006; Sallis et al., 1997). In general, none of the interventions using objective measures observed improvement of targeted physical activity. The Sports, Play, Active Recreation for Kids (SPARK) program targeted both school physical education classes and outside of school physical activity (Sallis et al., 1997). Although the program was able to help participants increase minutes engaged in activity for specialist or teacher led physical education classes, there was no stimulus on physical activity outside of school. The school-based intervention, Pathways, which also utilized SPARK curriculum, reported no differences in accelerometer data between the intervention schools and control schools (Caballero et al., 2003). Unlike many of the other interventions, Jago and colleagues (2006) chose to target Boy Scouts, limiting their participants to males only. Although subjects reduced sedentary behavior and increased light intensity physical activity, the aim of the study was to cultivate moderate to vigorous physical activity with anticipation of reducing body mass index. Consequently, researchers did not attain the desired effect of the intervention. Likewise, the Baylor GEMS summer camp (Baranowski et al., 2003) for 8-year-old African American girls failed to show significant differences between control and treatment groups physical activity levels, although physical

activity levels were substantially different between the two groups, with a positive trend in the hypothesized direction for the treatment group. Unlike the others, one intervention utilized a direct observational method, SOFIT, to determine children's physical activity levels during playground time (Kelder et al., 2005). Children at intervention sites significantly increased time spent in moderate-to-vigorous physical activity (MVPA), to over 50% of active time, and reduced time spent in sedentary behaviors such as sitting and standing. Structured lessons with various activities were provided, and led by trained teachers.

Even fewer of the reviewed studies used both objective and subjective measures to assess physical activity levels (Baranowski et al., 2003; Caballero et al., 2006; Sallis et al., 1997), and the results were discordant. Furthermore, there were some discrepancies in one of the studies. Caballero and colleagues (2006) were able to show improvements in self reported physical activity, but not in accelerometer readings.

Self-efficacy

Self-efficacy can be defined as “the confidence a person feels about performing a particular activity, including confidence in overcoming the barriers to performing that behavior” (Baranowski et al., 2002, p. 173). Therefore, the likelihood of a person to change a particular behavior is, in some measure, determined by confidence in their potential to do so (Bandura, 1995). Self-efficacy is one of several constructs in Bandura's SCT model, but tends to be the strongest predictor of behavior change. The intent to engage in or to adopt certain health behaviors is positively associated with ones' personal efficacy

beliefs. It is suggested that stronger self-efficacy beliefs characteristically imply more intense effort and determination. Furthermore, self-efficacy is commonly thought of as situational, meaning that it changes depending on the particular circumstances (Lox, Martin, & Petruzzello, 2010). Research has long established that self-efficacy is a strong predictor of intent and adoption of particular health behaviors, including physical activity (Bandura, 1995; Dzewaltowski, 1989).

Children's' self-efficacy in relation to exercise was examined in a number of the studies (Baranowski et al., 1990; Caballero et al., 2003; Harrison et al., 2006; Jago et al., 2006; Jurg et al., 2006; Kelder et al., 2005; Nader et al., 1996; Pate et al., 2003), with mixed results. Changes in self-efficacy were minimal, limited to only two studies, both school based interventions (Caballero et al., 2003; Harrison et al., 2006). Furthermore, subjects for both studies were dissimilar to the ethnic makeup in the United States. Although self-efficacy was measured, many of the intervention descriptions did not address the procedure or specific details related to exercise self-efficacy. It is possible these interventions did not directly attempt to affect self-efficacy, but they measured the variable to determine changes resulting from the intervention. In a meta-analysis of interventions to improve physical activity self-efficacy for adults, it was determined that interventions including vicarious experiences and feedback on past performance produced the most significant changes (Ashford, Edmunds, & French, 2010). Significant improvements in self-efficacy were noted when vicarious experiences were included in the interventions, yet this component was seldom incorporated in the intervention schemas.

Other Limitations

Other variables that were not apparent throughout the reviewed intervention studies included, gender effects, single versus dual parental support, and ethnicity. These factors may limit success or may be confounding variables influencing results.

Overall, there are strong correlations between gender and physical activity. Evidence considerably shows girls tend to have lower physical activity levels than boys (Garcia et al., 1995; Moore, Lombardi, & White, 1991; Sallis et al., 1993; Trost et al., 2003; Welk et al., 2003). Some studies found boys receive more support and facilitation to exercise from parents (Trost et al., 2003; Welk et al., 2003). Trost et al. (2003) showed parents placed more importance on physical activity of boys than girls. Furthermore, research suggests parents show more support and encouragement for boys for physical activity than girls (Trost et al., 2003; Welk et al., 2003).

Results as to whether gender of the child is a factor in parent-child physical activity levels have been conflicting. Child physical activity behaviors are strongly correlated to father's activity levels (Davison et al., 2003; DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham, 1998; Freedson & Evenson, 1991; Moore et al., 1991). Father explicit modeling is correlated to higher levels of physical activity in girls (Davison et al., 2003). Also, father physical activity behaviors are indicators of physical activity behaviors in male children and adolescents (Campbell, et al., 2001). Fathers have an influence upon child physical activity levels through modeling and attitudes toward physical activity (DiLorenzo et al.,

1998). Moore et al. (1991) found children of active fathers were 3.5 times more likely to be active than children with inactive fathers.

Single parent and dual parent support has also been cited in research literature (Cleland et al., 2005; Davison et al., 2003; Freedson & Evenson, 1991; Moore et al., 1991). Davison et al. (2003) reported high levels of physical activity increased from 56% when one parent provided support, to 70% if both parents provided support. Controlling for parent gender in families where one parent provided support, there was no evidence that parent gender mattered. This situation was validated in an earlier study that found when both parents were categorized as highly active, 93-97% of children were also highly active (Freedson & Evenson, 1991). Similarly, Moore et al. (1991) showed that children with only one active parent were 3.5 times as likely to be active as children from families in which neither parent was active. In relation to sports participation and cardiorespiratory fitness, Cleland et al. (2005) found that having two active parents was associated with increases in both variables. Once again, when only one parent was active, gender did not matter.

Research involving ethnicity and influences on physical activity behaviors is scarce, and conclusions from these studies are conflicting (Frenn et al., 2005; Garcia et al., 1995; Olvera et al., 2008; Pate et al., 1997; Sallis et al., 1993). Few studies examined ethnicity as it relates to parental and child physical activity correlates; furthermore, findings from existing studies were inconsistent. Using a questionnaire with a predominantly African-American group of children, Pate et al. (1997) found no correlation between child and parent physical activity levels.

Examining the effects a Health Promotion/Transtheoretical Model with African-American and Hispanic seventh graders, Frenn et al. (2005) found Hispanic females perceived less support than African-American classmates. Disparately, studies have found no significant differences in physical activity levels when accounting for ethnicity (Garcia et al., 1995; Sallis et al., 1993). One more recent study, involving Latino intergenerational dyads of mothers and daughters reported moderate participation levels, and satisfaction from the participants, suggesting that family based interventions may do well with Latino families (Olvera et al., 2008).

In general, many intervention studies used ethnically homogenous groups, while some ethnic groups were disregarded. Several of intervention studies were conducted in foreign countries, limiting the generalization to American populations. Furthermore, many United States studies failed to use a sample representative of the country's population. Of studies completed in the U.S., only three used subjects from a variety of ethnic backgrounds (Kelder et al., 2005; Nader et al., 1983; Nader et al., 1996). Others were limited to a large percentage of white subjects, African American subjects, or American Indian subjects.

Maintaining an appropriate level of physical activity is essential in preventing or reducing obesity and other health related problems. Fostering physical activity during childhood and adolescence can transmit into adulthood. In addition, it has been suggested that family-based interventions may serve to increase physical activity levels in children and adults. Past family-based physical activity interventions have resulted in modest outcomes and discordant results,

thus there is a need to construct more theoretical-based interventions. This study evaluated the effects of an education intervention to improve the families' level of physical activity and exercise self-efficacy.

CHAPTER III

METHOD

This research study utilized concepts from the conceptual frameworks of social cognitive theory and family reciprocal determinism. The purposes were to implement and evaluate the use of an education intervention to increase participants' level of physical activity, to determine which treatment, the parent-only treatment or the parents-children treatment, is better for increasing the levels of physical activity, and to determine which treatment is more effective for improving exercise self-efficacy in all participants. This chapter includes the sample size, instrumentation, research design, and procedures used to explore families influence over one another with regards to physical activity and exercise self-efficacy.

Participants

The participants for this study consisted of families recruited from a city in Central Texas and surrounding areas. Families were recruited utilizing print media through community centers, local churches, a public library, the Parks and Recreation Department, public schools, the local public university, the local chapter of the Girls Scout Organization, the local hospital, the local housing authority, and other clinics or centers in the Central Texas city. In order to increase program enrollment, additional families were given flyers through public

schools in surrounding cities. Over 2000 flyers were distributed in the geographic area during the year-long recruitment effort. The researcher also made phone calls to many local organizations, community leaders, and program directors to obtain names and contact information for potential participants. Additionally, participants were recruited face-to-face during at least nine community events. Although over 75 families signed up and committed to participate, only 24 attended the first meeting and participated in baseline assessments. Family profiles are summarized in Table 1. After five separate intervention groups, the baseline sample size included 64 participants; 38 children and 26 parents. The small sample size was a reflection of the limited resources, but is consistent with sample sizes used in earlier significant intervention studies (Baranowski et al., 2003; Ford et al., 2002; Golan et al., 2006). The criteria for participation included: 1) at least one child in the family must have been above the age of 6, 2) at least one parent/guardian agreed to attend program meetings, 3) no family member could currently be participating in a weight loss program, 4) the family must have ability to participate in physical activity, excluding those with health limitations, 5) the participants must have the ability to communicate in English, and 6) the family planned to remain in the geographical area over the next two years. Families were offered a variety of incentives for program retention, including a gift certificate upon assessment completion, and prize drawings at each session for attendance and participation.

Written informed consent and assent was obtained from all participants prior to participation in the study. Children were first asked for assent, and only

after their assent, parental participation and consent was obtained. This study was approved by the university's Institutional Review Board and all aspects of the intervention were compliant with guidelines for working with human subjects.

Participants were assigned to a treatment group, either the parents-only group (POG, n= 29) or the parents- children group (PCG, n= 35), according to when they signed-up for the study. Due to small participant numbers, convenience sampling was used. Treatment groups were formed as enough families volunteered for the program to warrant a group.

Table 1

Family Profiles

	Men	Women	Children	Ethnicity	Compliance
Family 1	0	1	1	Hispanic	Completers
Family 2	0	1	1	White non-Hispanic	Completers
Family 3	0	1	1	Hispanic & African-American	Non-completers
Family 4	0	1	3	Hispanic	Non-completers
Family 5	0	1	2	Hispanic	Completers
Family 6	0	1	1	Hispanic	Completers
Family 7	0	1	3	Hispanic	Completers
Family 8	0	1	1	Hispanic	Completers
Family 9	0	1	1	White non-Hispanic	Completers
Family 10	0	1	1	Hispanic	Non-completers
Family 11	0	1	2	Hispanic	Non-completers
Family 12	0	1	2	Hispanic	Non-completers

Table 1 (continued)

	Men	Women	Children	Ethnicity	Compliance
Family 13	0	1	3	White non-Hispanic	Completers
Family 14	0	1	2	Hispanic	Completers
Family 15	0	1	2	Hispanic	Completers
Family 16	1	1	1	Hispanic	Non-completers
Family 17	0	1	2	White non-Hispanic	Completers
Family 18	0	1	1	White/Hispanic	Completers
Family 19	0	1	1	White non-Hispanic	Completers
Family 20	0	1	1	White non-Hispanic	Non-completers
Family 21	1	1	2	Hispanic	Completers
Family 22	0	1	1	Hispanic	Completers
Family 23	0	1	2	White/Hispanic	Non-completers
Family 24	0	1	1	White/Hispanic	Completers
Total	2	24	38		

Materials

A calibrated physician scale was used to obtain weight and a mechanical stadiometer was used to determine height. Subjects were weighed wearing light clothes and no shoes. Body mass index (BMI) was calculated using the standard formula [weight (kg) / height (m)²].

The Digi-walker power walker by Yamax © was used to objectively measure physical activity participation. Pedometers are a valid instrument for assessing physical activity (Bassett et al., 2000; Behrens & Dinger, 2005; Rowe et al., 2004; Schmidt et al., 2007; Tudor-Locke et al., 2004) as compared to both indirect calorimetry (Crouter et al., 2003) and accelerometer data (Bassett et al., 2000). The Digi-walker has two primary modes: the simple mode is for measuring all levels of intensity, whereas the power mode will only measure high intensity physical activity levels. For the current study, participants kept the pedometer on the simple mode. The device is placed in the pocket or clipped to the pants.

Testing Procedures

Participants completed the pre- and post-tests at the intervention site, which was an independently different location for each intervention group. All eligible participants attended a preliminary meeting to collect baseline data. During the 45-minute baseline assessment, participants: 1) were informed about the details of the study, 2) completed informed consent and assent forms, 3) completed demographic questionnaires, self-efficacy instruments, and self report activity questionnaires, 4) were measured for height and weight, and 5) were given a pedometer and instructed on how to wear the device, read, and record

data. All measurements and post intervention questionnaires were repeated at the conclusion of the eight-week education sessions. The participants were asked to wear the pedometers for seven consecutive days, which was established as an appropriate protocol for both children and adults (Clemes & Griffiths, 2008; Ward, Evenson, Vaughn, Rodgers, & Troiano, 2005).

Adult participants' exercise self-efficacy was measured using a previously validated Exercise Self-Efficacy instrument (McAuley, 1993). It is a 13-item scale used to measure one's perceived confidence to overcome barriers to exercise, with a possible range of scores 0-100 (Appendix F). Participants rated their level of confidence that they would exercise if a variety of events were to occur such as bad weather, exercising alone, schedule conflicts, personal stress, or disinterest in the activity. The confidence ratings are associated with a 0-100 scale, where 0 is not at all confident, 50 is moderately confident, and 100 is highly confident. The previously reported internal consistency was .98 (Marquez & McAuley, 2006). Physical activity was measured subjectively using the International Physical Activity Questionnaire. Details of the questionnaire, management and scoring can be found on the IPAQ website (www.ipaq.ki.se). The IPAQ uses self-reported data to estimate physical activity over the one week time period. The test-retest reliability of the IPAQ is $\rho=0.96$ and the criterion validity is $\rho=0.52$ (Craig et al., 2003).

Children's exercise self-efficacy was measured using the adapted Self-efficacy for Physical Activity Scale, a previously validated 8-item instrument used with children (Motl, et al., 2001; Ward et al., 2007). The reported internal

consistency reliability using coefficient alpha was 0.74 and 0.88 for Caucasian and Hispanic youth respectively (Bartholomew, Loukas, Jowers, & Allua, 2006). Participants rate their exercise confidence according to a 3-point Likert scale (Disagree, Neither agree or disagree, and Agree) on items such as “I can do active things because I know how to do them” (Appendix F). Physical activity was measured subjectively using the 3-Day Physical Activity Recall instrument, calculating 30 minute blocks of moderate-to-vigorous activity over the 3 days. The test-retest reliability for the instrument is 0.98 (Weston, Petosa, & Pate, 1997).

The variables for this study are shown in Table 2.

Table 2

Variables in the Study

Variable	Level of Measurement	Values	Description	SCT
Pedometer	Interval	0 to 18363 steps	Collected participant data	Outcome
Intervention Group	Categorical	Parent-only group (POG) Parent-child group (PCG)	Convenience sampling	Knowledge
Ethnicity	Categorical	African American, Asian/Pacific Islander, Hispanic, Native American/Alaskan Native, White	As identified by the State of Texas	Extraneous

Table 2 (continued)

Variable	Level of Measurement	Values	Description	SCT
Exercise Self-efficacy	Ordinal		Based on a previously developed instrument	Self-efficacy
Gender	Categorical	Female, Male		Extraneous
Physical Activity Recall	Ordinal		Based on a previously developed instrument	Barriers & Facilitators

Intervention

The program spanned over eleven total weeks for each treatment group. Table 3 outlines the timetable and procedures of the intervention. Baseline and final measurements were collected prior and post intervention, respectively. The education intervention consisted of eight weeks. Participants attended seven separate sessions during the eleven weeks, allocating one week for pre-testing and two weeks for post-testing procedures and four separate group education sessions.

The parents-only treatment included meetings between the researcher and parents for four separate 60-minute education sessions spread out over an eight-week period. The parents-children treatment group included meetings between the researcher and participating family members living in the home. The participants attended four separate 60-minute education sessions spread out over an eight-week period. The researcher's K-12 teaching background provided

the expertise needed to modify sessions to include age- appropriate material for children. The researcher used simpler language and modified activities to include the children in the PCG. Visuals were provided and references were made meaningful/pertinent to the participants. Child care was provided for any children less than six years of age.

Following the eight-week intervention, during week eleven, participants completed the same assessments as the baseline assessment, returned pedometers, and completed a program survey. Incentive drawings occurred during each education session and at the conclusion of the intervention for participants who were involved throughout all of the education sessions and completed all baseline and post intervention assessments.

Table 3

Summary of Intervention Design and Agenda

Week	Procedures
Week 1	Introduction to the Program Baseline Measurements Pedometers Issued to Participants
Week 2	1 st Session: Energize our families- Getting Started Activity Journal Distribution and Discussion Activity: Yoga with Kids
Week 3	No Sessions
Week 4	2 nd Session: Find Fun in Physical Activity-Energy Out Distribution & Explanation of 1st Activity Calendar Activity: Chair Exercises
Week 5	No Sessions
Week 6	No Sessions
Week 7	3 rd Session: Less Sit, More Fit-Decrease Screen Time and Increase Energy Out Distribution & Explanation of 2 nd Activity Calendar Activity: "The Dice Game"
Week 8	No Sessions
Week 9	4 th Session: Maintain a Healthy Weight for Life Distribution & Explanation of 3 rd Activity Calendar Activity: "Family Activity Bingo"
Week 10	Participants picked up the Pedometers
Week 11	Post Test Measurements Return Pedometers Exit Survey Celebration

Program Protocol

The education curriculum was derived from a series of lessons from the Ways to Enhance Children's Activity and Nutrition (WeCan!) program developed and provided by the Department of Health and Human Services and the National Institutes of Health (NIH, n.d.). The curriculum was created by researchers, public health leaders, nutritionists and dieticians, health communicators, youth marketing experts, and community centers nationwide. The curriculum was planned using research from peer reviewed journals, reports on childhood obesity, and the results of a large-scale workshop on obesity prevention. The national program was also based on sound theoretical principals of behavior change, including the Social Cognitive Theory. WeCan! focuses on parents and primary caregivers because of their influence on children and their position as role models. The curriculum uses hands-on activities focused on teaching participants essential skills to facilitate their family's efforts to become more physically active. Furthermore, families are encouraged to try new physical activities together and share their experiences at the next meetings. In initial evaluation of program effectiveness, significant increases were reported for physical activity knowledge, physical activity attitudes, physical activity behaviors, screen time attitudes, and screen time behaviors (WeCan! Progress Report, 2007).

The WeCan! curriculum engages parents through parental engagement, support, and modeling, which are all strongly supported environmental influences noted in the literature (McMinn et al., 2008; Ornelas et al., 2007; Trost et al.,

2003). In addition to the prepared curriculum, the researcher incorporated the use of activity calendars, in-class demonstrations of appropriate physical activities, and activity diaries based on success in previous studies (French et al., 2005; Harrison et al., 2006; Nader et al., 1996; Saakslanti et al., 2004).

Each of the program objectives, which were developed for separate lessons, can be linked to specific constructs of Social Cognitive Theory, as seen in Table 4. The first session focused on conveying the important role of the family in behavior change, and ways family can support behavior change. Participants discussed the importance of being a positive role model, how to create a healthy home environment, and how to encourage family decision-making. During the first session, families received activity journals and the participants were encouraged to utilize the journal daily throughout the 8 weeks as a personal tool. The categories in the journal included: 1) the type of activity 2) the duration of the activity, 3) the intensity of the activity based on rating of perceived exertion, 4) who they participated with during physical activity, 5) their feelings about physical activity that day, and 6) a documented reason if they did not participate in physical activity. The journals were not used for data collection, but as an education tool to increase adherence. Participants were given a handout on yoga exercises with kids and the exercises were demonstrated and performed during the session.

Session two focused on reasons to do physical activity, ways of adding physical activity into daily lives, ways to overcome barriers to being physically active, and recommendations of physical activity for adults and children. During

session two participants were given an activity calendar with activities for each day between sessions. A handout on chair exercises was distributed to participants and the exercises were demonstrated by the facilitator and performed by the participants during the session.

The third session focused on sedentary behaviors and awareness of screen time of all participants. Participants discussed ways to limit screen time and generated lists of physical activities the family could do instead of screen time. During the session, participants were given an activity calendar with activities for each day between sessions. Participants participated in one of the activities from the calendar called “The Dice Game”.

The final session was a wrap-up session. Participants were given information to help handle setbacks and stay motivated. Participants also received resources for sustaining a physically active lifestyle and an activity calendar with activities for the final days of the intervention. They played a game from the activity calendar called “Family Activity Bingo”.

During the post-testing, participants completed an exit survey. The survey, “Parent Program Participant Feedback Form”, was part of the WeCan! community curriculum package.

Table 4

Application of the Social Cognitive Theory (SCT) to Lesson Objectives

Lesson	Lesson Objectives/Elements	SCT Constructs
1	Describe the important role that family plays in learning new behaviors.	Reciprocal Determinism Facilitation Collective Efficacy
	Define and give examples of ways to support behavior change.	Self-Efficacy Facilitation
2	List 3 reasons that being physically active is fun.	Outcome Expectations
	Identify 3 ways of adding physical activity into family's daily lives.	Self-Efficacy Facilitation Reciprocal Determinism
	List 3 ways to overcome challenges to getting more physical activity.	Reciprocal Determinism Self-Efficacy Facilitation
	Identify the amount of time that adults and children should be physically active.	Facilitation
3	Assess the amount of time family members spend in front of screens.	Facilitation Self-Regulation
	List 3 ways the family can limit screen time to no more than 2 hours per day.	Self-Regulation Self-Efficacy Facilitation
	List 3 physically active things they can do instead of screen time.	Self-Efficacy Facilitation
4	List ways to handle setbacks and stay motivated to maintain a physically active lifestyle.	Self-Efficacy Facilitation Self-Regulation
	Identify 3 resources to go to for more information about maintaining a physically active lifestyle.	Facilitation Self-Regulation

Data Analysis

After collecting all data, the researcher reviewed each response sheet to identify unusual responses or other problems. Next, the researcher entered data into the SPSS statistical software package (version 12.0 for windows). The data obtained from the participants were analyzed using descriptive, correlational, and mean comparisons statistical methods. Frequency distributions and descriptive statistics were produced.

A Pearson's correlation was used to determine the relationship between the self-report physical activity data and the objective pedometer data for the participants. A paired-samples t-test was performed to assess changes in self-reported physical activity from pre- to post-testing for all participants.

Independent samples t-tests were used to detect differences in self-reported physical activity between groups. A Pearson's correlation was performed to determine the relationship between attendance and self-report physical activity data for all participants. A paired-samples t-test was performed to assess changes in pedometer readings from pre- to post-testing for all participants. Treatment group and role (parent or child) changes in pedometer readings from pre- to post-testing were analyzed using an independent samples t-test. A Pearson's correlation was performed to determine the relationship between attendance and pedometer readings for all participants.

A paired-samples t-test was used to examine changes in weight from pre- to post-testing. Independent samples t-tests were conducted to examine differences between treatment groups.

To determine changes in exercise self-efficacy from pre- to post-testing, paired samples t-tests were performed. To determine differences in exercise self-efficacy change (pre- versus post-test) by group, independent samples t-tests were performed.

CHAPTER IV

RESULTS

Although 24 families attended the first meeting, only 16 completed the study. Completers were defined as those participants who attended the final session and completed one or more of the post assessments. Most of the participating parents were women (92%), while all parent participants identified as completers were women (100%). The majority of the participants were Hispanic (60%) and more than half (57%) had a BMI ≥ 26.9 mg·kg⁻² at baseline. Despite the researcher's best efforts to facilitate participation, 24 of the initial 64 participants did not complete the program (62% retention rate). Out of 4 education sessions, only 17% attended all 4 sessions, while 25% attended 3 sessions, and 58% attended 2 or fewer sessions.

Of the 40 participants completing the study, 20 participated in the parents-children group (PCG) and 20 participated in the parents-only group (POG). The children in the PCG and POG were between six and 18 years old (M= 12, SD= 3.86 and M= 9.83, SD= 3.56 respectively). The BMI range at baseline for the children in the PCG was 14 to 30 mg·kg⁻² (M=22.08, SD= 5.45). Children in the POG had a baseline BMI range of 16 to 35 mg·kg⁻² (M=23.13, SD=6.13). No statistically significant differences between the groups were detected in any of the baseline characteristics measured.

The parents in the PCG and POG were between 28 and 54 years old (M= 39.88, SD= 8.59 and M= 37.50, SD= 7.33 respectively). The BMI range at baseline for the parents in the PCG was 24 to 40 mg·kg⁻² (M=32.25, SD= 6.18). Parents in the POG had a baseline BMI range of 24 to 53 mg·kg⁻² (M=35.29, SD=10.39). Most of the women in this study (69%) were married or living with a partner, had a high school diploma or GED (94%), and were currently employed (88%). There were no baseline differences in parent characteristics between groups. Not all participants completed all of the assessments; therefore, variation in sample size is apparent for some variables. Participant characteristics are summarized in Table 5.

Table 5

Participant Demographics-Completers

	Total (n = 40)	Parents (n= 16)	Children (n=24)
Mean Age (SD)	22.6 (14.8)	38.69 (7.8)	10.9 (3.8)
Treatment Group (#)			
POG	20	8	12
PCG	20	8	12
Gender (#)			
Male	7	0	7
Female	33	16	17
Ethnicity (#)			
White- non-Hispanic	14	6	8
African- American	0	0	0
Hispanic	24	10	14
White-Hispanic	2	0	2

Physical Activity Participation

For each participant, the average daily pedometer steps were recorded in the first week and final week. Not all participants wore the pedometer each day. For days when no steps were recorded, those days were treated as missing data. The obtained range of the average daily pedometer measure was 1958-11869 steps per day. Table 6 presents changes in physical activity, measured by pedometer and self-report data for all participants. The Pearson's correlation test revealed no correlation in the self-report data and pedometer data for the children ($r=.299$, $p=.472$) or for the adults ($r=.239$, $p=.480$).

Table 6

Paired t-test of Physical Activity

Variable	Pre-test Mean \pm SD	Post test Mean \pm SD	<i>t</i>	<i>df</i>	<i>p</i>	<i>r</i>
Pedometer Steps	5970.10 \pm 3451.24	4529.76 \pm 1982.88	2.10	21	.048	.40
Child Self-report (MVPA/day)*	7.01 \pm 4.35	7.31 \pm 5.70	-.22	13	.826	.10
Adult Self-report (METs \cdot min \cdot wk $^{-1}$)	867.88 \pm 1027.97	1108.70 \pm 1113.86	-1.04	12	.317	.30

* MVPA, moderate to vigorous physical activity; average number of 30 minute blocks with activity of ≥ 3 METS

The adults averaged 868 METS \cdot min \cdot wk $^{-1}$ (SD=2285) during the baseline assessments and 1109 METS \cdot min \cdot wk $^{-1}$ (SD=1110) during post assessments. According to the existing guidelines for the International Physical Activity Questionnaire, the adults in the study were considered “moderately active”. The category of moderately active is described as “5 or more days of any combination

of walking, moderate-intensity or vigorous-intensity activities achieving a minimum of at least 600 MET-minutes/week” (www.ipaq.ki.se). The average number of 30 minute blocks of activity reported by children were 7.01 (SD=4.35) during baseline assessments and 7.31 (SD=5.70) during post assessments. The children spent approximately 3.5 hours in moderate-to-vigorous activity per day during both pre-and post-testing. These reported averages are above the 60 minutes per day recommended for children (USDHHS, 2008). There was no significant correlation between self-report data and attendance for parents ($r=-.01$, $p=.98$) or for children ($r=-.59$, $p=.22$).

The average daily steps for all participants was 5250(SD=2308). The average daily steps by role, parent or child, was 5760 (SD=1663) and 4637 (SD=2877), respectively. These reported averages are well below the recommended 10,000 steps per day (Tudor-Locke & Bassett, 2004). When looking at pedometer steps in relation to attendance, attendance was positively related to an increase in pedometer steps ($r=0.497$, $p=.050$), indicating that participants attending more education sessions accumulated more steps than their peers.

The first research questions examined whether or not participants would increase physical activity levels as result of participation in the education intervention. Tables 7 and 8 present the physical activity means and standard deviations data for all participants. The paired samples t-test revealed no changes in self-reported physical activity from pre- to post-test for the children ($t=-0.22$, $df=13$, $p=0.83$) or for the adults ($t=-1.04$, $df=12$, $p=0.32$). In order to

compare the two treatment groups, a new variable was calculated (Change). Change was the difference in self-reported physical activity at the end of the program from self-reported physical activity at the beginning. Independent samples t-tests were used to detect differences between treatment groups. No differences between groups were detected for changes in self-reported physical activity for the children ($t=.30$, $df=12$, $p=.77$). Children in the POG reported a slight decrease in self-reported physical activity from 8.63 (SD=1.72) to 8.56 (SD=2.52), while children in the PCG reported a slight increase in self-reported physical activity from 4.86 (SD=2.52) to 5.64 (SD=1.13). The data for children represent 30 minute blocks of moderate-to-vigorous physical activity (MVPA) per day. Children in the POG reported more time in MVPA than children in the PCG during pre-testing (4.5 hours and 2.5 hours, respectively) and during post-testing (4.5 hours and 3 hours, respectively). No differences between groups were detected for changes in self-reported physical activity for the adults ($t=-1.33$, $df=12$, $p=.21$). Parents in the POG reported an increase in self-reported physical activity from 764 METS·min·wk⁻¹ (SD=905) to 1232 METS·min·wk⁻¹ (SD=1382), while parents in the PCG reported a decrease in self-reported physical activity from 989 METS·min·wk⁻¹ (SD=1233) to 965 METS·min·wk⁻¹ (SD=799).

The paired samples t-test revealed a small decrease in the pedometer readings ($t=-2.10$, $df=21$, $p=.048$) from pre- to post-test for all participants. In order to compare the two treatment groups, a new variable was calculated (Change). Change was the difference in steps measured at the end of the

program from steps measured at the beginning. A statistically significant difference in Change among groups from pre- to post-test for pedometer readings ($t=2.36, df=20, p=.03$) was observed. Participants in the PCG increased pedometer reading totals by 500 steps per day on average, while participants in the POG decreased pedometer reading totals by 2550 steps per day on average.

Independent samples t-test revealed no significant change in pedometer readings for children between groups ($t=1.07, df=8, p=.32$) and a small, but statistically significant change in pedometer readings for adults between the two treatment groups ($t=2.32, df=10, p=.04$). Adult participants in the POG decreased pedometer reading totals by 2297 steps per day on average, while participants in the PCG increased pedometer reading totals by 2051 steps per day on average.

Table 7

Paired t-test of Physical Activity for Children

Variable	Pre-test Mean \pm SD	Post test Mean \pm SD	<i>t</i>	<i>df</i>	<i>p</i>	<i>r</i>
Self-report PA (MVPA/ day)*						
POG (n= 8)	8.63 \pm 1.72	8.56 \pm 2.52	.028	7	.979	.01
PCG (n=6)	4.86 \pm 2.52	5.64 \pm 1.13	-.696	5	.518	.30
Pedometer Steps						
POG (n=6)	6650.92 \pm 5051.50	3764.95 \pm 2401.55	-2.33	5	.067	.91
PCG (n=4)	4306.83 \pm 1445.24	3257.05 \pm 1287.13	-1.10	3	.350	.04

*MVPA , moderate to vigorous physical activity ; average number of 30 minute blocks with activity of ≥ 3 METS

Table 8

Paired t-test of Physical Activity for Adults

Variable	Pre-test Mean \pm SD	Post test Mean \pm SD	<i>t</i>	<i>df</i>	<i>p</i>	<i>r</i>
Self-report PA (METs·min·wk ⁻¹)						
POG (n= 7)	764.26 \pm 905.15	1232.25 \pm 1382.24	-1.27	6	.253	.54
PCG (n=6)	988.77 \pm 1233.04	964.57 \pm 799.14	.10	5	.925	.04
Pedometer Steps						
POG (n= 8)	7479.04 \pm 2664.23	5181.89 \pm 1696.31	-1.91	7	.097	-.17
PCG (n=35)	3594.29 \pm 1995.91	5645.44 \pm 1848.30	1.98	3	.142	.42

Body Weight Measures

Body weight was measured during pre- and post-assessment. The paired samples t-test revealed an increase in weight ($t=-2.38, df=32, p=.023$) from pre- to post-test for all participants. The average weight for all participants increased by two pounds from pre- to post-testing ($M=142.61, SD=67.89$ and $M=144.30, SD=66.23$, respectively). When weight data was examined separately for the parents and children, the paired samples t-test revealed a statistically significant increase in weight from pre- to post-test for the children ($t=-4.15, df=18, p=.001$), but not for the parents ($t=0.12, df=13, p=0.91$). The average weight for children increased by three pounds from pre- to post-testing ($M=101.37, SD=45.43$ and $M=104.42, SD=44.73$, respectively). Table 9 presents changes in weight for children and parent participants. In order to compare the two treatment groups, a new variable was calculated (Change). Change was the difference in weight measured at the end of the program from weight measured at the beginning. The obtained range for weight change was -8 to 8 pounds. No group differences ($t=-1.31, df=31, p=0.20$) were observed for changes in weight. The POG had a mean weight change of 2.51 ($SD=3.81$) while the PCG had a mean weight change of 0.75 ($SD=4.28$).

Table 9

Paired t-test for Weight Change

Variable	Pre-test Mean \pm SD	Post test Mean \pm SD	<i>t</i>	<i>df</i>	<i>p</i>	<i>r</i>
Child Weight Change (n= 19)	101.37 \pm 45.43	104.42 \pm 44.73	-4.15	18	.001	1.07
POG (n= 10)	97.50 \pm 42.80	101.00 \pm 41.66	-3.10	9	.013	.91
PCG (n=9)	105.67 \pm 50.43	108.22 \pm 50.17	-2.67	8	.029	.63
Adult Weight Change (n= 14)	198.57 \pm 51.27	198.43 \pm 50.49	.118	13	.908	.13
POG (n= 7)	203.00 \pm 57.41	204.29 \pm 54.55	-0.84	6	.431	.40
PCG (n= 7)	194.14 \pm 48.52	192.57 \pm 49.67	0.86	6	.425	.20

Self-efficacy Component

The second research question analyzed the effect of participation in the education intervention on exercise self-efficacy. No differences in exercise self-efficacy were observed in children ($t=-1.83$, $df=19$, $p=0.83$) or adults ($t=-1.14$, $df=17$, $p=0.27$) from pre- to post-test. No group differences were observed for exercise self-efficacy in children or adults. Table 10 presents changes in self-efficacy by treatment group and role. The obtained range of the exercise self-efficacy for adults for pre- and post-test data was 11.54 to 90 ($M= 47.53$, $SD=19.16$) and 22.31 to 78.46 ($M= 50.17$, $SD=18.22$), respectively. These mean exercise self-efficacy ratings are considered moderately confident on the 0-100 scale. The obtained range of the exercise self-efficacy for children for pre- and post-test data was 0.63-2.00 ($M= 1.53$, $SD=0.36$) and 0.25 to 2.00 ($M= 1.62$, $SD=0.35$), respectively. These mean exercise self-efficacy ratings lean toward “agree” on the likert scale, indicating a positive self-efficacy.

Program Evaluation

In addition to the hypothesis testing, a program evaluation of the intervention was conducted during the post-testing, final meeting. The “Parent Program Participant Feedback Form” was part of the WeCan! community curriculum package. The total mean score was 3.53 ($SD=.338$) and 100% agreed or strongly agreed with the post survey assessment items. An item mean score above 3.0 was considered favorable (see Table 11). Written comments were positive, with most participants indicating that the exercise and family game ideas

were the most useful program components. Some of the documented comments by the participants in the study were as follows:

It gave me different, fun ideas to help my family get fit.

I liked the encouragement to improve and make changes in my lifestyle.

I got ideas about motivating son/self to get more active.

It made me more aware of how much physical activity I get.

The participants also recommended more meetings during the program and the inclusion of nutrition as a program component.

Table 10

Paired t-test for Self-efficacy

Variable	Pre-test Mean \pm SD	Post test Mean \pm SD	<i>t</i>	<i>df</i>	<i>p</i>	<i>r</i>
Child Self-efficacy						
POG (n= 10)	1.69 \pm .222	1.54 \pm .323	-1.08	9	.305	.35
PCG (n=10)	1.63 \pm .333	1.51 \pm .405	-2.21	9	.054	.83
Adult Self-efficacy						
POG (n= 8)	38.75 \pm 11.71	44.52 \pm 16.23	-1.09	7	.308	.42
PCG (n=10)	52.23 \pm 18.90	54.69 \pm 19.25	-.514	9	.620	.20

**p*<0.05

Table 11

Program Evaluation Responses in Percentages

	Agree (3)	Strongly Agree (4)
The program was very useful to me as a parent	46.2	53.8
I learned how to help my family maintain a healthy weight.	69.2	30.8
I got useful tips to help my family be more physically active.	30.8	69.2
The program taught me how to reduce screen time.	58.3	41.7
I learned how much physical activity my family needs.	30.8	69.2
I want to share what I learned with other parents	53.8	46.2
I would recommend the program to a friend.	15.4	84.6

CHAPTER V

DISCUSSION

This study evaluated the effects of an education intervention to improve the families' level of physical activity and exercise self-efficacy. This study was not designed to be a mothers and children study, but due to the absence of fathers at post-assessment, we were only able to look at the effects of the intervention on the women and children. A majority of the women were married or living with a partner (69%), and although efforts were made to recruit the entire family unit, including fathers, there was a lack of male participation in the WeCan! intervention. Only two fathers were involved in the study at baseline, but no fathers completed the study. We were not surprised by the lack of participation of the men in this study, as earlier studies confirm challenges to engaging men and reiterate that family-based interventions have mostly been successful in engaging mothers (McLean, Griffin, Toney, & Hardeman, 2003; Waters, Galichet, Owen, & Eakin, 2011). The inability to recruit fathers for the current study was unfortunate, given that one father-focused study reported significant changes in fathers' and children's physical activity (Morgan, Lubans, et al., 2011).

In general, the intervention utilized in the present study did not result in significant improvements in physical activity. While the self-report data did not correlate to pedometer data, the self-report data at pre- and post-intervention suggest that the parents and children in the study were meeting physical activity recommendations. Categorically, adults in the study were considered “moderately active” and the children in the study averaged above the 60 minutes per day recommended. Disparately, participants in this study averaged at the low end of the activity range for pedometer data as it is suggested that a range of 5,000 to 7,499 steps/day represents a low activity level (Tudor-Locke et al., 2004). Also, the average steps/day decreased from 5970 at baseline to 4530 at post-testing. Notably, average daily pedometer steps were much lower in this study in comparison with previous studies (Bravata et al., 2007; Flohr, Todd, & Tudor-Locke, 2006; Tudor-Locke et al., 2004). The lack of association of the physical activity outcome measures is consistent with findings from previous studies (Caballero et al., 2003; Ransdell et al., 2004). An explanation for the discrepancy among the physical activity data is the participants’ failure to comply with wearing the pedometer, which may have lead to insufficient information. For days when no steps were recorded, those days were treated as missing data; therefore it was impossible to ascertain if they participated in physical activity when no data was reported.

Contrary to the hypothesis, the children in the study did not significantly increase physical activity levels as a result of participation in the intervention, regardless of the intervention or treatment group. No significant group differences

were observed for physical activity, but the children in the parents-only group (POG) reported higher levels of physical activity than the children in the parent-child group (PCG) at both pre- and post-testing. The absence of an intervention effect is consistent with other family-based studies, which also reported no significant changes in children's physical activity levels. Nader et al. (1989) reported no significant effect from a year-long family-based education intervention on physical activity levels of 5th and 6th grade children from 206 healthy Mexican-American and non-Hispanic white families. Similarly, Nader et al. (1983) observed no changes in the reporting of exercise minutes from pre-test to post-test for the 42 children involved in a family-based three-month cardiovascular risk reduction education project. Additionally, Ransdell et al. (2001) cited no significant changes in self-reported physical activity over time from a 12-week family based pilot study for mother/daughter pairs and triads. The reasons for these results are unclear, but it is possible that a lack of statistical power in this study could have resulted in an inability to detect significant intervention effects. Furthermore, both groups reported higher participation rates in physical activity than the average American child (CDC, 2008) suggesting that the children in this study did not need to increase physical activity.

With regards to adult physical activity participation, it was hypothesized that the parent-only treatment group would see a greater effect on physical activity levels assessed by objective and subjective measures. It is important to highlight that while significant differences were detected in steps per day

measured by pedometer, no group differences were observed in self-reported physical activity data. In a similar pilot study, a 6-month program designed for improving physical activity across three generations of women, findings were significant for changes in pedometer steps per day, but no significant effects were found for the self-report data (Ransdell et al., 2004). Furthermore, results of the pedometer data in this study indicated that without children's involvement (POG), activity levels decreased in the adult population while results of the self-report data indicated that without the children's involvement (POG), the activity levels increased in the adult population. Although our findings are inconsistent, the finding that parents' physical activity levels increase when children are involved in the intervention is congruous with other family-based intervention studies (Baranowski et al., 1990; Ransdell, Robertson, Ornes, & Moyer-Mileur, 2004; Ransdell, Taylor, Oakland, Schmidt, Moyer-Mileur, & Schultz, 2003). Baranowski et al. (1990) detected positive changes in self-reported physical activity levels of adult participants in a center-based program for Black-American families. Increased energy expenditure was reported for both the experimental and control groups, which included the children. In another study of mother-daughter pairs, Ransdell et al. (2003) found that relatively inactive mothers significantly increased participation in aerobic, flexibility and muscular endurance activities as a result of participating in the program with their daughters. The most likely explanation for the contradictory physical activity data is the participants' failure to comply with wearing the pedometer. Due to compliance issues, it is

difficult to draw sound conclusions about the parents' physical activity levels with regards to intervention participation.

With regards to body weight, children in both groups had a significant increase in weight from pre- to post-testing, but no significant group differences were observed. These findings of weight gain are consistent with a mother-daughter study, which reported weight gains in the daughters during the 12-week intervention (Ransdell et al., 2001). There were more female children in the current study than male children, and the average age does suggest that some of the girls may be at the age for experiencing puberty. Additionally, according to the baseline body mass index data (BMI), 63% of the children were considered to be underweight (BMI below 18.5) or to have a healthy weight (BMI 18.5 to 24.9). Although increases in weight are not ideal as the result of an intervention, it is possible that the children in the current study were experiencing a normal weight increase due to typical growth patterns. As for the parents, no significant group differences or changes in weight over time were observed. According to the baseline BMI data, 87% of the parents were considered overweight or obese, conveying the need for addressing weight loss. Despite the unfavorable results, it should be noted that a maintenance of current weight is a positive outcome, as the trend is that Americans are gaining weight (Sherry, Blanck, Galuska, Pan, Dietz, & Balluz, 2010). Furthermore, participants may not have lost weight if they were not making dietary changes along with increasing physical activity levels. It is suggested that the best obesity prevention strategies include the modification

of multiple lifestyle factors, including dietary changes, which were not addressed in this study (Mozaffarian, Hao, Rimm, Willett, & Hu, 2011).

With respect to the psychological construct measured in this study, exercise self-efficacy, no significant group differences or improvements over time were observed. Among interventions to promote physical activity in youth, self-efficacy has been found to mediate changes in physical activity, but few studies have explored the effect of interventions on exercise self-efficacy (Lubans et al., 2008). Based on previous intervention success (Harrison et al., 2006; Kelder et al., 2005), it was hypothesized that self-efficacy would significantly increase in all participants, but the current study failed to show significant changes in self-efficacy for any participants. Specific discussions and activities were targeted at changing self-efficacy, but these methods proved inconclusive. Explanations for the lack of an effect is the possibility that the WeCan! curriculum and supplemental activities may not have adequately targeted exercise self-efficacy, or perhaps the short duration of the study did not provide for an intervention effect. For instance, Harrison et al. (2006) found that a ten-lesson, 16-week intervention led to higher self-efficacy in the intervention group. It is difficult to compare results of this study to pre-existing data because few studies have analyzed the effect of a physical activity intervention on self-efficacy.

Lessons Learned

Although the present study did not support the effectiveness of a family-based intervention for increasing physical activity and improving exercise self-efficacy, important lessons were learned that can contribute to practice and

theory for future research. Many of the challenges during the study were related to recruitment of participants. During all recruitment events, parents and children were interested in participating in the program, but it was difficult to obtain families who would commit to program participation. We had an extremely low response rate to signing-up for the program as much less than 5% of the people contacted chose to participate in this free, healthy, and fun program. Perhaps integrating the program within the structure of a host organization could promote ownership of the program and make use of existing communication systems. Also, by gaining support of distinguished local organizations, such as sport teams, public schools, or other public entities the intervention becomes a multilevel approach. Increasingly, researchers are acknowledging the importance of applying a multilevel approach to influence physical activity behaviors (Marcus et al., 2006; van Sluijs et al., 2007) and there is evidence for effectiveness using this type of approach (van Sluijs et al., 2007).

It is not known if the lack of participation by all family members had an effect on adherence in this study, but encouraging all family members to take part, with special emphasis on the father, could potentially lead to higher rates of adherence (Morgan, Lubans, et al., 2011). The challenge of recruiting fathers has been noted in the literature (McLean et al., 2003; Waters et al., 2011) and this difficulty may be an important missing piece to the current study. Studies indicate that fathers' time spent with their children (Beets & Foley, 2008) and fathers' involvement in a weight-loss intervention (Morgan, Lubans, et al., 2011) is linked to increased activity levels in children. Stronger efforts should be made in the

recruitment of fathers although little is known about the best method for recruiting and retaining men in physical activity interventions. Recent weight loss studies suggest that the development of programs that are tailored specifically for men (Morgan, Warren, Lubans, Collins, & Callister, 2011) and fathers (Morgan, Lubans, et al., 2011) may lead to increased engagement from this population. Furthermore, men may be more attracted to humor and comical language in recruitment materials (Morgan, Warren, et al., 2011).

It is important to emphasize that attendance to the intervention sessions was low, which may have affected results of the study. Attendance was taken at each meeting and drawings for prizes were based on presence at the sessions. Also, participants were contacted prior to all meetings in order to increase turnout at the meetings. There were four education sessions over the duration of the program, but attendance was low. Attendance during the summer may be a perceived barrier to participation as proposed by the results of an exploratory girl's intervention (Olvera et al., 2010). Additionally, attendance may have been related to the intervention effect on physical activity. The self-report data were not significantly correlated to attendance, but the pedometer data were. Although the pedometer data validity was questionable, this correlation suggests that attendance may have stimulated participants to either partake in more activity or to wear the pedometer more often.

As evident in this study, habitual participation in physical activity is a difficult task for individuals to achieve. Explanations for the low physical activities observed in this study are not available in the data, however, we speculate that

environmental and measurement factors played a significant role in physical activity changes. First, it should be considered that family members not participating could sabotage the dedication and enthusiasm of those taking part in the program. Although it is an aspect of the environment that is relatively unexplored, there is evidence that family members and significant others apply pressure to undermine exercise participation in adults (Stanforth & Mackert, 2009). In the current study, no data was collected for those living in the home but not participating. There is no way of knowing how others in the home may have influenced the environment during the intervention, but it may be necessary to identify these negative influences for those participating. Understanding negative influences on intervention success will allow for the identification of preventative strategies for overcoming this barrier. Secondly, the lackluster results may be explained, as previously mentioned, by seasonal timing of the WeCan! intervention. The majority of the sessions were held during the summer vacation and during periods of extreme heat, which may have contributed to the participants being less physically active. Tovar et al. (2010) conducted a 9-week study over the summer break to assess where children spend their time while they are out of school. They reported that children spend most of their time engaging in sedentary or low intensity activities, which included indoor games and playing. In the current study, indoor activity ideas were included in the take-home activity calendars, but participants were not required to report on these activities. Seasonal timing of interventions should be considered during planning of summer interventions. It might also be beneficial to discuss structured activity

for the summer months to help parents and children plan for time out of school. Lastly, our findings highlight the need for using more accurate measures to assess physical activity (O'Connor et al., 2009; van Sluijs et al., 2007). Physical activity measures were self-reported and participant dependent, which may have resulted in ambiguous physical activity levels. Self-report data may have been under or over reported due to poor recall or participants desire to report socially desirable responses, while pedometer data may have been flawed due to poor adherence. It has been suggested that using pedometers as a tool to measure changes in physical activity may be a study limitation (Bravata et al., 2007). Due to a lack of compliance, the estimates of average daily pedometer steps cannot be considered reliable. For many participants, there were days when no steps were recorded, which was not in accordance with the suggested protocol of seven days for providing accurate assessment of physical activity (Clemes & Griffiths, 2008; Ward et al., 2005). Participants in the study did convey several issues with the pedometer, such as a) participants in the study forgot to wear the pedometer, b) they misplaced the pedometer, or c) they were not allowed to wear it due to rules/regulations. The use of more objective measures of physical activity such as accelerometers would increase accuracy of physical activity measures. In the future, it may be necessary to require the use of the activity diary as part of the intervention program, giving the participants more accountability for their behaviors. Also, prizes and awards should be given for meeting program objectives or compliance with the program activities and not just program attendance.

Weight did not significantly increase in the adult participants in this study. Results of a national survey confirmed that weight gain is a current trend and that the percentage of obesity continues to grow (Sherry, Blanck, Galuska, Pan, Dietz, & Balluz, 2010). Adult participants in the current study maintained weight as the mean was 198 pounds at both pre- and post-testing. The fact that adult participants did not lose weight may be due to other factors, such as dietary behaviors, which could affect weight loss. It is reasonable to suggest that future studies should include strategies for dietary changes in combination with physical activity modifications. It has been documented that the best obesity prevention strategies include the modification of multiple lifestyle factors, including but not limited to physical activity, diet, and screen time (Mozaffarian, Hao, Rimm, Willett, & Hu, 2011).

Because there was no significant change in exercise self-efficacy for any participants, it appears that the findings of the current investigation do not support the theory of Reciprocal Determinism. Children in this study reported overall high levels of exercise self-efficacy. Perhaps, because the children already had a high exercise self-efficacy, there was not much room for improvement. As for the adults, reporting a moderate exercise self-efficacy, there was room for improvement. A recent meta-analysis (Ashford et al., 2010) that examined psychological techniques for improving physical activity self-efficacy found that vicarious experience and providing feedback were successful approaches. They concluded that interventions using vicarious learning showed significantly higher effects on physical activity self-efficacy versus those that did

not. The use of face-to-face meetings in this intervention study should have provided opportunities for vicarious learning, but this was not the case.

Other challenges related to the current study could possibly be related to the WeCan! curriculum. The curriculum was designed as a parent/caregiver community program for facilitating positive physical activity and nutrition behaviors. There are several issues that may have impacted the effectiveness of the curriculum in this intervention study. First, because the curriculum was not designed as a parent-child curriculum, the content had to be adapted for the parent-child treatment group. Also, the goal was to target physical activity without targeting other health behaviors, therefore the nutrition portion of the curriculum was not used. Finally, the inclusion of other outcome measures, outside of the scope of WeCan!, may have influenced the integrity of the curriculum. The present evaluation suggests that WeCan! curriculum may not target exercise self-efficacy, and there is no evidence that the curriculum was designed for this purpose. It should be acknowledged that WeCan! was constructed using sound theoretical principals, but the researcher of the current study linked the curriculum to the Social Cognitive Theory constructs. Furthermore, evidence for the effectiveness of the curriculum is inadequate at this time. Although early evidence supports the potential value of the curriculum, it appears that few studies have investigated the effectiveness of the WeCan! on a large scale (WeCan! Progress Report, 2007).

Apart from the limitations mentioned previously, the findings of this study should be interpreted with caution, as they may not be representative of the

larger community. With regards to randomization, plans changed as a result of a low response to the distributed study invitation. Families were going to be randomized to the different groups, but given the recruitment difficulties, all families who responded and chose to join the group were included at the time of response. Participants were from a relatively small convenience sample, with only 16 families completing. The sample size for the current study was similar to the small samples used in previous family-based studies (Nader et al., 1983; Ransdell et al., 2001; Ransdell et al., 2004). The final sample size of the study was 40 participants and not all participants completed all assessments leading to variability in sample size of all measures. Also, the retention rate in this study was lower than the reported rate in earlier family studies (Baranowski et al., 1991; Nader et al., 1983; Ransdell et al., 2001; Ransdell et al., 2004) and physical activity interventions (Waters et al., 2011). Although the participant retention rate was low, it was a fundamental component considered throughout the planning process. In order to increase retention, there were session drawings for prizes, as well as an intervention completion drawing at the end of the eleven weeks. It is possible that participants do not react well to the “chance” to win a prize and may better react to the guarantee of a reward. Also, participants had consistent contact with one person throughout the entire intervention. The principal researcher attended all recruiting events and each session throughout the intervention, and conducted all education sessions. This stable, personal contact was intended to increase the comfort and trust of the participants throughout the research process. Sessions were held in convenient and easily

accessible locations for participants. Despite the various considerations in planning, participation in both the education sessions and data collection process was derisory.

A further limitation of the current study is the incapacity to report on a control group or child-only group. The absence of a control group may limit the ability to generalize findings or to make comparisons to similar interventions. Support for the decision to eliminate the child-only group was related to the literature on parent influence on physical activity behaviors, tenets of Social Cognitive Theory (SCT), previous family-based interventions, and restricted resources. Given the evidence for parent influence on their children's physical activity (Beets & Foley, 2008; Cleland et al., 2005; Davison et al., 2003; Ornelas, et al., 2007) and the basic premise of SCT, that behaviors are stimulated by the environment, we decided to focus strictly on the involvement of parents. Further, interventions including parent-only or parent-child groups have been shown to have success with weight loss (Golan et al., 2006) and increased physical activity levels (Ransdell et al., 2003). Thus, a control group of children-only was not used in the current study.

Given the nature and characteristics of implementing this type of program in the community, it is valuable to note that participants completing the program positively evaluated the program. Aside from a failure to see significant improvements in physical activity levels or increases in exercise self-efficacy, it is necessary to consider positive program aspects. It is important to note that

participants responded that they found the program useful and would recommend the program to a friend.

The optimal intervention design for helping youth and parents adopt and maintain healthy physical activity behaviors has yet to be established. To our knowledge, this is the first study to use the WeCan! curriculum to investigate the effectiveness of a family education intervention to increase physical activity and to improve exercise self-efficacy in all participants. The findings from this study should be interpreted with caution, but suggest that a family-based intervention may be effective for promoting increases in physical activity and weight maintenance in participating adults. Aside from these findings, the results indicate the need for duplicating this study on a larger scale, an extension to include randomization of participants, and long-term implications of participation in the intervention. The information obtained from this study can contribute to the development of sound strategies for family-based interventions. The increasing prevalence of problems related to low physical activity levels, including obesity and related diseases, suggest the continued need for research in this area.

APPENDIX: A

DEMOGRAPHIC QUESTIONNAIRE

Demographic Information Form for Participating Families

We ask this information to make sure we get the views of people from a range of backgrounds. All information is confidential and therefore will not be shared with anyone.

How many family members will be participating in the intervention? _____

Please list the participating family member' age, gender, and roles below.

Role (i.e. child, parent, guardian)	Gender	Age

How many family members live in the home? _____

If a family member is not participating, please list why.

What is your total household income, including all earners in your household?

- Less than 10,000
- 10,000 to 19,999
- 20,000 to 29,999
- 30,000 to 39,999
- 40,000 to 49,999
- 50,000 to 59,999
- 60,000 to 69,999
- 70,000 to 79,999
- 80,000 to 89,999
- 90,000 to 99,999
- 100,000 to 149,999
- More than 150,000

What is your marital status?

- Never Married
- Married or with partner
- Separated
- Divorced
- Widowed

What is your ethnicity?

- White, Non-Hispanic
- African-American
- Hispanic
- Asian-Pacific Islander
- Native American

If there are multiple ethnicities represented, please list all.

For the following 2 questions, use these possible answers:

Less than high-school
 High-School/GED
 Some College
 2-year College Degree (Associates)
 4-year College Degree (BA, BS)
 Master's Degree
 Doctoral Degree
 Professional Degree (MD, JD)

What is the highest level of education completed by the mother/guardian?

What is the highest level of education completed by the father/guardian?

Parent/Guardian Employment Information

Mother/Guardian Are you currently employed? Yes No

Father/Guardian Are you currently employed? Yes No

There is a possibility that the researcher may extend the original study into a long-term project.

Would you be willing to talk with the researcher, or possibly participate in another program?

If so, please list contact information for a relative other persons we may contact if you move, in order to get in touch with your family.

Contact Name: _____ Contact Phone:

Contact Email: _____

Current Home Address:

Answer only if you want to:

Why did you choose to respond to the call for participants?

APPENDIX: B

ACTIVITY DIARY

Families Moving Together Activity Diary

	Activity Description	How long?	How hard? (easy, moderate, challenging)	Did anyone else do the activity with you? Who?	How did you feel? Or Other comments	If you did not do any activity, can you explain why you did not?
Day 1						
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						
Day 7						

APPENDIX: C

HEALTH HISTORY FORMS

Health History Form

There are potential risks involved in participating in an exercise program. Therefore, I recommend that you get medical clearance from a health care professional before participating in exercise.

However, you may decide to participate without that approval only if you agree that you do not have symptoms of heart or lung disease, have diabetes, and have not been diagnosed with heart disease, lung disease, diabetes, or other conditions that may increase your risk of having a cardiac event during exercise.

I the undersigned, understand that if any of these conditions exist, I must obtain approval by a health care professional before participating in exercise.

If at any time my health changes, and any physical limitations occur that would be compromised by my full participation, I will discuss with the researcher how this might affect my health and my safe participation.

Circle any condition that applies. If further explanation is needed use the back of the form. All information given will be kept confidential.

1. Cardiovascular disease (heart, blood vessel, or stroke disease) Chest pain during exertion.
2. Elevated blood lipids (Cholesterol or Triglycerides)
3. Epilepsy
4. Shortness of breath, asthma, emphysema, or other respiratory problems.
5. Inner ear problems.
6. Elevated blood pressure and under medication or not
7. Often feel faint or have spells of severe dizziness
8. Diabetes that is affected by exercise
9. Any joint, bone, or muscle problems
10. An eating disorder (anorexia, bulimia)
11. Smoke cigarettes
12. Any other concerns that might affect your ability to participate safely in an exercise program. List and explain.

I acknowledge that I fully understand that participation in exercise may involve potential risks. I warrant that I am in good health and have no physical condition that would prevent me from participation in this event of activity.

I have had the opportunity to ask questions related to my participation in an exercise program.

Print Name _____

Sign Name _____

Date _____

Health History and Agreement to Participate-Child

There are potential risks involved in participating in an exercise program. Therefore, I recommend that you get medical clearance from a health care professional before participating in exercise.

However, you may decide to participate without that approval only if you agree that you do not have symptoms of heart or lung disease, have diabetes, and have not been diagnosed with heart disease, lung disease, diabetes, or other conditions that may increase your risk of having a cardiac event during exercise.

I the parent/guardian of _____, understand that if any of these conditions exist, he/she must obtain approval by a health care professional before participating in exercise.

If at any time my child's health changes, and any physical limitations occur that would be compromised by full participation, I will discuss with the researcher how this might affect my child's health and safe participation.

Circle any condition that applies. If further explanation is needed use the back of the form. All information given will be kept confidential.

1. Cardiovascular disease (heart, blood vessel, or stroke disease) Chest pain during exertion.
2. Elevated blood lipids (Cholesterol or Triglycerides)
3. Epilepsy
4. Shortness of breath, asthma, emphysema, or other respiratory problems.
5. Inner ear problems.
6. Elevated blood pressure and under medication or not
7. Often feel faint or have spells of severe dizziness
8. Diabetes that is affected by exercise
9. Any joint, bone, or muscle problems
10. An eating disorder (anorexia, bulimia)
11. Smoke cigarettes
12. Any other concerns that might affect your ability to participate safely in an exercise program. List and explain.

I acknowledge that I fully understand that participation in exercise may involve potential risks. I warrant that my child is in good health and has no physical condition that would prevent him/her from participation in this event of activity.

I have had the opportunity to ask questions related to my child's participation in an exercise program.

Print Child's Name _____

Print Parent's/Guardian's Name _____

Parent's/Guardian's Signature _____ Date _____

APPENDIX: D

CONSENT FORM

CONSENT FORM FOR PARENTS/GUARDIANS

FAMILIES MOVING TOGETHER: INCREASING PHYSICAL ACTIVITY BY TARGETING PARENTS EXCLUSIVELY VS. PARENTS TOGETHER WITH CHILDREN

Dear Participants;

You are invited to participate in an educational intervention, Families Moving Together, to increase the levels of physical activity in you and your family members. This research study is being conducted by Stacia Miller from the Department of Health, Physical Education and Recreation at Texas State University – San Marcos. Stacia Miller can be contacted at 512-245-2246 or sm66@txstate.edu.

Purpose of this Research Study

Over the course of 11-weeks, your family will be part of an education program designed to help you and your children increase physical activity. It is a unique program focusing on what you can do as a parent to help your family lead a physically active, healthy lifestyle. You will learn specific skills on how to create a healthy home environment and how to encourage healthy family decision making.

If you agree to participate in this research study, you and your family will be expected to do the following things:

- Before beginning participation in the education program, you and your family will meet with the researcher, Stacia Miller, during a 90 minute session. During this session you and your family will:
 - Fill out several forms about your health history, demographic information, exercise self-efficacy, and a questionnaire about your most recent physical activity behaviors.
 - Be measured for body weight and height.
 - Receive an accelerometer, and learn how to properly use it to record your daily physical activity behaviors.
- During the education program, you and your family will be expected to:
 - Attend at least 4 educational sessions focusing on increasing physical activity and reducing screen time.
 - Keep a physical activity journal.
- At the conclusion of the education program, you and your family will return for 2 final sessions to meet with the researcher to:
 - Repeat the assessment activities (forms, weight, height, etc.).
 - Return the accelerometer and have a celebration for you and your families' health.
 - Participate in an informal exit interview with the researcher.

The criteria to participate in the research study are:

- You must have at least one child above the age of 6. Childcare will be provided for children under the age of 6.
- All parent(s)/guardians in the home must agree to attend program meetings.
- No family members can be participating in a weight loss program.
- You must have the ability to participate in physical activity and be without health limitations. "Health limitations include: have been diagnosed with heart disease, diabetes, and chronic obstructive pulmonary disease (including severe asthma), have recently experienced a musculoskeletal injury, or have been told by a health care provider to not exercise."
- You must be able to communicate (including speak, read and write) in English.
- You have plans to remain in the geographical area within the next two years.

Potential Risks or Discomforts in this study are minimal:

- During exercise, it is normal for your heart rate and breathing rate to increase and for you to sweat. There maybe, however, unforeseeable risks to exercise. To ensure your safety, you must disclose your current health and health history.
- Therefore, I recommend that you get medical clearance from a health care professional before participating in exercise. However, you may decide to participate without that approval only if you agree that you do not have symptoms of heart or lung disease, have diabetes, and have not been diagnosed with heart disease, lung disease, diabetes, or other conditions that may increase your risk of having a cardiac event during exercise.
- You are responsible for paying your own medical bills, including those received: 1) if you are referred to a healthcare provider prior to your participation in exercise, and/or 2) If you seek/receive medical attention due to a complication or injury associated with your participation in exercise.
- Participation is voluntary, and participants may withdraw at any time without prejudice or threat to their standing at the University.
- Families will be asked to voluntarily discuss the family and home environment as it pertains to physical activity and physical inactivity behaviors.

Compensation/Incentives:

- At all meetings, there will be drawings for door prizes such as exercise equipment, movie tickets, or gift certificates.
- There will be a final celebration party at which snacks will be provided, and for those who have attended and completed all sessions, there will be 2 drawings for a \$50 gift card.

Confidentiality:

Your identity in this study will be kept confidential. The results of the study may be shared for scientific purposes, but your name will not be used. When the results of the research are shared, no information will be included that might give away who you are.

Your file may be seen by the Texas State University-San Marcos Institutional Review Board, or by the persons doing this study. Personal information will be stored in a locked file cabinet in Stacia Miller's office for five years, after which, it will be destroyed. We will ask for additional written consent from you if this data will be used for other research purposes.

Termination of Research Study:

You are free to decide if you would like to take part in this study. If you choose not to take part, it will not affect you or your family in any way. You may withdraw from the intervention at any stage and do not need to give any reason and you have the right to withdraw your data from the study. If you decide to stop participating in the study, please let the researcher know that you will not return.

Feedback regarding the findings of this research study will be made available to all participants upon request and the dissertation will be available in the Texas State University library.

This research has been approved by the Texas State University Institutional Review Board (IRB) approval number _____.

Authorization:

"I have read and understand this consent form. I also understand that my participation and my child's participation in this research study is entirely voluntary, and that we may withdraw from the study at any time without penalty. In consideration for their services, I release Texas State University-San Marcos and its employees, including those involved in the research from any claims: (1) for personal injuries, including death, that we may receive, and (2) for any damage to our property that may occur from any cause related to our participating, regardless of the cause of the personal injuries or property damage."

Please sign and date both copies of this consent form. One needs to be returned to me at the pre-testing session; you should retain the other copy for your records.

Participant Name (Printed): _____

Participant Signature _____ Date _____

Researchers Name _____

Signature _____ Date: _____

Any questions about participation in this project may be directed to the researcher Stacia Miller 512-245-2246. If you have any inquiries or complaints about the way you have been treated, you may contact the IRB Chairperson, Dr. Jon Lasser (512-245-3413 – lasser@txstate.edu), or to Ms. Becky Northcut, Compliance Specialist (512-245-2102).

APPENDIX: E

ASSENT FORM

Assent Form for Children Participants

FAMILIES MOVING TOGETHER: INCREASING PHYSICAL ACTIVITY BY TARGETING PARENTS EXCLUSIVELY VS. PARENTS TOGETHER WITH CHILDREN

This research study is going to teach you and your family how to become more physically active together. Your parents/guardians have given their permission for me to ask you to be in this study.

If you choose to take part in this study, you will be asked to participate in meetings with your parents/guardians.

During the meetings, you and your family will be asked to come up with ideas about how to participate in more physical activity together.

The information that I collect and the discussions that we have will be kept private and they will not be shown to other people. Only the researchers at the University and I will know your information.

You can choose whether or not you want to be a part of this study (even if your parents/guardians gave you permission). You do not have to tell me why you do not want to take part and will not be in trouble if you decide not to.

I agree to take part in the research study conducted by Stacia Miller. I understand that my participation is up to me and I can choose to leave at anytime.

This research has been approved by the Texas State University Institutional Review Board (IRB) approval number _____.

Student Name _____

Signature _____ Date _____

Researcher Name _____

Signature _____ Date _____

APPENDIX: F

EXERCISE SELF-EFFICACY INSTRUMENTS

Barriers Specific Exercise Self-Efficacy Scale

The following items reflect situations that are listed as common reasons for preventing individuals from participating in exercise sessions or, in some cases, dropping out. Using the scales below please indicate how confident you are that you could exercise in the event that any of the following circumstances were to occur.

Please indicate the degree to which you are confident that you could exercise in the event that any of the following circumstances were to occur by circling the appropriate %. Select the response that most closely matches your own, remembering that there are no right or wrong answers.

For example, in question #1 if you have complete confidence that you could exercise even if "the weather was very bad," you would circle 100%. If, however, you had no confidence at all that you could exercise, if you failed to make or continue making progress (that is, confidence you would not exercise), you would circle 0%.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

NOT AT ALL
CONFIDENT

MODERATELY
CONFIDENT

HIGHLY
CONFIDENT

I BELIEVE THAT I COULD EXERCISE REGULARLY FOR THE NEXT 3 MONTHS IF:

1. The weather was very bad (hot, humid, rainy, cold).

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

2. I was bored by the program or activity.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

3. I was on vacation.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Mark your answer by circling a %.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

NOT AT ALL
CONFIDENT

MODERATELY
CONFIDENT

HIGHLY
CONFIDENT

I BELIEVE THAT I COULD EXERCISE REGULARLY FOR THE NEXT 3 MONTHS IF:

4. I was not interested in the activity.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. I felt pain or discomfort when exercising.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

6. I had to exercise alone.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

7. It was not fun or enjoyable.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. It became difficult to get to the exercise location.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

9. I didn't like the particular activity program that I was involved in.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Mark your answer by circling a %.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

NOT AT ALL
CONFIDENT

MODERATELY
CONFIDENT

HIGHLY
CONFIDENT

I BELIEVE THAT I COULD EXERCISE REGULARLY FOR THE NEXT 3 MONTHS IF:

10. My schedule conflicted with my exercise session.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

11. I felt self-conscious about my appearance when I exercised.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

12. An instructor does not offer me any encouragement.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

13. I was under personal stress of some kind.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

APPENDIX B.C

Self-Efficacy for Physical Activity

Rationale: Self-efficacy is one of the most frequently studied correlates of physical activity (Sallis, Prochaska, & Taylor, 2000). True self-efficacy, often referred to as perceived self-efficacy (Bandura, 1997, p. 3), is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments." However, in familiar activities that must be performed regularly to achieve desired results, Bandura suggests that self-regulatory efficacy becomes more salient. This type of efficacy is often operationalized as "barriers efficacy" or the confidence a person has in overcoming barriers to changing his or her behavior. Because of its potential role in moderating the intervention, self-efficacy will be specifically targeted in the intervention, and thus there is a strong rationale for assessing it.

	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE
1. I can be physically active on most days of the week.			
2. I can ask my parents or other adults to do active things with me.			
3. I can be physically active on most days even if it is very hot or cold outside.			
4. I can do active things because I know how to do them.			
5. I can be physically active even at home.			
6. I can be physically active on most days even if I could watch TV or play video games instead.			
7. I can ask my best friend to be physically active with me on most days.			
8. I have the skill to be active in my free time.			

Adapted from Motl et al., 2000.

From *Physical Activity Interventions in Children and Adolescents*, by Dianne S. Ward, Ruth P. Saunders, and Russell R. Pate, 2007, Champaign, IL: Human Kinetics. 243

APPENDIX: G

FLYER



Texas State is holding a family-centered personal training and health education program, using curriculum from the National Institutes of Health WeCan! Program. It is intended to improve the physical activity levels in all family members. Families with at least one child above the age of 7 are invited to participate in an educational intervention

Over the course of 11 weeks, starting in the Fall, families will be asked to attend 7 meetings (4 educational, 3 for testing and follow-up). The meetings, sponsored by the City of San Marcos Parks and Recreation, will be held at (location to be announced). The educational meetings will last approximately 60 minutes and will focus on how to improve physical activity levels and decrease sedentary time in all family members.

Results from the program will be used in a research study to determine the better of two alternative approaches to family health education. Volunteers who participate in the Intervention will be eligible for prize drawings during each session.

For additional information contact

Stacia Miller, MEd. at 512-245-2246 or sm66@txstate.edu.

Come join us in fun, healthy activity.



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