

Parent-Child Relationships and Parental Tactic Use: The  
Socialization of Physical Activity within the Context of  
an Expectancy-Value Model

by

John Pugliese

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Graduate Supervisory Committee:

Barbara Tinsley, Co-Chair  
Morris Okun, Co-Chair  
Pamela Kulinna  
George Knight

ARIZONA STATE UNIVERSITY

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## ABSTRACT

The purpose of this study was to expand on existing parental socialization models of youth achievement motivation for engaging in physical activity. This study examined the extent to which youth affective reactions and expectancy-value beliefs mediated the relation between parental influence tactics and youth physical activity. More specifically, the direct and indirect effects of parents' positive, negative and sedentary-control tactics, the direct effect of parents' desire to change their child's physical activity, and the moderating role of the socio-emotional climate on the relation between parental influence tactics and child outcomes were investigated. Data were collected from 171 4th, 5th, 7th, 8th and 9th grade students and their parents. Pedometers were used to collect youth physical activity data and all participants completed questionnaires. Youth expectancy-value beliefs and negative affective reactions to parental influence tactics were both positively related to youth physical activity. Path analyses revealed that youth expectancy-value beliefs and negative affective reactions fully mediated the direct effects of positive and negative parental influence tactics on youth physical activity, respectively. Moreover, parents' desire to change their child's physical activity was negatively related to parent's use of positive influence tactics. Although several moderators were examined, none were statistically significant (lowest  $p > .05$ ). The results suggest that additional explanatory power is gained by including a broader range of parental influence tactics and youth affective reactions in models of achievement motivation. The findings are in accord with prior recommendations made to parents with sedentary children.

I dedicate this dissertation to my family. Particularly to my understanding and patient wife, Barbara, who has supported me throughout this process. I must also thank my parents, John and Gina Pugliese, both of whom believed in my pursuit of academics.

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## Chapter 1

### INTRODUCTION

Regular physical activity throughout life is essential for optimal health and development. Approximately 70% of adults in the U.S. do not report engaging in regular leisure-time physical activity in spite of the health risks associated with a sedentary lifestyle, such as obesity, coronary heart disease, and diabetes (Barnes, 2007). Similar to adults, low levels of habitual physical activity appear to have serious health consequences for youth. The prevalence of children who have been classified as overweight has tripled in last three decades with the highest prevalence rates (18.8%) among children between the ages of 6-11 years old (Flegal, Carroll, Ogden, & Johnson, 2002; Ogden et al., 2004). Scientific evidence strongly suggests adult obesity has its roots in childhood and adolescence (Moore et al., 2003; Reilly et al., 2003). The increase in obesity among youth is a precursor to obesity-related diseases. For example, researchers have noted a lagged rise in the incidence of type II diabetes relative to the increase in obesity (Molnar, 2004). Today's youth in the U.S. are at an increased risk of obesity, cardiovascular disease, diabetes, and stroke in adulthood compared to earlier born cohorts (Hallal, Victoria, Azevedo, & Wells, 2006).

The importance of regular physical activity and exercise cannot be understated; both have demonstrated robust physical and mental health benefits in children and adolescents. The efficacy of exercise in reducing body fat and improving metabolic activity has been demonstrated in research with youth (Atlantis, Barnes, & Singh, 2006; Shaibi et al., 2006). Contrary to youth engaging

in lower levels of physical activity, youth engaging in higher levels of habitual physical activity have better bone mass and density in adolescence and reduced risk of osteoporosis in adulthood (Janz et al., 2001). In a meta-analysis of the effect of regular physical activity on mental health, Calfas and Taylor (1994) concluded that exercise has small-to-moderate positive effects on depression and anxiety. More recent research suggests that aerobic activity can decrease depression and increase youth self-esteem (Crews, Lochbaum, & Landers, 2004). Moreover, children who report high levels of involvement in sports relative to other activities report lower levels of depression, higher psychological resilience, and fewer internalizing/externalizing problems than children uninvolved in any kind of organized activity (Bartko & Eccles, 2003). Internalizing problems include symptoms such as anxiety, depression and social withdrawal, whereas externalizing problems are defined by negative social behavior such as aggressiveness and delinquency (Eisenberg et al., 2001). Overall, regular physical activity appears to contribute to healthy physical and emotional development.

The aim of the present study is to expand on existing models of youth achievement motivation for engaging in physical activity. The Expectancy-Value model of achievement motivation and the more narrowly focused Parental Socialization sub-model developed by Eccles and her colleagues (Eccles-Parsons et al., 1983; Eccles, 1993) provide a theoretical framework for examining predictors of youth physical activity. The former model explains how two sets of beliefs, expectancy for success and the perceived value of a task, influence an individual's choice to engage, persist, and perform a given task. The latter model

provides a conceptual basis for understanding how parents socialize these expectancy-value beliefs.

The version of the Parental Socialization sub-model that guided the present research is presented in Figure 1. As specified in the broader Expectancy-Value model, Figure 1 presents key constructs that are hypothesized to represent the cluster of psychological and behavioral phenomena that are influenced by social agents. The model in Figure 1 differs from prior explanatory models of parental socialization of youth physical activity in several ways. First, the current study is the initial one to investigate child affective reactions to social influence attempts as a mediator within a parental socialization model of achievement motivation (Figure 1, A.). The broader Expectancy-Value model includes affect as an endogenous variable, but Eccles' Parental Socialization sub-model omits it (1993). Second, the range of parental tactics examined within the literature has been narrowly focused on positive influence tactics, especially within the Parental Socialization sub-model. The model in Figure 1 includes both negative influence tactics and sedentary control tactics, and suggests that both may impact youth expectancy-value beliefs and affective reactions (Figure 1, B.). Third, Figure 1 suggests that the socio-emotional climate has two roles in the model: as a direct effect on parental tactic use and as a moderator of how tactics influence child outcomes (Figure 1, C.). Prior research has primarily examined the direct effect of climate on youth outcomes; however, both roles are consistent with current conceptualizations of how the parent-child relationship impacts socialization.

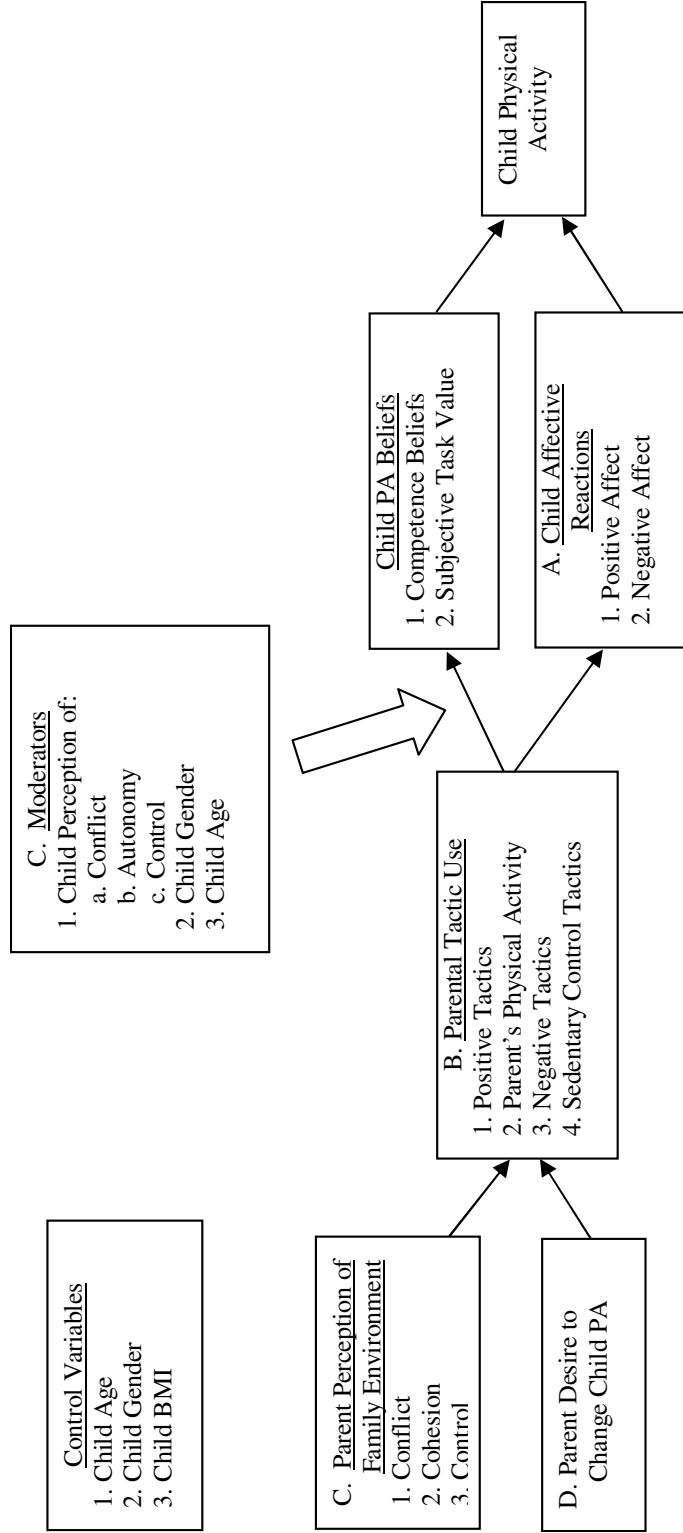


Figure 1. Expanded conceptual model of parental socialization of child and adolescent physical activity.

Finally, Figure 1 suggests that parents' desire to change their child's physical activity may have direct effects on parental tactic use (Figure 1, D.).

### Child and Adolescent Physical Activity

Physical activity is defined as “any bodily movement that is produced by the contraction of skeletal muscles and substantially increases energy expenditure above resting level” (Caspersen, Powell, & Christenson, 1985, p. 126). Although exercise and physical activity are commonly used interchangeably, exercise actually represents a distinct subclass of physical activity. Exercise is defined as “planned, structured, and repetitive bodily movement done to improve or maintain one or more components of physical fitness” (Caspersen, Powell, & Christenson, 1985, p. 128). Current national recommendations for physical activity call for youth to “engage in at least 60 minutes of physical activity on most and preferably all days of the week” (U.S. DHHS, 2005). The primary focus of these national recommendations are on improving fitness in youth; however, only 35.8 percent of U.S. adolescents in grades 9-12 meet current recommended physical activity levels, and 9.6 percent report no vigorous physical activity (Eaton et al., 2006). Among children and early adolescents, data suggest that 22.6% of children 9 through 13 years of age engage in no free-time physical activity and only 38.5% report participation in organized sports (Duke, Huhman, & Heitzler, 2003). Compounded with overall reductions in leisure-time physical activity, U.S. youth have experienced reductions in the amount of physical activity required by physical education (PE) programs in schools (National Association for Sport and Physical Education, 2006).

Epidemiological data indicates that physical activity and energy expenditure decline with age throughout childhood and adolescence (Pate, Long, & Heath, 1994; Sallis, 1993), and evidence suggests that sedentary behavior increases over time (Janz, Burns, & Levy, 2005). Tracking studies suggest that, compared to less active 6 year-old peers, children who are highly active at 6 years of age are 3 times more likely to be highly active at 9 years of age. In addition, physical activity is less stable during adolescence than in childhood (McMurray, Harrell, Bangdiwala, & Hu, 2003). In sum, although physical activity declines across childhood and adolescence, physical activity tends to be stable through the elementary years and less so during adolescence.

As they mature, children are capable of engaging in a greater diversity of activities, both physical and sedentary. During leisure time, physical activity represents one of many competing activities that children perform. Evidence suggests that U.S. children spend approximately half of their waking hours engaged in leisure-time activities (Larson & Verma, 1999). However, many of these activities are sedentary in nature, such as playing video games, using the computer, and watching television. Research suggests that children with heavy television viewing habits tend to be engaged in less extracurricular activities than light viewers (Huston et al., 1992). On average, children spend about 90 minutes per day using the computer or playing video games (Stranger & Grindina, 1999). Larson and Verma (1999) report that children in the U.S. spend between 1.5 to 2.5 hours a day watching television. Moreover, as the family socioeconomic level decreases, children watch more television. Cherney and London (2006), in a study

of children between 5 and 13 years old, compared time spent watching television, playing computer/video games, and engaging in sports. They found that children's computer/video game use averaged approximately 1.1 hours per day and that television use averaged approximately 1.67 hours per day, whereas approximately 1.8 hours per day was spent in sport activities. In addition, research findings demonstrate that certain media can have negative effects on youth such as increased obesity and poor school performance (Gable & Lutz, 2000; Gentile & Walsh, 2002; Roberts, Foehr, Rideout, & Brodie, 1999; Robinson, 1999).

Children appear to spend an equal amount of time in active and sedentary leisure activities. At first, this finding may seem contrary to the notion that children have become sedentary. However, a single cross-sectional sample of youth is informative only at a particular developmental point in time, and research has demonstrated that children become less active *over time*. Therefore an understanding of the processes that result in the maintenance of healthy activity levels is warranted.

Several motivational factors that consistently predict children's participation in physical activity include: enjoyment, self-efficacy, outcome expectations, social relationships, fitness, and perceptions of ability (McCullagh, Matzkanin, Shaw, & Maldonado, 1993; Sallis, Prochaska, & Taylor, 2000; Weiss, 1993). However, little is known about how these factors compare to children's motivation to engage in sedentary activities. Therefore, it is of interest to understand the development and socialization of motivational factors and how they compare when children decide how to spend their leisure time. One model



that incorporates several of the motivational constructs just mentioned is the Eccles-Parsons et al. (1983) Expectancy-Value model.

### Expectancy-Value Theory

Originally developed to investigate academic achievement, the Expectancy-Value model hypothesizes that achievement-related choice, persistence, and effort are a function of individuals' expectations they can perform well within a particular activity domain, and the personal value they attach to the outcome of engaging in an activity. The Expectancy-Value model was developed under the assumption that children make activity choices amid a range of possible alternatives; the assumption is apropos in light of the increase in sedentary activity over childhood and adolescence (Janz, Burns, & Levy, 2005). Research on child and adolescent physical activity has focused on two major constructs from the broader Expectancy-Value model: perceptions of competence and subjective task value.

*Perceptions of competence.* Competence is a function of two components; expectancy of success and perceptions of ability. *Expectancy of success* is defined as the perceived probability of success in a given task (Eccles-Parsons et al., 1983). Defined in this manner, subjective expectancies appear similar to Bandura's concept of outcome expectancy which specifically refers to the anticipated consequences of a given behavior (Schunk & Pajares, 2002; 2005). However, subjective expectancies bear greater resemblance to Bandura's concept of self-efficacy. In fact, Eccles has referred to expectancy of success as "domain-specific personal efficacy" (Eccles, 2005, p.105). Personal efficacy or expectancy

of success is similar to self-efficacy when measured at the task-specific level (e.g., success on a math test); however, expectancy of success tends to be measured at the domain specific level (e.g., sports). *Perceptions of ability* are defined as the “assessment of one’s own competency to perform specific tasks or carry-out role-specific behavior” (Eccles-Parsons et al., 1983, p. 82). Although perceptions of ability are defined as being task specific, in practice, measures have focused on the domain-specific level. For example, Eccles and her colleagues have asked participants whether they are good at sports (a domain), or how good they are at sports relative to their peers. Taken together, competence perceptions can be both evaluative and comparative.

However, children do not appear to distinguish between expectancy for success and competence beliefs (Eccles & Wigfield, 1995). Although conceptually distinct, personal efficacy and perceptions of ability appear to be empirically inseparable when assessed in childhood. Items used to measure both constructs load on one factor forming a single expectancy/ability construct (Eccles & Wigfield, 1995). In fact, Fredricks and Eccles (2005) simply referred to this combined construct as competence and include items assessing expectancy of success and perceptions of ability. In general, the developmental course of children’s competency perceptions (including self-efficacy) is characterized as overly-optimistic and inaccurate in kindergarten, and gradually become more realistic as children progress through elementary school (Dweck, 2002; Schunk & Pajares, 2002). Over the course of elementary school, children are increasingly able to evaluate their abilities relative to peers.

*Subjective Task Value* (STV) is composed of four components: attainment value, enjoyment, utility value, and cost (Eccles, 2005; Eccles & Wigfield, 2002; Wigfield & Eccles, 2002). *Attainment* value represents the importance of doing well on a given task. *Enjoyment* is similar to intrinsic reward, representing the enjoyment one experiences from performing a given task. *Utility* value refers to how a given task is perceived to benefit other goals. For example, one might play sports in order to make new friends. Finally, *cost* is the relative expense of engaging in a given activity. For example, if an individual plays organized sports, time to engage in other activities such as playing music or attending social gatherings may be limited. Research findings suggest that motivation to engage or persist within a task is related to an individual's perception of task importance or the intrinsic reward (Deci, 1975). Developmentally, most research finds that the various dimensions of task value become more differentiated in adolescence (Eccles & Wigfield, 1995; Wigfield & Eccles, 2002); however some evidence has demonstrated that task value is differentiated in young children (Watkinson, Dwyer, & Neilson, 2005).

The efficacy of the Expectancy-Value model constructs have been demonstrated across a number of studies investigating youth sport participation (Fredricks & Eccles, 2002). Deeter (1989) tested a model of achievement motivation in the sports domain using several of Eccles' constructs. The results suggested that task-specific self-efficacy was predictive of the performance of college students on a physical activity task, and neither attainment nor utility value were predictive of performance. Eccles and Harold (1991) conducted the

first study to strictly apply the model to sport involvement in children and adolescents. Path analyses indicated that perceptions of ability, utility, value, and importance of sports were significantly related to sports participation. Cox and Whaley (2004) demonstrated that Expectancy-Value model constructs are predictive of effort and persistence in a youth sports context. Research by Xiang and colleagues (2003) with 2nd through 4th grade students suggests that both STV and expectancy for success were predictive of children's intent to participate in physical education. Finally, a qualitative study by Watkinson, Dwyer, and Neilson (2005) suggests that when interviewed, children indicate that ability and value are reasons for engagement in physical activity during recess time. Overall, the findings within sports, physical education and school recess suggest that achievement motivation models may be a viable theoretical approach for understanding child and adolescent leisure-time physical activity choices.

Several studies have found evidence indicating a link between perceptions of ability, children's enjoyment, and leisure activity (Brustad, 1996; Dempsey, Kimiecik, & Horn, 1993; Kimiecik, Horn, & Shurin, 1996; Kimiecik & Horn, 1998; Trost et al., 2003). For example, Biddle and Armstrong (1992) examined psychological correlates of active versus inactive boys and girls between the age of 11 and 12 years old. Results suggested that sport competence and intrinsic motivation were related to the percentage of time boys spent in vigorous physical activity. A study by Stucky-Ropp and DiLorenzo (1993) found that children's enjoyment of physical activity was predictive of both 5th and 6th grade boys' and girls' level of physical activity. Sallis and colleagues (1999) investigated the

extent to which a host of psychological variables predicted change in physical activity level over the course of 20 months in 4th grade children. Results suggested that both physical competence and preference for physical activity were positively related to boys' and girls' physical activity change scores.

The broader Expectancy-Value model suggests that various socio-cultural, socioeconomic, and stable child characteristics influence individuals' beliefs. Exogenous influences on behavior are mediated by achievement-related beliefs, expectancies, and task value. Other social agents, such as parents, peers, and teachers often interpret reality for children, bringing to bear the agent's own belief system. Parents are typically the primary socialization agents in middle childhood and have been a focus of Eccles's work (1993) on achievement motivation. The culmination of this work has led to the development of a parental socialization sub-model that more succinctly outlines the mechanisms through which the socialization process occurs (Eccles, 1993; Fredricks & Eccles, 2004).

### *Parental Socialization*

Eccles (1993) hypothesized four distinct pathways by which parents influence children: communication, providing opportunities, modeling, and the social-emotional climate they create. Pathways of influence can be characterized as direct, indirect, or as providing opportunities (Parke & Buriel, 1998). Through these various paths, parents manage their child's experience and interpretation of the world (Jacobs, Vernon, & Eccles, 2005). For example, parents may indirectly influence children's physical activity beliefs and behaviors by modeling regular exercise behavior. Alternatively, parents may directly encourage their children to

be active or provide an environment to be physically active through payment of fees for organized sports. For example, Fredricks and Eccles (2005) demonstrated that parents reported higher levels of activity-supportive behaviors for boys than for girls and that mothers' equipment purchases were positively related to their child's competence and value. Only fathers' involvement in coaching their child was positively related to both competence and value. Finally, the authors reported that the cumulative effect of various supportive factors was positively related to children's competence and value of sport participation.

Research on the extent to which parental behaviors influence children's beliefs is similar in the general physical activity domain. In an early study, Brustad (1993) examined the extent to which parental beliefs and behaviors were predictive of children's attraction to physical activity. Results indicated a robust link between parental encouragement and children's beliefs. Two limitations of this study are apparent; parental encouragement was the only behavior examined, and children's competence was an amalgam of both task value and competence beliefs. In another cross-sectional investigation, Trost and colleagues (2003) found that parental support was moderately related to child self-efficacy. Finally, Welk and colleagues (2003) examined the separate effects of parental support, role-modeling, facilitation, and involvement on children's perceived physical competence and general attraction to physical activity in a sample of 3rd through 6th graders. Results suggested that parental encouragement and facilitation had significant positive effects on both attraction and competence. Role-modeling and

involvement only had significant positive effects on attraction and competence, respectively.

There is abundant literature on the relation between parental behaviors and children's physical activity. In a qualitative review of correlates of child and adolescent physical activity, only parental support and direct help were related to adolescent physical activity, however, similar relations were not found for children's physical activity (Sallis, Prochaska, & Taylor, 2000). A recent quantitative review of the relation between parental socialization behaviors and child and adolescent physical activity demonstrated small-to-moderate relations for both children and adolescents (Pugliese & Tinsley, 2007). Specifically, parental encouragement, instrumental behaviors (i.e., transportation, payment of fees), and role modeling exhibited significant relations with physical activity level. No gender differences in the relation between parental behaviors and children's physical activity were observed across eight studies providing separate data for males and females.

In a study investigating parenting practices in a sample of 9-year-old girls, Davison, Cutting, and Birch (2003) identified two distinct parental practices: role-modeling and logistic support. Logistic support represents instrumental behavior that supports physical activity or sports participation. Results indicated that a mother's logistic support and a father's explicit modeling were predictive of their daughter's physical activity levels. Parental socialization behaviors also have been shown to predict changes in physical activity over time. Sallis and colleagues (1999) examined the extent to which parental behaviors predicted change in

physical activity over the course of 20 months in a sample of 4th graders. Zero-order correlations suggested that baseline parental co-participation, transportation, and encouragement were predictive of increases in boys' physical activity over time, but not girls' physical activity. Moreover, an increase in parent provision of transportation was related to increases in girls' and boys' physical activity over time. With regard to sports participation, Fredricks and Eccles (2005) found that although mothers' encouragement was predictive of child sport participation at the baseline assessment, it was not predictive of participation one year later. Furthermore, a number of support factors, such as equipment purchases, coaching, and time engaging in physical activity with a child, were positively related to sports participation. Overall, a clear link between parental behaviors and children's physical activity has been established; however, these relations tend to be modest and as a whole are not predictive of future participation.

Based on the evidence presented, children who choose to be physically active are characterized by a strong sense of physical ability, and derive enjoyment from participation in physical activity. Children are more likely to develop these beliefs and be active if their parents are supportive of physical activity. Parents provide support in a variety of ways, such as improving access to activity equipment (i.e., bicycle), transportation for the purpose of engaging in physical activity, and the payment of fees for organized sports participation. Parents may also provide support by encouraging and prompting their child to be active, and co-participating in physical activity with their child. Parents who find physical activity important in their child's life, and believe their child enjoys



physical activity, are more likely to provide support for physical activity and have more physically active children.

### The Present Study

The goal of the present study is to expand Eccles's Parental Socialization sub-model in several ways. The accumulated evidence supports the standard Expectancy-Value model as well as the Parental Socialization sub-model developed by Eccles (1993). Both models reflect Eccles and colleagues (1993) stage-environment fit perspective and suggest that mismatches between a child's social or family environment and his or her developmental needs (i.e., poor fit) have adverse consequences on motivation. Given such a perspective, the present study will expand Eccles' sub-model in several ways by exploring 1) the role of parents' negative and sedentary control tactics, 2) youth affective reactions to parental influence attempts, 3) how parents' perception of the socio-emotional environment and the desire to change their child's physical activity levels predicts parental tactic use. Finally, current research has increasingly acknowledged the possible context-dependent nature of socialization (Bugental & Grusec, 2006). Therefore, the present study will also investigate several proposed moderators of the expanded Parental Socialization sub-model, including children's age, gender, and their perceptions of the parent-child relationship. By focusing on a boarder range of child-specific parent behavior, child affect, child age, and the parent-child relationship context, the present study provides a more rigorous application of the Parent Socialization sub-model in the physical activity domain.

*Predictors of Youth Physical Activity-Related Beliefs, Affect, and Behavior*

*Negative parental behaviors.* Researchers studying the sport and physical activity domain have focused almost exclusively on positive parenting behaviors. The investigation of negative parenting practices may enhance the explanatory power of the Parental Socialization sub-model. Social influence models of health behavior change suggest that social influence agents often use a combination of positive and negative strategies, and these strategies may elicit differential responses in terms of affect and ultimately, behavior change (Tucker, Orlando, Elliott, & Klein, 2006). Early research on young children's physical activity investigated the influence of parental discouragements to be active or to decrease activity (Klesges, Hanson, & Haddock, 1990; Klesges, Malott, Boschee, & Weber, 1986). Results in a preschool samples using observational measures did not reveal any significant associations. However, observations were conducted in participants' homes and it is unclear how the presence of observers would affect negative parental behaviors. Also, parents may feel that it is natural for young children (i.e., preschoolers) to play and be active, and this behavior may not elicit discouragements at this age. Beyond this early research by Klesges and colleagues (1986, 1990), scant attention has been paid to the role of negative parental behaviors in the physical activity domain.

The effect of coaching behavior has often been investigated with the aim of understanding how it relates to athletes' experiences within sports. Examining research on coaching has two benefits; the population is appropriate for the discussion, and youth self-perception and participation are often the outcome of

interest. Conceptually, models of coaching behavior are consistent with the framework in the Expectancy-Value model; children's perception and the meaning they ascribe to coaching behaviors mediates the relation between coaching behaviors and participation or effort (Curtis, Smith, & Smoll, 1979). Finally, measures assessing coaching behavior are designed to capture both positive and negative behaviors. Early research found that negative coaching behaviors are related to significantly lower attraction to baseball by little leaguers (Curtis, Smith, & Smoll, 1979). Attraction to sports was defined as interest in participating, which dovetails with the Expectancy-Value model's subjective value construct. Although Smith and Smoll (1990) did not find a relation between negative behaviors and attraction to baseball when they controlled for positive behaviors, in a more recent study, punitive and hostile interactions had strong negative relations with young athletes' attitudes (Smith & Smoll, 1997).

*Parent influence attempts and child affect.* Only a few studies have investigated children's affective reactions to parental attempts to influence physical activity. Within the literature focused on youth sport participation, research has tended to investigate stress and enjoyment (Scanlan, Babkes, & Scanlan, 2005). An early study by Scanlan and Lewthwaite (1984) suggested that young athletes experienced greater enjoyment when parents and coaches demonstrated satisfaction with performance, and a lack of non-contingent affective reactions. Such non-contingent affective reactions consisted of displaying pride, satisfaction, and emotional support (i.e., "makes me feel good") without regard to sport outcomes. Youth athletes also demonstrated higher levels

of anxiety when they perceived high parental pressure to perform. With regard to enjoyment, Brustad (1988) demonstrated that parental pressure had a negative relation with early adolescents' enjoyment in a community basketball league. Implicit in the operationalization of parental pressure were parental affective reactions to sport outcomes, such as getting upset.

Using a sample of adolescent and college athletes, Williams and colleagues (2003) investigated affective reactions to coaching behaviors. Results suggested that an overall negative affective factor was negatively related to athlete's self-confidence and positively related to anxiety. Moreover, interventions have demonstrated that coaches in the control group have an athlete drop out rate that is five times higher than coaches receiving training designed to teach them how to be supportive without being overly punitive and emotional (Barnett, Smoll, & Smith, 1992). Overall, research suggests that youth's affective reactions to influence attempts may be an important outcome with regard to physical activity.

The lack of research on negative behaviors and the role of affect regarding physical activity represent gaps in the literature. It is reasonable to assume that the extent to which parents are punitive, controlling, and pressure children to be active may influence children's physical activity-related beliefs, affect, and behaviors. The literature on coaching behavior provides a frame of reference for the present study, in which parents' use of control, pressure, and punitive action is explored within the context of the Eccles Parental Socialization sub-model. The present study examines whether parental use of negative tactics (a composite of

pressure, punitive actions, and control) are related to children's beliefs, affect, and behaviors regarding physical activity.

*Parental sedentary control tactics.* The Expectancy-Value model hypothesizes that children's motivation to engage in a given activity is the result of a comparison of beliefs concerning available options. Within the Parental Socialization sub-model, children's competence and value beliefs are influenced by various parental behaviors. However, the Eccles' Parental Socialization sub-model does not include parental behavior regarding competing activities. It is reasonable to assume that children's beliefs among alternative activities are also influenced by parental behaviors. Therefore, parents likely influence children's choices regarding engagement in different activities because parents may manage children's leisure-time activities more broadly, directly influencing, modeling or limiting opportunities across a range of interrelated activities (Parke & Buriel, 1998).

Ryan and Blanchard (2008) conducted a study that provides an example of how beliefs regarding sedentary activities may impact physical activity. They investigated "cross-behavioral" (p.790) cognitions in a sample of adults and undergraduate college students regarding physical activity. Cross-behavioral cognitions represent beliefs and attitudes that compete against each other when an individual is making a choice. The authors examined the extent to which beliefs, attitudes and intentions to engage in sedentary activities explained additional variance in physical activity over and above that of physical activity beliefs. The

results suggested that sedentary beliefs and attitudes were negatively related to intent to engage in physical activity and physical activity behavior.

Ryan and Blanchard (2008) frame their findings in the context of behavioral choice which is consistent with the notion of choice proposed in the Expectancy-Value model. Measures of competence and subjective value do not include specific alternative activities, often asking children to rate their interest in, for example, sports as compared to “other activities”. It is difficult to know which activities children are comparing sports to, and therefore the model may benefit from a measure with concrete comparisons, especially for children. While investigating a number of popular sedentary activities, Ryan and Blanchard (2008) found that only TV viewing was negatively related to intent to engage in physical activity, suggesting that specific competing activities may be relevant. Although a number of activities may compete with physical activities, the present study focuses on comparisons with a few popular sedentary activities such as television watching, playing video games, and computer/internet use.

In light of the role parents play as managers and socializing agents, it is reasonable to expect cross-behavior socialization to play a role in children’s choices. A child who is encouraged to be active in a home with strict rules regarding television usage faces a different set of choices than a child in a home with no such rules. It is important to note that research is mixed on the extent to which parental regulation and rules influences children’s media use, especially television (Vandewater, Park, Huang, & Wartella, 2005). Parent and child T.V. viewing habits are positively related, and families who engage in alternative

activities tend to spend less time watching television, suggesting that media use is influenced by the family (Barradas, Fulton, Blanck, & Huhman, 2007; Gentile & Walsh, 2002). However, scant or no attention has been paid to examining how parental behaviors regarding sedentary activities influence children's beliefs and choices about leisure time activity. For example, to what extent does parental encouragement of physical activity and discouragement of sedentary activity influence children's beliefs about both activities and their behavior choices?

Given the research on cross-behavioral cognitions and the relative lack of research on cross-behavioral socialization, the present study examines how parental influence tactics are related to children's perceptions of competence and subjective task value compared to popular sedentary activities. Specifically, the focus is on parental behaviors that would limit or discourage youth from engaging in sedentary activities. Therefore, the relations between sedentary control tactics and children's physical activity-related beliefs, affective reactions, and behavior were investigated. Sedentary control tactics were assessed as a composite of parental control, discouragement, or punitive actions regarding sedentary activity. In addition, the present study addresses the relative strength of these associations compared to traditional positive tactics in the physical activity literature, such as parental encouragement, instrumental behaviors, and modeling.

### *Contextual Factors*

*Parenting style and family environment.* Even when parents engage in supportive behaviors, the emotional tone associated with support delivery may not be interpreted by youth in a positive manner. Some forms of support can have

negative outcomes in terms of children's beliefs, affective responses, and ultimately, physical activity behavior. As noted earlier, the limited research on parental pressure highlights how negative emotions combined with supportive behaviors such as encouragement may undermine positive outcomes. Parents' emotional tone can be conceptualized and assessed within the Parental Socialization sub-model using the framework provided by the literature on parenting style.

Several theoretical perspectives, such as the typological, attachment-based, and interactional approach, have been developed to conceptualize and study parent-child relationships (Parke et al., 2006). The concept of parenting style has not received much attention from researchers studying sports and physical activity. The typological approach has a long tradition originating with Baumrind's (1991) three different parenting types: authoritative, authoritarian, and permissive. The typology spawned a multitude of studies on parenting style. An alternative to typing parents was to investigate the individual qualities of parenting. Parent-child relations are typically investigated along three dimensions: autonomy, conflict, and harmony (Collins & Steinberg, 1998). Autonomy refers to the extent to which parents exert control over youth behavior. Parental control can be exerted through a number of practices. For example, parents may employ restrictive rules for outside play. Conflict represents the degree to which hostility is present during interactions, and harmony is the degree of warmth and the degree to which the parent and child are emotionally close. The implication is that



supportive behaviors may be perceived negatively by children if they are delivered in the context of a family environment that is high in conflict.

Darling and Steinberg (1993) argue that parenting style represents “characteristics that alter the efficacy of the parent's socialization efforts by moderating the effectiveness of particular practices and by changing the child's openness to socialization” (p. 488). The authors argue that parenting patterns involve three distinct dimensions: parenting practices, parenting style, and socialization goals. Practices refer to the behaviors parents utilize in accomplishing socialization goals for a given outcome. That is, socialization goals organize and direct parental behaviors. For example, if the goal of socialization is physical competence, and the mechanism through which this socialization goal is accomplished is by providing opportunities to be active, then enrolling a child in a sports league or taking him or her to the park to ride a bike would all be manifestations of the same parental practice. Parenting practices may fall within the direct, indirect, or provision of opportunities pathways of socialization mentioned earlier. Socialization goals are domain-specific, and as such, represent exogenous factors that may influence the practices parents use. Whereas parental socialization goals and practices are domain-specific, they are distinct from parenting style.

Darling and Steinberg (1993) suggest that parenting style refers to a non-domain-specific pattern of behaviors that are manifestations of the parent's general emotional attitude toward the child. Style consists of various non-content behaviors such as tone of voice, body language, or facial expressions. Style

represents the emotional context in which parental socialization practices occur. As such, parenting style cuts across various domains in which parental socialization practices unfold. For example, an authoritarian parent may restrict TV viewing time, and require their child to go outside and play. The authoritarian may be encouraging physical activity, but is also imposing their will upon the child, diminishing the child's own autonomy. The stylistic approach of the parent thus may influence children's openness to socialization attempts, which in turn may further moderate the relation between practices and outcomes.

Evidence suggests that parenting style moderates the relation between parental practices and children's academic performance (Steinberg et al., 1992). However, researchers in the domains of physical activity and sport typically have treated parental style or aspects of the parent-child relationship as exogenous factors or have ignored them altogether. For example, research on children's motivation and interest in leisure-time activity suggests that parental control reduces the overall interest in leisure-time activities in both male and female 7th through 9th graders (Sharp et al., 2006). A few studies have investigated youth perceptions of the emotional climate and its relation to organized activity. Persson, Kerr, and Stattin (2007) investigated whether adolescents' feelings toward the family context and their negative experiences were related to their dropping out of organized activities including participation in sports. Adolescents were asked a series of questions tapping the degree to which they experienced feelings of being controlled, disrespected, and proud when in the presence of family. Controlling for age, gender, and family structure, results indicated that

youth reporting greater feelings of control and disrespect were 1.5 times more likely to stop participating in an organized activity. A study by Ullrich-French and Smith (2006) investigated the relation between parent-child relationship quality and conflict and enjoyment, intrinsic motivation, stress, and competence in a sample of 10-14 year old soccer players. Conflict with mothers and with fathers were negatively related to enjoyment and positively related to stress, whereas relationship quality was positively related to intrinsic motivation. Relationship quality with fathers was also negatively related to stress and positively related to both perceived competence and intrinsic motivation. Finally, in a recent study, Vierling, Standage, and Treasure (2008) found that youth who perceived their parents as providing more support for autonomy were more likely to report increased competence beliefs with regard to physical activity.

The limited research evidence suggests that the emotional climate produced by specific patterns of parenting may enhance or undermine children's participation in sports and physical activity. The present study addresses the extent to which children's perceptions of several facets of the parent-child relationship (autonomy, control, and conflict) moderate the relations between parental tactic use and children's affective reactions and expectancy-value beliefs. However, it is also reasonable to assume that parental perceptions of the parent-child relationship also act as an exogenous influence on their use of tactics. Consequently, as can be seen in Figure 1, perceptions of the parent-child relationship are depicted both as an exogenous variable and as a moderator variable. The key distinction between the two roles posited for perceptions of the

parent-child relationship is that *parents'* perception of the relationship is proposed to be an exogenous factor whereas the *child's* perception of the relationship is posited to moderate the effect of tactic use on child outcomes.

*Gender.* A consistent finding within the literature on physical activity concerns the difference in both level and rate of decline between males and females over time (Bar-Or & Rowland, 2004; Sallis, Zakarian, Hovell, & Hofstetter, 1996). Sallis (1993) summarized the results of several studies reporting gender differences in children's physical activity. Samples ranged between 8 and 17 years of age. On average, males were 14% and 23% (self-report and objective measures, respectively) more active than females across all ages. In addition, female physical activity declined on average 2.6% to 7.4% per year compared with 1.8% and 2.7% per year in males (self-report and objective measures, respectively). It is important to note that the rate of decline was substantially higher in females when physical activity was assessed with objective measures such as pedometers or accelerometers. Similar gender differences have also been reported in specific physical activity contexts such as recess (Ridgers, Stratton, & Fairclough, 2006) and sports participation (Telford, Salmon, Timperio, & Crawford, 2005).

Significant gender differences have been also demonstrated with regard to perceptions of ability and subjective task value in the sports domain (Eccles & Harold, 1991). Boys consistently report higher scores on ability perceptions, perceived importance of sports, enjoyment, and usefulness of sports. Consistent empirical evidence suggests that parents' gender-stereotyped beliefs about sports

are predictive of children's competence and task value. For example, in a sample of 11 to 12 year olds, Jacobs and Eccles (1992) specifically examined the influence of mothers' stereotyped beliefs on (a) their perception of their child's sports ability, and (b) their child's own perception of sports ability. Results suggested that mothers' perception of their child's ability within the sports domain partially mediated the positive relation between stereotyped beliefs and children's perceptions of ability. These findings are consistent with reports that suggest activity preferences, such as sports, tend to be highly gender-typed, especially for males (Larson & Verma, 1999; McHale, Kim, Whiteman, & Crouter, 2004). An earlier study by McHale, Crouter, and Tucker (1999) found that children's sex-typed interests vary as a function of fathers', but not mothers', traditional gender-role attitudes.

The extent to which parents' gender influences the socialization of youth physical activity beliefs has rarely been studied. Fredricks and Eccles (2005) found that, on average, mothers and fathers reported higher perceptions of ability and value for sport for males than for females. Only parents' perceptions of ability were predictive of sport participation for both genders. Regression models were estimated for mothers and fathers separately, precluding any examination of a parent by child gender interaction effect. Despite this limitation, the findings were replicated in a recent report published by Jacobs, Vernon, and Eccles (2005) investigating only mothers' beliefs.

The evidence regarding the role of gender suggests that it is prudent to examine, or at minimum control for, youth gender when investigating youth

physical activity. Males and females are likely to vary in their expectancy-value beliefs regarding physical activity, and physical activity behavior. Parents' gender has demonstrated mixed results across the extant literature, mostly due to the lack of data on fathers. In the present report, to the extent possible, the effects of parent gender will be examined along with the inclusion of youth gender as a possible control or moderating factor.

*Age.* Prior research in the physical activity domain has demonstrated that parental behaviors vary as a function of child age (Pugliese & Tinsley, 2007). For example, Pugliese and Tinsley found that the association between parental modeling and physical activity decreases with age, likely due to the increased influence of peers. Conversely, the association between encouragement and physical activity increased across age. Regarding sedentary activity, research suggests that parental rules concerning T.V. are negatively related with children's age (Barradas, Fulton, Blanck, & Huhman, 2007). As the parent-child relationship changes while children mature, parental strategies and behaviors are likely to vary. It may also be possible for the range of leisure time activity choices to change over time. For example, as children become more computer-literate, the computer may become a more attractive leisure time pursuit. The changing array of leisure time choices may present a new set of conditions for parents to manage. Finally, as children acquire more autonomy, parental control and management of children's leisure time may lessen; parents of older children may use more indirect rather than direct tactics.

## *Hypotheses*

*Hypothesized relations among parental influence tactics, children's affective reactions, comparative expectancy-value beliefs, and physical activity behavior.* Use of positive influence tactics and parents' level of physical activity are expected to be positively related to (1) positive affective reactions to influence attempts, and (2) expectancy-value beliefs for physical activity relative to sedentary activities. After accounting for positive tactic use, it was hypothesized that use of negative tactics will be (1) inversely related to youth expectancy-value beliefs for physical activity relative to sedentary activities, and (2) positively associated with negative affect in response to influence attempts. Use of sedentary control strategies will be positively related to, (1) youth expectancy-value beliefs for physical activity relative to sedentary activities, and (2) negative affective reactions to parental influence attempts. Finally, youth expectancy-value beliefs for physical activity relative to sedentary activities and positive affective reactions will be positively related to youth physical activity, whereas negative affective reactions will be negatively related to youth physical activity.

*Hypothesized relations between parental perceptions of the family environment, parental desire to change child physical activity, and parental tactic use.* Parents who perceive higher levels of conflict with their child will utilize fewer positive tactics and more negative tactics. Conversely, family cohesion will be positively related to positive tactics use. It unclear whether perceptions of conflict and cohesion will be related to sedentary control tactics. However, it is hypothesized that higher levels of control within the family will be positively

related to negative tactic use and sedentary control tactics. Finally, it is expected that parents' desire to increase their child's physical activity will be positively related to the use of positive tactics and attempts to control or limit sedentary activities.

*Hypothesized indirect effects of parental perceptions of the family environment, parental desire to change child physical activity, and parental tactic use.* It is expected that positive and negative tactic use will fully mediate the relation between the extent parents' desire to change their child's physical activity and youth affective reactions, expectancy-value beliefs, and physical activity. That is, the indirect effect of parents' desire to change their child's physical activity on child outcomes will be positive and statistically significant whereas the direct effect will not be statistically significant. Second, it is expected that youth expectancy-value beliefs and affective reactions will fully mediate the relations between all three types of parental tactics and youth physical activity; there should be no statistically significant direct effects between tactic use and child physical activity. Third, the relation between parents' physical activity and children's physical activity should also be fully mediated by children's expectancy-value beliefs and affective reactions.

*Hypothesized moderation of the effects of tactic use on child variables.*

Figure 1 also suggests that the role of child perceptions of the parent-child relationship should function as a moderator of the relations between parental tactic use and child expectancy-value beliefs and affective reactions. Specifically, a stronger positive relation is expected between positive tactic use, expectancy-



value beliefs, and positive affect for youth who report higher levels of autonomy and lower levels of conflict and control than youth who report low levels of autonomy and higher levels of conflict and control. In contrast, a stronger positive relation is expected between negative and sedentary control tactics and negative affect for youth who report lower levels of autonomy and higher levels of conflict and control than youth with the opposite pattern.

Two other moderators are examined: youth age and gender. It is expected that expectancy-value beliefs and positive affect will only partially mediate the relations between parental tactic use and children's physical activity when examined across age groups. The prediction of partial mediation is based on the notion that age may serve as a proxy for other unmeasured factors that may relate to children's physical activity, such as peer influences or gender stereotypes, and that parents typically have greater direct influence over a child's environment earlier in age. Therefore, it is expected that the direct effect between positive and negative tactic use and youth physical activity will be statistically significant in the younger group, but not statistically significant in the older group. In both younger and older youth the indirect effect of tactic use as mediated by youth expectancy-value beliefs and affective reactions will remain statistically significant. In addition, it is expected that the effect of sedentary control tactics on expectancy-value beliefs will be less in the older than the younger group. Moreover, it is expected that sedentary control tactics will exhibit a stronger positive relation with negative affect within the older group than the younger group.

Given that parents perceive that their sons have more physical ability than their daughters, the relation between parents desire to change their child's physical activity and tactics use may be stronger among boys than girls. Furthermore, the relations between positive and negative tactic use and expectancy-value beliefs should be stronger for males than females.

## Chapter 2

### METHOD

#### *Participants*

The present study included 4<sup>th</sup>, 5<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> grade students and their parents. Students were recruited from one elementary school and two junior high schools located in the southwestern United States. Table 1 presents demographic data for the population of students at each school. Although metropolitan status (i.e., rural vs. suburban) was initially a concern, recent evidence suggests that the differences in physical activity and sedentary behaviors between suburban and rural youth are smaller relative to when they are compared with urban youth (Springer, Hoelscher, Castrucci, Perez, & Kelder, 2009).

*Elementary school sample.* Fourth and fifth grade students (n = 145) were recruited in the spring of 2008 at a single elementary school located in a semi-rural community participating in a larger study of physical education and physical activity patterns of youth. The average age of the elementary school students in the sample was 10.32 years old, ranging between 8 and 12 years old; 49.7% of the sample was female. Of the 63 youth reporting their ethnicity, 63% were non-Latino White, 21% Latino, 8% African American, 1.6% Middle Eastern, 1.6% Native American, and 5% reported their ethnicity as “other”.

*Junior high school sample.* Seventh, eighth and ninth grade (n = 165) students were recruited within boys’ and girls’ physical education classes in two junior high schools in the spring and fall of 2008. In each school, two girls’ and two boys’ seventh and eighth/ninth grade classes were targeted. The average age

Table 1.

*General Demographic Data for Participating Schools*

Demographics	School		
	A	B	C
School Population	629	1244	1144
Grades	PK-5	7th - 9th	7th - 9th
Ethnicity			
Caucasian	481	955	716
Hispanic	115	180	336
Black	18	52	44
Asian	10	29	19
Native American	5	28	29
% Free - Reduced Lunch	26.01%	24.04%	44.18%
School Designation	Rural	Suburb	Suburb
Community Population	2,484	463,552	

of the junior high school students in the sample was 12.8 years old, ranging between 11 and 15 years old; 49.3% of the sample was female. Of the 98 youth reporting their ethnicity, 71% were non-Latino White, 12% Latino, 5% African American, 3% Asian or Pacific Islander, 2% Native American, and 6% reported their ethnicity as “other”.

All students volunteering to participate in the study were compensated with a raffle ticket. The raffle ticket provided students with an opportunity to win a prize at the end of data collection. Raffle prizes included various sports equipment and gift certificates to local sporting goods stores.

*Parent sample.* Parents or caregivers were recruited through a letter sent home with students. Parents were not compensated for their participation. The response rate of parents of elementary school students was 45%. Among parents of elementary school students, 86 adults (65 families) completed the questionnaires; 52 respondents were mothers, 33 were fathers, and 1 was a female grandparent. Among these families, 72% indicated they lived in a two-parent home. The average age of parents of elementary school children was 36 years old for mothers and 38 years old for fathers. Among mothers of elementary school children, 63% identified themselves as non-Latino White, 22% Latino, 8.5% African American, 1.7% Asian or Pacific Islander, 3% Native American, and 1.7% reported their ethnicity as “other”. Among fathers, 69% identified themselves as non-Latino White, 20% Latino, 5% African American, 1.7% Native American, and 3% reported their ethnicity as “other”. In terms of education, 33% of mothers had at least a GED or High School diploma, whereas 60% had some

form of post-secondary vocational training, some college, or a college degree.

Among fathers, 46% had a GED or High School diploma, whereas 45% had some form of post-secondary vocational training, some college, or a college degree.

At the junior high school level, parent recruitment resulted in a response rate of 64%. Among parents of junior high school students, 140 adults (106 families) completed the questionnaires; 93 respondents were mothers, 45 were fathers, 1 was an “other adult female”, and 1 was an “other adult male”. Among these families, 70% indicated it was two-parent home. The average age of parents of junior high school children was 40 years old for mothers and 42 years old for fathers. Among mothers of junior high school children, 76% identified themselves as non-Latino white, 15% Latino, 2% African American, 4% Asian, 1% Native American, and 1% reported their ethnicity as “other”. Among fathers of junior high school children, 71% identified themselves as non-Latino white, 19% Latino, 5% African American, 1% Asian, 1% Native American, and 1% reported their ethnicity as “other”. Among mothers, 38% had at least a GED or High School diploma, whereas 62% had some form of post-secondary vocational training, some college, or a college degree. Among fathers, 48% had a GED or High School diploma, whereas only 52% had some form of post-secondary vocational training, some college, or a college degree. Across the three schools (one elementary and two junior high), a total of 171 families with at least one child and one parent participant were available for analysis.

### *Procedure*

The University's Institutional Review Board and the participating Public School Districts approved all procedures. All students were informed of the study during school hours and were given parent/caregiver consent forms. Students were also required to complete a hand written assent form. Student participation consisted of two parts. One part involved wearing a pedometer and completing a daily step-count log for seven days. Students also completed a daily validation form which asked them to indicate whether they had removed the pedometer for greater than 1 hour and to report their physical activities outside of school. The second part involved filling out a questionnaire. Parents also completed a questionnaire.

*Pedometers.* To obtain an adequate sample of student physical activity, pedometer counts were collected over seven days. Prior research has indicated that two to eight days is sufficient for measuring a student's physical activity level (Troost, Pate, Freedson, Sallis, & Taylor, 2000; Tudor-Locke, McClain, Abraham, Sisson, & Washington, 2009). Although most students and physical education teachers were familiar with pedometers, or had used pedometers prior to data collection as a part of the physical education curriculum, each class of students was given a brief orientation as to the function and proper placement of pedometers. Students were instructed to wear the pedometer at all times and to remove the pedometer during sleep and water activities. Researchers demonstrated in each class the proper placement of the pedometer, located on the

hip above the right knee (Louie & Chan, 2003; Ramirez-Marrero, Smith, Sherman, & Kirby, 2005).

Students were instructed to log the number of steps each day in a step-count log (see Appendix A). Researchers were present on each day of data collection to ensure students followed the proper protocol. Students were told to log the number of steps taken four times a day; before school, before physical education (PE), after PE, and after school. At the beginning of the school day, elementary school students were instructed to record the number of steps and reset the pedometer, thus segments of the day and 24 hour readings were recorded. Junior high school students were instructed to reset the device after PE each day, recording a 24 hour reading only. Over the weekend, students were instructed to record their steps at the beginning and end of each day without resetting the device. Pedometers and logs were collected the school day following the weekend.

On each day of data collection, validation checks were conducted in order to clarify any unusual or extreme activity log entries with students. In addition, each activity log included a few items that asked children if they had worn their pedometer the entire day and if they had removed the pedometer for any reason other than when they were instructed to remove it (e.g., sleeping, shower, swimming). After data entry, all pedometer data were checked for extreme or unusual values to ensure data quality prior to analysis.

*Student questionnaire data.* Questionnaires for students were administered either before or after the collection of the physical activity data. Student



questionnaires were administered in academic classrooms for elementary school students, and during PE for junior high school students. Researchers were present to clarify or answer student questions regarding questionnaire items. Elementary school students' responses were not anonymous as data were collected as part of a larger study on youth physical activity and health. Consistent with the IRB approved protocol of the larger study, and in order to link student survey responses to activity logs and the pedometer, students were assigned numbers that allowed for survey data to be matched with pedometer data. Responses were anonymous for junior high school students as data were collected independently of the study investigating elementary school students' physical activity. Each junior high school student was given a study packet which contained the child and parent surveys, activity log, and pedometer. All packet items were marked with a non-identifying ID in order to link the survey responses with pedometer data.

After completion of the student questionnaire, all students were instructed to deliver a parent questionnaire packet to their parent or caregiver. Each parent questionnaire packet contained a consent form, instructions, demographic questionnaire, and two identical parent questionnaires. Parents were informed that "...two Parent Questionnaires are included because, if possible, we would like to provide an opportunity for more than one parent to respond. If your home is a single parent home, simply return the uncompleted questionnaire." The instructions did not specify a preference for the gender of the parent. Pilot testing suggested the survey took no more than 30 minutes to complete. Completion of

the parent questionnaire was considered a parent's own consent to participate in the study. Parents were instructed to return the surveys to their child's teacher.

### *Instruments*

Pedometers are small devices that monitor the mechanical aspect of physical movement, specifically, information on vertical movement and count strides (Bar-Or & Rowland, 2004). That is, a pedometer provides a count of the number of steps an individual takes in a given time frame. A limitation of pedometers is that they do not record the intensity of movement (e.g., walking vs. running; Bar-Or & Rowland, 2004). Pedometers have been frequently used to measure youths' physical activity because of the high internal consistency reliability and acceptable levels of validity (Bar-Or & Rowland, 2004; Kohl, Fulton, & Caspersen, 2000).

Despite the advantage of practicality, the precision of self-report measures of physical activity suffers compared to the use of electronic and mechanical devices such as pedometers. In general, researchers are recommended to employ at least two different measurement techniques when assessing physical activity (Bar-Or & Rowland, 2004; Kohl, Fulton, & Caspersen, 2000; Sallis, McKenzie, & Alcaraz, 1993). Multiple measures allow for different aspects of physical activity to be represented in analyses of the processes underlying engagement in physical activity such as *frequency* of activity over a given time frame and *type* of activity (Kerner & Kurrant, 2003).

The present study utilized the current gold standard in pedometer research for purposes of measuring student physical activity levels; the Yamax Digiwalker

SW-200 (Schneider, Crouter, & Bassett, 2004). In the present study, youth physical activity was assessed using the average number of steps taken per day, where a minimum of three days of data were present. The Yamax pedometer has produced valid ( $r = .64$  to  $.95$  with observational measures) and reliable estimates over time of children's physical activity in prior research (Barfield, Rowe, & Michael, 2004; McKee, Boreham, Murphy, & Nevill, 2005), and acceptable internal consistency reliability ( $r = .51$  to  $.92$ ) across different activities (Jago et al., 2006).

### *Measures*

*Youth measures.* Copies of the youth measures are presented in Appendix B. Student questionnaires consisted of 71 items, and took no longer than 30 minutes to complete. Questionnaire items assess relative physical activity competence and value, parental influence strategies related to physical activity and sedentary behavior, children's affective and behavioral reactions to parental influence attempts, and questions concerning parent-child relationship quality. Table 2 presents youth-related constructs, their associated references, and the survey item numbers used to assess them.

*Relative expectancy and value beliefs.* Measures of students' relative expectancy and value for physical activity were based on measures used by Fredricks and Eccles (2005; see Appendix B, Questions 1-18). Original items were altered such that students compared physical activities with common sedentary activities on a number of dimensions such as perceived competence (i.e., how good are you at physical activity), expectancy for success, importance,

Table 2.  
*Measures and Scales used to Measure Associated Constructs.*

Construct	Instrument/Measure	Items
Youth (Appendix B)		
Relative Competence	Modified Expectancy-Value Measure; Fredricks & Eccles (2005)	1-3
Relative Expectation of Success	Modified Expectancy-Value Measure; Fredricks & Eccles (2005)	4-6
Relative Importance	Modified Expectancy-Value Measure; Fredricks & Eccles (2005)	7-9
Relative Likeability	Modified Expectancy-Value Measure; Fredricks & Eccles (2005)	10-13
Relative Interest	Modified Expectancy-Value Measure; Fredricks & Eccles (2005)	14-17
Relative Utility	Modified Expectancy-Value Measure; Fredricks & Eccles (2005)	18a-18f
Parental Positive Tactics	SPARK Measure; Sallis and colleagues (1993)	21,25,26,30
Parental Negative Tactics	Modified Items; Lewis & Rook, (1999); Logic, Okun, & Pugliese, (2009)	22,23,24,27,29,31,34
Sedentary Control Strategies	Developed for the present study.	28,32,33,35
Positive Affect	Modified <i>How I Feel</i> (HIF) scale; Walden, Harris, & Catron (2003)	36,37,41,42
Negative Affect	Modified <i>How I Feel</i> (HIF) scale; Walden, Harris, & Catron (2003)	38,39,40,43,44,45
Autonomy	<i>Perception of Parents</i> (POP); Grolnick, Ryan, and Deci (1991) <i>Child Version of The Family Environment Scale</i> (CVFES); Pino, Simons, and Slawinoski (1984)	59-64
Conflict	<i>Child Version of The Family Environment Scale</i> (CVFES); Pino, Simons, and Slawinoski (1984)	66,67,68
Control	Pino, Simons, and Slawinoski (1984)	69,70,71
Parents (Appendix C)		
Parent Desire to Change Child PA	Developed for the present study.	1
Parental Positive Tactics	SPARK Measure; Sallis and colleagues (1993)	29,33,34,38
Parental Negative Tactics	Modified Items; Lewis & Rook, (1999); Logic, Okun, & Pugliese, (2009)	30,31,32,35,37,39,42
Sedentary Control Tactics	Developed for the present study.	36,40,41,43
Parent Physical Activity	Godin Physical Activity Measure; Godin & Shephard (1985)	41-43
Child Physical Activity	Physical Activity Checklist; Sallis and colleagues (1993)	2 -21
Child Sedentary Activity	SPARK Measure; Sallis and colleagues (1993)	22-25
Family Conflict	<i>Family Environment Scale</i> (FES); Moos & Moos (1986)	52,60,69,78,87,96,104,114,122
Family Cohesion	<i>Family Environment Scale</i> (FES); Moos & Moos (1986)	50,58,67,76,85,94,103,112,120
Family Control	<i>Family Environment Scale</i> (FES); Moos & Moos (1986)	57,66,75,84,93,102,111,119

and liking. Common sedentary activities included school work, watching T.V., playing video games, and using the computer. For example, with regard to video games students were asked “Compared to playing video games, how good are you at physical activities?” Students responded on a 5-point scale with anchor points of *not very good* (1) to *very good* (5). To assess relative value, students were asked how “useful” physical activity was for a variety of hypothesized activities such as spending time with friends, making you feel good about yourself, staying healthy/fit, playing games, being liked by others, and learning new things. Students responded on a 5-point scale with anchor points of *not very useful* (1) to *very useful* (5). The general form of these items has been used with children in the 2<sup>nd</sup> grade and are highly reliable ( $\alpha = .81-.92$ ) in the elementary population (Eccles, 1993; Wigfield & Eccles, 1992).

*Parental influence tactics.* Positive and negative parental influence tactics were assessed with 15 items used in prior research focusing on social and family influences on physical activity (see Appendix B, Questions 21-35). Students were told to think about how often their parent over the past three months had tried to influence them to engage in physical activity or disengage from sedentary activities. Positive parental influence tactics were measured with four items developed by Sallis and colleagues (1993), and were designed to assess the extent to which parents used encouragement, co-activity, transport, and purchasing sports or exercise equipment. An example of a positive tactic item is “During the last 3 months, how often have your parents drove you to a place where you can do physical activities or play sports?” The intraclass  $r$  for positive tactic items ranged

from .36 to .60 in a sample of primarily Caucasian students taking part in a study on physical education (SPARK; Sallis, et al., 1993). Negative parental influence tactics were assessed with seven items adapted from measures used in research on health-related social control (Lewis & Rook, 1999; Logic, Okun, & Pugliese, 2009). For example, students were asked “During the last 3 months, how often have your parents repeatedly reminded you not to watch TV or play video games?” Prior research with college-age students has demonstrated sufficient reliability ( $\alpha = .73$ ) for the negative tactic items. Given the similar wording to the Sallis et al. (1993) measure of positive tactics, reliability was expected to be adequate. Children’s perceptions of parental attempts to control sedentary activities were measured with four items developed specifically for the present study. For example, students were asked “During the last 3 months, how often have your parents discouraged you from watching TV or playing video games?” Students were asked to respond on a 5-point scale for all items with anchor points of *never* (1) to *very often* (5). The items focusing on sedentary activities were developed by modifying the Sallis et al. (1993) measure of positive tactics with the expectation of adequate reliability. Scale scores for positive, negative, and sedentary control tactic items were computed by averaging the responses of the appropriate items.

*Affect aroused by parental influence attempts.* Affective responses aroused by parents’ influence attempts were measured using a modified version of the *How I Feel* (HIF) scale developed by Walden, Harris, and Catron (2003; see Appendix B, Questions 36-45). The HIF scale was designed to measure positive

(e.g., happy, excited) and negative (e.g., sad, scared, mad) emotional arousal and emotional regulation in 8- to 12-year-old children. Recent confirmatory factor analyses suggest the HIF measures three conceptually distinct factors: positive emotion, negative emotion, and emotional control (Walden, Harris, & Catron, 2003). In the present study, only the positive and negative emotion scales were used. Reliability of the positive and negative scales ranged from .86 to .89 and .87 to .90, respectively (Walden, Harris, & Catron, 2003). The question stem for the HIF (i.e., Please rate the sentences below for how true each was of you in the past three months) was modified to include "...when your parent tries to get you to play sports, exercise, or be active." The change was not expected to impact the psychometrics of the scale. Students were asked to respond on a 5-point scale for all items with anchor points of *not at all true of me* (1) to *very true of me* (5). Scores on positive and negative arousal scales were computed by averaging the responses to the appropriate items.

*Relationship quality.* Autonomy was assessed using the *Perception of Parents* (POP) autonomy support (six items) scale developed by Grolnick, Ryan, and Deci (1991; see Appendix B, Questions 59-64). The scale was originally developed on a large sample of children in grades three through six. For each item, four descriptions were provided and children were instructed to circle the statement that most closely describes their parents. The response options represent a 4-point Likert scale that range from 1 to 4. Low responses indicate low perceived autonomy support whereas high scores represent high perceived

autonomy support. Internal consistency in both urban and suburban samples is adequate for this scale ranging from .66 to .70 for both parents.

Parental control and family conflict was measured using two scales from the *Child Version of The Family Environment Scale (CVFES)* developed by Pino, Simons, and Slawinoski (1984; see Appendix B, Questions 65-71). Each scale consisted of three items, and similar to the POP scale, the CVFES scale items present children with three descriptions of family life. Children select a description that most closely describes their family. The response options represent a 3-point Likert scale that ranges from 1 to 3. The scales were originally developed for children in grades one through six, and test-retest reliability of .80 was observed over a four week period (Moos & Moos, 1986).

*Parent measures.* The parent questionnaire (see Appendix C) consists of 127 items designed to assess parents' physical activity goals, influence tactics, and perception of their child's physical activity and response to attempts to influence physical activity. The questionnaire also contains scales and items assessing parents' own physical activity, the general nature of the family environment, and demographics. Table 2 presents all constructs, their associated measures, and item numbers.

*Demographics.* Parents were asked to indicate their gender, age, ethnicity, occupation, and education for themselves and their spouses (see Appendix C, Questions 1-16). Parents were also asked to indicate their child's height, weight, and date of birth. Finally, parents were asked to provide information related to



family structure, including marital status, the presence of a father, and the number, age, and gender of other children living in the home.

*Parent desire to change child physical activity.* A single item was used to assess how much parents wanted to change their child's physical activity, and in which direction (see the third page of Appendix C, Question 1). Five response options were presented from *want to decrease very much*, to *don't want to change at all*, to *want to increase very much*. The result was a 5-point scale ranging from -2 to 2, with negative values indicating a desire to decrease their child's activity to positive values indicating a desire to increase their child's physical activity.

*Parental influence tactics.* Parental influence tactics were assessed with the identical scale used for students (see Appendix C, Questions 26-40).

*Parent physical activity.* Parental report of physical activity was assessed using a three item scale developed by Godin and Shephard (1985; see Appendix C, Questions 41-43). Items in this measure required respondents to recall the frequency with which they had engaged in activities at mild, moderate, and strenuous intensity levels for at least 15 minutes over the past 7 days. The score derived from this scale was used as a measure of parental role modeling of physical activity.

*Parent report of child physical activity.* Parent report of child physical activity was measured using a checklist developed by Sallis and colleagues (1993; see Appendix C, Questions 2-21). The checklist consisted of 18 physical activities ranging from sports (e.g., baseball, football, soccer), exercise (e.g., aerobic dance, swimming laps), and recreational activities (e.g., hiking). Parents were asked to

indicate how many days over the prior week their child spent at least 15 minutes engaged in a given physical activity or sport. A score was calculated by multiplying the number of days engaged in an activity by the corresponding MET (metabolic equivalent of task) value and summing across activities. In addition, parents were asked to indicate the average number of hours per day their child spent on school work, watching T.V., playing video games, and using the computer or Internet (see Appendix C, Questions 22-25). Parents were asked to respond on a 5-point scale for all items with anchor points of *never* (0) to *5 hours or more* (5). Parents' report of child physical activity and sedentary activity were used for descriptive purposes and to provide validation for youth pedometer counts.

*Family environment.* The family environment was assessed using three of the nine subscales from the *Family Environment Scale* (FES) developed by Moos and Moos (1986; see Appendix C, Questions 50-127). The conflict, cohesion, and control scales of the FES were used in the present study. Each subscale includes nine forced choice items. Each original scale included 10 items, but three items were dropped during IRB approval due to their sensitive nature. Respondents were asked to indicate whether a given descriptive statement (item) is true or false of their family. An example item assessing family cohesion is "Family members really help and support one another." Originally, as reported by Moos and Moos (1974, 1986), reliabilities for the subscales ranged from .67 to .78, however there may be some debate as to the whether these reliability estimates are accurate. Roosa and Beals (1990) have suggested that the FES has serious reliability issues

such as failing to meet established thresholds for acceptability (i.e., .70), and that scale reliability may vary as a function of family stressors. As recommended by Roosa and Beals, the conflict, cohesion, and control subscales were reassessed for reliability prior to data analysis.

Conceptually, the parent FES scales partially overlap with scales used to capture child reports of the parent-child relationship. Similar but different scales were used to assess reports by parents and their children of family conflict and control. The parent scales were true-false items assessing general perceptions of the family environment, whereas the child measures focused more on the parents' behavior. Autonomy was only measured from the child's point of view whereas cohesion within the family environment was only measured from the parent's perspective.

## Chapter 3

### RESULTS

#### *Data Analysis Plan*

Two primary data sets were compiled; one consisting of youth data ( $n = 310$ ) and parent data ( $n = 233$ ), and a sub-sample of matched child-parent data ( $n = 171$ ). Each data set was analyzed according to the flowchart presented in Figure 2.

#### *Data Augmentation, EM Algorithm, and Missing Data*

The present study used multiple imputation (MI) and the expectation-maximization (EM) algorithm to address missing data issues. MI is a simulation-based data augmentation technique that allows missing values to be replaced by  $m > 1$  plausible values. The  $m$  complete data sets are analyzed and the results subsequently combined. MI has been demonstrated to produce unbiased parameter estimates when *missingness* is either *missing completely at random* (MCAR) or *missing at random* (MAR) (Schafer & Graham, 2002). MCAR is present when missingness is not conditional on the data or the unobserved missing values. MAR is present when variables within the data set are related to missingness, but unrelated to the unobserved missing values. Traditional ways of handling missing data, such as mean imputation or regression-based single imputation, have been demonstrated to produce biased parameter estimates in simulation studies under MCAR and MAR (Schafer & Graham, 2002). One popular method, listwise deletion, has also been shown to be unbiased when data is MCAR, but biased under MAR (Enders, 2006). Little's Test (1988) was used

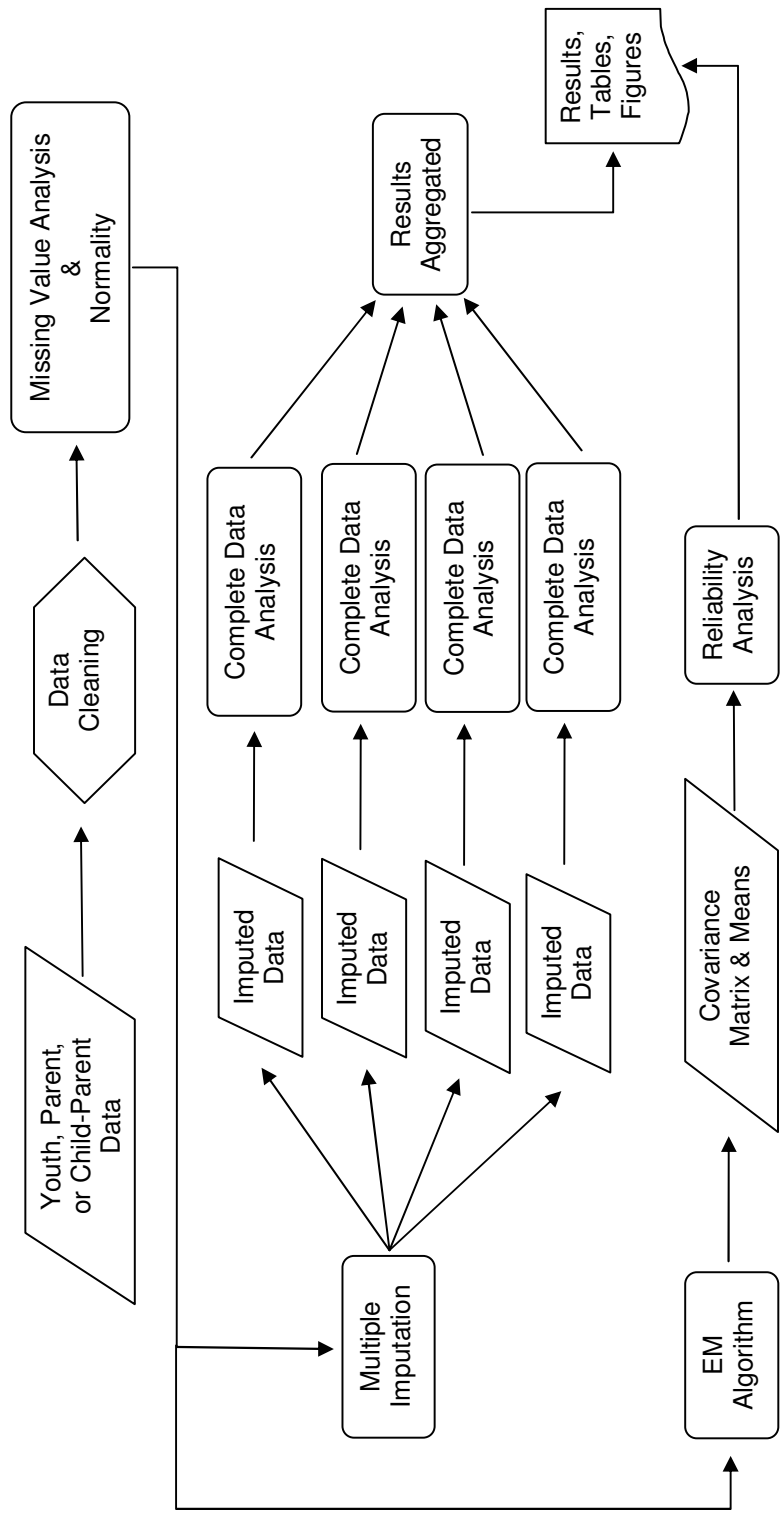


Figure 2. Data analytic flow-chart for the analysis of multiple imputed data sets and expectation-maximization (EM) derived covariance matrices.

to establish whether the data met the more strict assumption of MCAR. A statistically significant result suggests that the researcher can reject the data as MCAR. Finally, MI assumes that the data are multivariate normal and that missingness can occur with any of the variables (Enders, 2006).

The MI process has two steps; the Imputation Step (I-step) and Posterior Step (P-step). The I-step begins with an initial estimate of a vector of means ( $\mu$ ) and matrix of covariances ( $\Sigma$ ) using a maximum likelihood process similar to the EM algorithm. Regression equations are constructed, and predicted values plus a random residual are imputed for each missing value. The addition of the random residual insures variability is maintained in the augmented variable. The P-step begins by re-estimating  $\mu$  and  $\Sigma$ , essentially adding a random perturbation to each parameter. The process is iterative, cycling numerous times through the I-step and the P-step. To avoid serial correlation among estimated parameters ( $\mu$  and  $\Sigma$ ), and to insure a random draw from the distribution of missing values, complete data sets are saved at intervals during the process. For example, the process may cycle 1000 times, saving an augmented data set at every 200<sup>th</sup> iteration. In order to preserve existing relationships among study variables, it is important that the *imputation model* include all variables to be used in the subsequent analysis (Enders, 2006). Therefore, imputation models were developed separately for each analysis. For example, when comparing group means, the imputation model included the variables under study, plus the indicator variable that defined each group.

After data augmentation, results were combined for reporting means and correlations among study variables. Rubin (1987) presented several equations for combining results across  $m$  analyses (see Appendix D). Prior to calculating the mean of correlations, all parameters were properly transformed using the Fisher  $z$  transformation. All estimates were back-transformed prior to reporting. Significance tests were calculated by dividing each of the combined estimates by the square root of the combined total variance of the imputed estimates. An EM algorithm based covariance matrix was used for data input when estimating alpha reliability for scales with missing values.

Estimates of parameters from path models were also combined using the formulas provided in Appendix D. Formulas developed by Li, Meng, Raghunathan, and Rubin (1991) for combining chi-square statistics were used (see Appendix E) to assess the fit of path models based on multiple imputed data sets. The test statistic,  $D_d$ , was used for testing multiple chi-square fit statistics (i.e., overall model fit) and likelihood ratio tests (i.e., tests of parameter estimates across moderators). It is important to note that Li et al. (1991) view this test as an approximation of the true probability, which may range between one-half to twice as large as the observed  $p$ -value. Overall, the authors suggest that such a test may be less powerful than multiple parameter inference.

*Frequency of missing data.* The child data set included 67 variables, including all scale items, physical activity pedometer counts, age, gender, and school. After excluding youth who did not complete the self report survey ( $n = 53$ ), a sample of 310 youth remained for analysis. On average, variables were

missing 3.98 values for an average missing data rate of 1.3% per variable. The variable missing data rate was calculated by dividing the average number of missing values per variable by the total possible number of values. The highest missing data rate for a scale item was 3.8% for an item asking children to indicate how often parents bought them sports or exercise equipment. Youth body mass index was missing at the overall highest rate (36%). The missing data rate for the primary outcome variable (i.e., average daily step count) was 17%. On average, students were missing 1.33 items, or approximately 2% of the total number of items. The student missing data rate was calculated by dividing the average number of missing items per student by the total possible number of items. Across students and items, the missing data rate was 2%. Little's Test suggested the youth data were not MCAR,  $\chi^2(5048) = 5431.465, p < .001$ . Because currently no statistical test for determining whether data are MAR exist, for the purposes of these analyses, it was assumed that the data met the criteria for MAR. Recall that MI techniques produce consistent and unbiased estimates under MAR (Enders, 2006).

The parent data set included 73 variables including all scale items and a summary item for the parent-report physical activity checklist. Overall, there were 233 parents available for analysis. On average, variables were missing 5.1 values for a missing data rate of 2.1%. The highest missing data rate was 5% for an item asking parents to indicate whether family members tend to rely on themselves when problems arise. On average, parents were missing data on 1.58 items, or approximately 2.1% of the total number of items. Across parents and items, the



missing data was 2.1%. Little's Test suggested the parent data was MCAR,  $\chi^2(3220) = 0.00, p = 1.00$ , and therefore the data was assumed to be MAR.

*Item-level MI.* Attempts were made to impute values at the item-level, but failed to produce stable results. The principal reason item-level imputation failed was due to collinearity among items. The linear dependence consistently produced a singular estimated covariance matrix. One can reduce linear dependence by omitting one of the collinear variables, but as stated previously, the imputer should include all relevant variables for the analysis to avoid biased estimates in the imputation model. In addition, collinearity is not restricted to the bivariate case, but may exist among a combination of multiple variables. A second option was to include a ridge prior, which has the effect of including uncorrelated cases to the analysis, and therefore the possibility of biasing estimates toward zero. Given the small sample size in the present analysis, methods that may produce estimates that were biased toward zero did not seem reasonable. Therefore, the final option was to collapse across items, and impute at the scale-level.

*Scale construction.* All scale scores were created by averaging the ratings of the items on a given scale except for FES items, which were created by summing responses across items. If the participant was missing items within a scale, person-level mean imputation was used to replace that value. For missing FES items, each scale was first averaged and then multiplied by the number of items. The procedure effectively imputes person-level mean values for each FES scale. For youth ( $n = 310$ ), missing data rate for scale scores was 1.7%, and if

demographic data is included the rate increases to 15.8%. The increase was largely due to the absence of family demographics for youth without a parent responder. The missing data rate among all parents (n=233) was 1%. Among the sub-sample of youth with a matched parent responder (n = 171), the missing data rate was 1% and the missing data rate for pedometer counts was 12%. The variable with the highest missing data rate in the sub-sample was the scale measuring family cohesiveness (2%). Little's Test for the sub-sample suggested the sub-sample data set was not MCAR,  $\chi^2(931) = 1009.070, p < .04$ , and therefore the data was assumed to be MAR.

*Missing pedometer data.* The missing data rate for youth pedometer counts was 17% in the child-only data, and 12% in the matched child-parent sub-sample. Recall that youth physical activity represents the average number of steps taken per day, where a minimum of three out of seven days of data are present for each child. Pedometer data for elementary school children was collected as part of another study using the same method, and only summary data of daily steps were available. However, pedometer data for all junior high school youth were available for analysis. Out of the 165 junior high school youth, 136 youth returned pedometer logs. On average, youth were missing 1.48 days of pedometer counts, and 5% of the 136 youth did not have three days of pedometer count data. The number of days with pedometer data was uncorrelated with the average across days ( $r = -.10, p = .24$ ). Finally, in an effort to examine whether utilizing one day of pedometer counts for a youth was viable, a single day was randomly sampled from each child and correlated with the average across all other days. Although

the correlation was high,  $r = .62$ , it was not deemed sufficiently high to be considered a suitable replacement for an aggregated measure.

### *Preliminary Analyses*

*Reliability of child self-report scales.* Table 3 presents the standardized Cronbach's alphas ( $\alpha$ ) for youth self-report scales based on both the original data and the EM algorithm produced covariance estimates among scale items (Enders, 2003). Overall, five of the 14 scales constructed from child self-report items had low to poor reliability ( $\alpha < .70$ ). These scales measured relative competence, relative expectations of success, autonomy, conflict, and control. Items were removed where a significant improvement in reliability was achieved. The poorest reliability was observed for the scale measuring youth perceptions of control within the family. Only two out of three items were significantly correlated and the removal of an item from the scale did not appear to improve reliability. Several factors can contribute to reliability; lack of variability in the items will attenuate alpha, or assuming a similar level of covariance and variance, alpha can be inflated with the addition of items. Given that the number of items can influence alpha, Table 3 includes the average inter-item correlations for all scales. Both competence and expectations of success have moderate to high inter-item correlations (.36 and .47, respectively), which indicated a fair degree of inter-correlation among items. In contrast, all three parent-child relationship scales had low-to-moderate inter-item correlations suggesting these scales were less reliable. Results involving these scales should be interpreted with caution. Overall, there

Table 3.

*Cronbach's Alpha ( $\alpha$ ) and Inter-Item Correlations for Child Self-Report Scales.*

Scale	No. of Items	Original Data	EM Estimate	Avg. Inter-Item Correlation <sup>a</sup>
Competence	3	0.62	0.62	0.36
Expectation of Success*	2	0.64	0.64	0.47
Importance*	2	0.76	NMV	0.61
Likeability	4	0.75	0.75	0.64
Interest	4	0.76	0.76	0.67
Utility	6	0.71	0.70	0.30
Parental Positive Tactics	4	0.76	0.75	0.44
Parental Negative Tactics	7	0.76	0.75	0.31
Sedentary Control Strategies	4	0.75	0.76	0.43
Positive Affect	4	0.80	0.80	0.50
Negative Affect	6	0.83	0.82	0.45
Autonomy*	5	0.55	0.54	0.19
Conflict	3	0.56	0.53	0.30
Control*	2	0.30	0.29	0.16

\* Items were dropped from scale to improve reliability.

<sup>a</sup> Based on original scale.

NMV = No missing values

*Reliability of parent self-report scales.* Table 4 presents standardized Cronbach's alphas ( $\alpha$ ) for the parent self-report scales based on both the original data and covariances among scale items using the EM algorithm (Enders, 2003). Overall, of the six scales constructed from parent self-report items, three scales had low to poor reliability ( $\alpha < .70$ ) including the measures of positive tactics, family cohesion, and family control. Parent-reported positive tactic use had moderate inter-item correlations (.30 and .29, respectively), which indicates a fair degree of inter-correlation among items. In contrast, all three FES scales had low inter-item correlations. The poorest reliability was observed for the scale measuring perceptions of family control. Similar to the child scales, there was little to no difference between alphas based on the original data and EM generated alpha coefficients.

*Factor structure of FES scales.* The present results confirm the findings of Roosa and Beals (1990); FES scales have poor reliability. In an attempt to improve the scales reporting on parents' perceptions of the family environment, a principal-axis factor analysis (PAF) with an oblique rotation was conducted in order to identify the best items from the 26 items assessing conflict, cohesion, and control. Oblique rotations allow factors to correlate, and theoretically, there was no reason to prohibit a solution with correlated factors. For example, it was reasonable to believe that families scoring high on a conflict scale would also score low on family cohesion. The PAF analysis revealed that some scale items had poor loadings, or were cross-loaded across two or more factors. In several steps, cross-loaded items were removed from the PAF analysis until a consistent

Table 4.  
*Cronbach's Alpha( $\alpha$ ) for Parent Self-Report Scales.*

Scale	No. of Items	Original Data	EM Estimate	Avg. Inter-Item Correlation <sup>a</sup>
Parental Positive Tactics	4	0.61	0.60	0.30
Parental Negative Tactics	7	0.78	0.74	0.34
Sedentary Control Tactics	4	0.78	0.78	0.47
Family Environment Scales				
Conflict	9	0.70	0.69	0.20
Cohesion	9	0.44	0.44	0.08
Control	8	0.48	0.47	0.10

set of three factors, with loadings greater than .30, emerged in the final factor solution. A total of 14 items were removed from the analysis, and the final oblique solution produced three correlated factors accounting for 31% of the total variance among the items. Each factor consisted of four items and the final factor structure was further tested using confirmatory factor analysis (CFA).

The CFA analysis was conducted using SAS PROC CALIS. Chi-square was used to assess the extent to which the factor model reproduced the observed covariance matrices among scale items, however because chi-square is sensitive to sample size, three additional goodness-of-fit indices were used to assess model fit: Root Mean Square Error of Approximation (RMSEA), Akaike Information Criterion (AIC), and the Comparative Fit Index (CFI). RMSEA is relatively insensitive to sample size and penalizes for lack of parsimony. Typically, a RMSEA of less than .08 indicates adequate model fit and less than .05 indicates good model fit. AIC is based on information theory and is used to assess fit relative to an alternative model. Preference is given to the model with the lower AIC value. In the present analysis, an uncorrelated factor model was compared to a correlated factor structure. In addition, due to the nested nature of both models, a nested model test (difference in Chi-square values) was also conducted. Finally, the CFI was used to gauge the lack of fit relative to a *null* model. Generally, CFI values above .90 indicate acceptable model fit.

Correlated and uncorrelated CFA models were tested. The correlated solution provided less than optimal fit to the data,  $\chi^2(51) = 102.81, p < .0001$ , RMSEA = .06, AIC = 0.80, CFI = 0.88. All item loadings were significant, and

the percent of variance accounted for within items ranged from 9% to 56%. A significant correlation between conflict and cohesion ( $\psi = -.42$ ,  $t = -5.30$ ,  $p < .001$ ) was observed. The uncorrelated solution also provided less than optimal fit to the data,  $\chi^2 (54) = 123.59$ ,  $p < .0001$ , RMSEA = .07, AIC = 15.58, CFI = 0.83. All item loadings were significant, and the percent of variance accounted for in the items ranged from 8% to 56%. A nested model test between each model indicated that a statistical improvement in fit was observed by estimating the correlated factor solution,  $\chi^2 (3) = 20.78$ ,  $p < .001$ . In addition, the AIC was lower for the correlated solution compared to the uncorrelated solution. Figure 3 presents the final correlated model. FES scale construction for family control, cohesion, and control was based on the results of the correlated CFA.

The items identified within the CFA were used to calculate new reliability estimates for the conflict, cohesion, and control scales. Items used to construct the conflict scale (Appendix B, items 60, 78, 87, 114) had an average inter-item correlation of .38, and despite the reduction in items, a modest improvement to alpha reliability was observed (increased to  $\alpha = .71$ ). The greatest improvement in reliability was observed for the scale measuring family cohesion. Items used to construct the cohesion scale (Appendix B, items 76, 94, 112, 120) had an average inter-item correlation of .34, and alpha reliability increased to .67. Items used to construct the control scale (Appendix B, items 66, 84, 93, 111) had an average inter-item correlation of .21, and alpha reliability modestly increased to .51.

*Normality.* First, each variable was examined for univariate normality using the Shapiro-Wilk test (Tabachnick & Fidell, 2001). Second, due to the



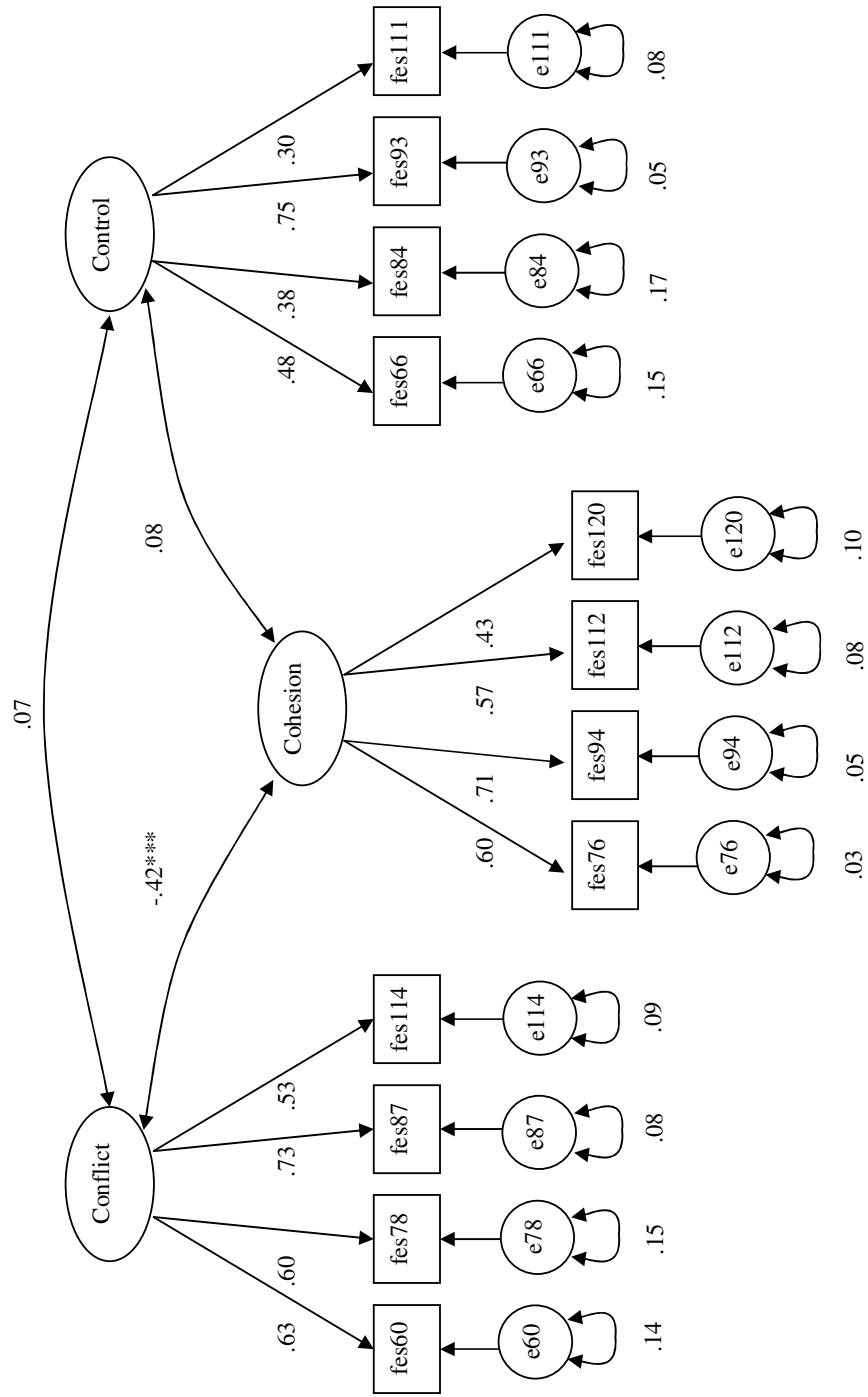


Figure 3. Confirmatory Factor Analytic (CFA) model of parent reported Family Environment Scales measuring conflict, cohesion, and control.

assumption of multivariate normality for many multivariate statistics, each data subset was tested for multivariate normality using a combination of Mardia's skewness and kurtosis tests (Mardia, 1980), the Henze-Zirkler T test (Henze & Zirkler, 1990), and an examination of  $Q-Q$  plots of Mahalanobis distance (Tabachnick & Fidell, 2001). Significant  $p$ -values for all tests indicate a rejection of normality. Deviation from a 45-degree line in the  $Q-Q$  plot indicates a deviation from the multivariate normal distribution.

Results suggested that none of the youth variables, except for autonomy support and pedometer counts, were univariate normal as tested. Moreover, multivariate normality was rejected by all three multivariate tests. Inspection of the  $Q-Q$  plot confirmed the results of the multivariate tests. Inspection of histograms and skewness statistics suggested that expectancy-value-based variables (i.e., competence, expectations of success, liking, importance, interest, and utility) were primarily negatively skewed. Positive tactics and positive affect were also negatively skewed, whereas negative tactics, sedentary control tactics, and negative affect were positively skewed. CFES scale scores were primarily platykurtic or uniform in distribution. Square-root and logarithmic transformations were applied to the data in order to increase normality, although it should be noted that univariate normality is not a necessary condition for multivariate normality. Table 5 presents the results of each multivariate normality test under various transformations for youth data. Overall, applying logarithmic transformations to variables identified as significantly skewed produced a slightly

Table 5.  
*Tests of Multivariate Normality for Each Subset of Data.*

Subset	Mardia				Henze-Zirkler	
	Skewness	<i>p</i>	Kurtosis	<i>p</i>	<i>T</i>	<i>p</i>
Youth Data						
Original Scaling	1514	<.0001	5.18	<.0001	8.27	<.0001
Square-Root	1273	<.0001	2.69	0.007	3.16	0.002
Logarithmic	1143	<.0001	1.28	0.199	1.61	0.106
Parent Data						
Original Scaling	927.8	<.0001	8.49	<.0001	18.63	<.0001
Square-Root	653.1	<.0001	3.97	<.0001	12.99	<.0001
Logarithmic	608.5	<.0001	2.38	0.017	16.94	<.0001

less skewed, but arguably multivariate normal distribution which should be suitable for multivariate statistical procedures.

Similar to the analysis of the youth variables, parent data were also analyzed for both univariate and multivariate normality. All parent variables, including parental tactics, reports of youth physical activity, and FES scales were not univariate or multivariate normal. Therefore, square-root and logarithmic transformations were applied and the data were re-examined for normality. Table 5 presents results of all three multivariate tests of normality. Despite applying both square-root and logarithmic transformations, none of the three tests reached non-significance. Based on the results, log transforms were applied to the parent data.

#### *Group Differences and Relationships among Youth Variables*

*Youth with no parent responder.* Approximately 45% of youth did not return a parent survey (n=139). Therefore, it was of interest to investigate differences between youth with and without parent responders. Each youth variable was examined both in the original scale, and after a logarithmic transformation was applied. All results, in both the original scale and logarithmic scale, were identical in terms of statistical significance. Therefore, for ease of interpretation, Table 6 presents means and standard deviations, *t*-tests, and effect sizes (*r*) for youth with a parental responder and for those without a parental responder in the original scale. Of the 18 study variables available for analysis, the two groups differed statistically on three variables. Youth with parental responders tended to be older by approximately three months on average than

Table 6.  
*Tests of Mean Differences for Child Self-Report Variables by Parental Response to Questionnaire.*

Variable	No Parent Responder (n=139)		Parent Responder (n=171)		<i>r</i>	<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Age	11.46	1.48	11.80	1.50	0.11	-2.02	0.044
Gender <sup>a</sup>	0.51	0.50	0.48	0.50	0.03	0.57	0.569
Body Mass Index	19.81	4.21	20.78	4.51	0.11	-1.91	0.057
Competence	4.19	0.64	4.04	0.76	0.11	1.87	0.063
Expectation of Success	4.33	0.90	4.11	0.86	0.13	2.21	0.028
Importance	4.45	0.76	4.23	0.91	0.12	2.19	0.029
Likeability	4.24	0.68	4.15	0.81	0.06	1.13	0.259
Interest	4.28	0.69	4.17	0.75	0.08	1.43	0.154
Utility	3.96	0.74	3.99	0.77	0.02	-0.35	0.730
Parental Positive Tactics	3.48	1.87	3.41	1.09	0.03	0.58	0.565
Parental Negative Tactics	1.96	1.40	2.11	0.84	0.09	-1.54	0.124
Sedentary Control Tactics	2.13	1.46	2.05	0.99	0.04	0.69	0.489
Positive Affect	3.56	1.89	3.46	0.84	0.06	1.00	0.317
Negative Affect	1.93	1.39	1.97	0.94	0.02	-0.41	0.684
Autonomy	2.34	0.56	2.36	0.56	0.01	-0.23	0.814
Conflict	1.75	0.53	1.73	0.50	0.01	0.24	0.813
Control	1.88	0.50	1.80	0.55	0.07	1.24	0.217
Pedometer Counts	10948.00	4154.96	10089.00	3718.52	0.11	1.90	0.059

<sup>a</sup>Gender mean represents the proportion of the sample that was male.

youth without parental responders. Conversely, youth with no parental responder tended to report greater expectations of success in physical activity relative to sedentary activities. These youth also perceive physical activity as more important relative to sedentary activities than youth with a parental responder. There were three comparisons that were of marginal statistical significance (i.e.,  $p < .08$ ); youth with no parental responder tended to have lower BMI's, report greater competence in physical activities relative to sedentary activities, and record a greater number of average steps per day. The effect sizes for all tests were small (highest  $r = .11$ ).

*Single vs. dual responders.* Approximately 32% of youth returned two parental surveys; one for a mother or other female caregiver, and one for a father or other male caregiver. Table 7 presents means, standard deviations,  $t$ -tests and effect sizes ( $r$ ) for differences between youth with a single parent responder and youth with two parent responders. All results, in both the original scale and logarithmic scale, were identical in terms of statistical significance. Of the 18 study variables available for analysis, groups differed statistically on two variables. Youth with dual responders reported greater use of positive tactics ( $r = .17$ ) and more autonomy support ( $r = .27$ ) than youth with a single parent responder. The majority of children with two parental responders were female (56%), whereas 50% of the children with a single parent responder were female. The relation between the proportion of males and the number of parental responders was not statistically significant ( $t = 1.08, p = .28$ ). Although single-parent responders were more prevalent in the junior high school sample than in

Table 7.  
*Tests of Mean Differences for Child Self-Report Variables by the Number of Parents Responding to Questionnaire.*

Variable	One Parent Responder (n=116)		Two Parent Responder (n=55)		<i>r</i>	<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Age	11.74	0.50	11.93	0.50	0.08	-1.10	0.271
Gender <sup>a</sup>	0.50	1.55	0.44	1.37	0.08	1.08	0.282
Body Mass Index	20.99	4.54	20.26	4.65	0.11	1.38	0.169
Competence	4.05	0.78	4.01	0.72	0.03	0.42	0.674
Expectation of Success	4.14	0.85	4.04	0.88	0.08	1.07	0.286
Importance	4.25	0.93	4.20	0.86	0.04	0.48	0.633
Likeability	4.12	0.84	4.20	0.74	0.07	-0.85	0.396
Interest	4.15	0.79	4.20	0.66	0.05	-0.59	0.555
Utility	4.00	0.76	3.99	0.81	0.01	0.08	0.936
Parental Positive Tactics	3.32	1.11	3.60	1.03	0.17	-2.22	0.027
Parental Negative Tactics	2.10	0.88	2.10	0.74	0.00	0.04	0.966
Sedentary Control Tactics	2.05	1.00	2.07	0.95	0.01	-0.19	0.847
Positive Affect	3.45	0.94	3.48	0.76	0.02	-0.32	0.752
Negative Affect	2.00	0.98	1.91	0.90	0.06	0.82	0.413
Autonomy	2.31	0.30	2.48	0.57	0.27	-3.58	< .001
Conflict	1.73	0.50	1.72	0.50	0.01	0.19	0.848
Control	1.84	0.57	1.72	0.49	0.14	1.90	0.059
Pedometer Counts	10012.00	3642.33	9814.81	3704.80	0.04	0.46	0.644

<sup>a</sup>Gender mean represents the proportion of the sample that was male.

the elementary school sample (62% versus 38%), the relation between number of parental responders and school level was not significant,  $\chi^2 (1, 171) = .001, p < .97$ .

*Elementary vs. junior high school students.* Although number of parental responders was not related to school level, elementary school and junior high school youth differed on several variables. Table 8 presents means, standard deviations, *t*-tests and effect sizes (*r*) for youth variables by school level. Predictably, elementary school students were younger than junior high school students. In addition, elementary school children reported greater competence, importance, likeability, interest, and utility with regard to physical activity relative to sedentary activities when compared to junior high school youth. Elementary school youth also tended to report greater parental use of positive, negative, and sedentary control tactics than junior high school youth. Although elementary school youth reported greater autonomy than junior high school youth, the latter group reported a greater degree of conflict and control than the elementary school youth. Finally, consistent with prior research, junior high school youth reported fewer pedometer step counts per day than elementary school youth.

*Relations among youth variables.* Table 9 presents correlations among all child-related variables for youth who had a parental responder (*n* =171). Several statistically significant negative correlations were observed between youths' age and expectancy-value measures. Relative to younger youth, older youth tended to report lower competence, expectations of success, importance, interest, and utility



Table 8.  
*Tests of Means Differences for Child Self-Report Variables by School.*

Variable	Elementary (n=65)		Junior High School (n=106)		<i>r</i>	<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Age	10.22	0.69	12.77	0.91	0.90	-26.77	<.001
Gender <sup>a</sup>	0.48	0.50	0.48	0.50	0.01	0.07	0.942
Body Mass Index	18.71	3.65	22.05	4.42	0.47	-6.94	<.001
Competence	4.31	0.60	3.87	0.79	0.37	5.22	<.001
Expectation of Success	4.22	0.87	4.04	0.85	0.14	1.88	0.062
Importance	4.45	0.83	4.10	0.93	0.25	3.34	0.001
Likeability	4.32	0.72	4.04	0.85	0.23	3.04	0.003
Interest	4.32	0.75	4.07	0.74	0.22	2.90	0.004
Utility	4.17	0.83	3.89	0.72	0.24	3.16	0.002
Parental Positive Tactics	3.56	1.20	3.31	1.02	0.15	1.96	0.051
Parental Negative Tactics	2.32	0.97	1.97	0.72	0.28	3.72	<.001
Sedentary Control Tactics	2.27	1.07	1.91	0.89	0.25	3.31	0.001
Positive Affect	3.56	0.83	3.40	0.84	0.12	1.62	0.107
Negative Affect	2.03	0.95	1.93	0.93	0.07	0.92	0.361
Autonomy	2.45	0.58	2.31	0.54	0.17	2.19	0.030
Conflict	1.65	0.54	1.78	0.47	0.17	-2.19	0.030
Control	1.66	0.55	1.88	0.53	0.26	-3.48	0.001
Pedometer Counts	11720.00	3471.98	8884.49	3455.49	0.48	7.04	<.001

<sup>a</sup> Gender mean represents the proportion of the sample that was male.

Table 9.  
Correlations among Child Self-Report Variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age	-																
2. Gender	.02	-															
3. Body Mass Index	.33***	.12	-														
4. Competence	-.24**	-.08	.26**	-													
5. Expectation of Success	-.15*	.09	.04	.23**	-												
6. Importance	-.18*	-.03	.03	.34***	.39***	-											
7. Likeability	-.13	.09	.14	.51***	.42***	.47***	-										
8. Interest	-.16*	.12	.20*	.51***	.47***	.49***	.76***	-									
9. Utility	-.23**	.05	.02	.35***	.18*	.28***	.36***	.36***	-								
10. Positive Tactics	-.12	.05	.07	.31***	.33***	.25***	.35***	.41***	.43***	-							
11. Negative Tactics	-.17*	.04	.06	.16*	.17*	.11	.11	.11	.20**	.49***	-						
12. Sedentary Control Tactics	-.17*	.11	-.07	.12	.11	.03	.14 <sup>†</sup>	.07	.12	.26***	.56***	-					
13. Positive Affect	-.13	-.04	-.03	.31***	.34***	.26***	.28***	.32***	.37***	.55***	-.36***	.20**	-				
14. Negative Affect	-.06	-.07	.04	.05	.08	.07	.03	-.05	.06	.18*	.47***	.24**	.30***	-			
15. Autonomy	-.03	-.17*	-.07	.13	-.09	-.07	-.04	.03	.12	.19*	.04	-.04	.10	-.05	-		
16. Conflict	.10	.03	.25**	-.14 <sup>†</sup>	-.01	-.02	-.12	-.13	-.21**	-.22**	.11	.10	-.10	.19*	-.32***	-	
17. Control	.21**	.01	.18*	-.06	-.02	-.05	-.09	-.14 <sup>†</sup>	-.09	-.17*	.09	.14 <sup>†</sup>	-.08	.17*	-.28***	.42***	-
18. Pedometer Counts	-.31***	.16*	-.19**	.33***	.21**	.17*	.25**	.27***	.24**	.34***	.21*	.15 <sup>†</sup>	.16*	.22**	.01	-.01	.04

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

<sup>†</sup>  $p < .08$

of physical activity relative to sedentary activities. In addition, older youth as compared to younger youth tended to report lower parental use of negative and sedentary control tactics. Predictably, a statistically significant negative correlation was observed between youth age and pedometer counts. Youth with a higher BMI tended to report higher family conflict than youth with lower BMI. All positive correlations between youths' report of parental use of positive tactics and expectancy-value measures were statistically significant. Correlations between positive tactic use and competence as well as expectation of success were both moderate in size ( $r = .31$  and  $.33$ , respectively). Correlations between positive tactic use and subjective value constructs ranged from small to moderate in size. For example, the correlation between positive tactics and importance was small ( $r = .25$ ), whereas the correlation with utility was moderate ( $r = .43$ ).

Positive tactic use was positively related to both negative and sedentary control tactics. A strong statistically significant correlation between positive affect and positive tactic use was observed. However, statistically significant negative correlations were observed between positive affect and parents' use of negative and sedentary control tactics. Positive tactic use was also significantly related to youth perceptions of the family environment in two ways; (1) positive tactic use was positively correlated with parent autonomy support, and (2) both conflict and control were negatively related to positive tactic use. Youth pedometer counts were positively related to all expectancy-value variables, positive and negative tactics, and positive and negative affect.

### *Group Differences and Relations among Parent Variables*

*Mothers vs. fathers.* Table 10 presents means, standard deviations, and dependent sample *t*-tests for parents of youth with dual responders. Each variable was examined both in the original scale, and after a logarithmic transformation was applied. The statistical significance of each dependent sample *t*-test was identical between original and transformed variables; therefore tests results are presented in the original scaling for ease of interpretation. There were no statistically significant mean differences among parent self-report variables except for parent age. On average, fathers were approximately 1.5 years older than mothers. Table 11 presents correlations among parent self-report variables. The diagonal represents the degree to which mother and fathers within the same family unit tended to respond similarly on the same scale. Several strong ( $r > .50$ ) positive relations were observed among variables on the diagonal, indicating a fair amount of agreement between mothers and fathers. Overall, parents tended to be less congruent in their responses regarding their own self-reported physical activity ( $r = .33$ ), and the degree of control within the family unit ( $r = .30$ ).

Table 11 also contains several statistically significant off-diagonal correlations among mothers and fathers for dual reporting youth. Not all correlations were symmetrical; for example, mothers' desire to change their child's physical activity was not related to fathers' negative tactics, although the converse was statistically significant. Specifically, (a) fathers' desire to change their child's physical activity was negatively correlated with mothers' report of their child's physical activity and positively related to mothers' use of negative

Table 10.  
*Dependent Sample t-Tests for Mothers and Fathers in Dual Reporting Families.*

Variable	Mothers (n=55)		Fathers (n=55)		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Age	39.98	7.08	41.51	6.52	-2.620	0.011
Education	3.90	1.84	3.77	1.83	0.070	0.941
Parent Desire to Change Child PA	0.76	0.69	0.84	0.76	-0.780	0.438
Positive Tactics	3.03	0.83	3.01	0.75	0.220	0.825
Negative Tactics	1.56	0.56	1.54	0.50	0.280	0.783
Sedentary Control Tactics	2.23	0.87	2.11	0.83	1.120	0.270
Parent PA	2.46	1.41	2.41	1.22	0.030	0.975
Child Sedentary Activity	1.43	0.51	1.41	0.33	0.280	0.783
Child PA	82.65	73.68	72.31	64.91	1.540	0.130
Conflict	1.10	1.35	1.31	1.45	-1.140	0.259
Cohesion	3.42	1.05	3.46	0.93	-0.050	0.964
Control	3.24	1.05	3.00	1.12	1.420	0.161

*Note:* All variables were self-reported by both mothers and fathers, PA = Physical activity.

Table 11.  
*Correlations among Parent Self-Report Variables for Dual Reporting Families.*

Mother Variables	Father Variables									
	1	2	3	4	5	6	7	8	9	10
1. Parent Desire to Change Child Physical Activity	.55***	-.07	.19	-.07	.23	-.16	-.23 <sup>†</sup>	.04	.04	-.04
2. Positive Tactics	-.06	.65***	.00	.09	.25 <sup>†</sup>	.24 <sup>†</sup>	-.16	.01	.29*	.11
3. Negative Tactics	.37**	.06	.41**	.22	.19	-.14	-.03	.22	.23	-.05
4. Sedentary Control Tactics	.18	.36**	.39**	.60***	.07	.00	.10	.23	.16	.11
5. Parent Physical Activity	.06	.00	.00	.04	.33*	.31*	-.16	.04	-.13	-.02
6. Child Physical Activity	-.42**	.33*	-.18	-.21	-.02	.78***	-.03	-.05	-.09	.22
7. Child Sedentary Activity	.06	-.11	.09	.28*	-.07	-.15	.38**	.03	-.03	.02
8. Conflict	.04	.01	.22	.23	-.18	-.05	-.04	.49***	-.21	-.13
9. Cohesion	-.11	.06	-.18	-.11	.05	-.07	-.10	-.20	.47***	.00
10. Control	-.03	.09	-.10	.01	.15	.02	.11	.13	.14	.30*

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

<sup>†</sup>  $p < .08$

strategies, (b) fathers' use of positive tactics was positively related to mothers' reports of their child's physical activity, (c) fathers' use of negative tactics was positively related to mothers' use of sedentary control tactics, (d) fathers' use of sedentary control tactics was positively related to mothers' report of their child's sedentary activity, and (e) mothers' use of positive tactics was positively related to fathers' reports of family cohesion. Only the positive correlation between parents' use of positive tactics and report of their child's physical activity was symmetrical across both parents. Finally, mean differences between mothers ( $n = 92$ ) and fathers ( $n = 24$ ) were examined among youth with only a single parent responder. Similar to parents in dual reporting families, no statistically significant differences emerged.

*Random selection of mother and father data.* Several options were considered for youth with dual responding parents. One option considered was creating a composite of both mother and father responses, and using these aggregate responses in further analyses. However, this approach would have limited the ability to include parent gender in any analysis for either the purpose of control, or to answer any substantive questions. Given that dual responders (i.e., youth with mothers and fathers) did not statistically differ in their survey responses, and that similar items were highly correlated, only one set of parent responses for youth with two parent responders were used for path analyses. Mother and father data for each youth were randomly chosen as the primary parent to be analyzed. The randomization process was conducted as follows; (a) each youth was randomly assigned a number between zero and one, (b) youth

identifiers were sorted according to their random number, and (c) the first 28 of the 55 dual responders were designated as the “mother” data group whereas the remaining 27 were designated as the “father” data group. In total, there were 171 child-parent pairs for analysis.

### *Relations between Youth and Parent Variables*

*Correlations.* Table 12 presents correlations between youth and parent variables. Among the six parent and child variables that were conceptually congruent, four were statistically significant. Parents and children tended to respond similarly in terms of parents’ use of positive tactics, sedentary control tactics, and the amount of conflict within the family. Parent reports of child physical activity were also moderately correlated with child pedometer counts. Several statistically significant negative correlations were observed between parent variables and child variables; (a) an increase in parents’ desire to change their child’s physical activity was associated with a decrease in competence, likeability, and interest in physical activity relative to sedentary activities for youth, (b) a decrease in youth reports of competence, importance, likeability, interest, and utility in physical activity was related to an increase in parents’ report of their child’s sedentary behavior, and (c) a decrease in parents’ report of their child’s sedentary behavior was also related to an increase in child reports of positive and negative affect related to parents’ influence attempts, and an increase in the average number of pedometer counts. Several positive, statistically significant correlations were observed between parents’ report of positive tactic use and child expectancy-value beliefs. An increase in positive tactic was related



Table 12.  
Correlations among Child Self-Report and Parent Self-Report Variables.

Child Variables	Parent Variables									
	Parent Desire to Change Child Physical Activity	Positive Tactics	Negative Tactics	Sedentary Control Tactics	Family Conflict	Family Cohesion	Family Control	Parent Physical Activity	Child Physical Activity	Child Sedentary Activity
Competence	-.27***	.02	-.18*	-.07	-.02	.09	.01	-.02	.12	-.16*
Expectation of Success	-.04	.11	-.05	-.08	.04	.03	-.01	.05	.01	-.12
Importance	-.02	.16*	-.09	-.05	.06	.03	.06	.04	.02	-.17*
Likeability	-.17**	.19*	-.09	-.04	-.08	.13	-.06	.04	.18*	-.19*
Interest	-.22**	.23**	-.11	-.07	-.04	.14	-.05	.00	.09	-.17*
Utility	-.04	.21**	-.02	.05	-.03	.11	.04	.11	.11	-.16*
Positive Tactics	-.18*	.40***	-.03	.02	-.02	.17*	.03	.23**	.08	-.12
Negative Tactics	-.04	.14 <sup>†</sup>	.11	.06	.04	-.02	.00	.16*	.07	-.14 <sup>†</sup>
Sedentary Control Tactics	-.04	.13	.10	.26***	.11	-.02	-.01	.09	.04	-.11
Positive Affect	-.15*	.20**	-.06	-.09	.03	.10	.16*	.11	.02	-.11***
Negative Affect	.09	-.09	-.04	-.05	.09	-.05	.05	.05	-.03	-.10***
Autonomy	.02	.05	-.14 <sup>†</sup>	-.19*	-.04	.04	-.24**	.00	.15*	-.04
Conflict	.14 <sup>†</sup>	-.10	.07	.02	.20**	-.07	-.06	.07	-.09	.11
Control	-.11	-.08	.15*	.02	.08	-.07	-.06	-.01	-.11	-.02
Pedometer Counts	-.12	.06	-.09	.02	.21**	.10	.04	.00	.26***	-.22**

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

<sup>†</sup>  $p < .08$

to an increase in importance, likeability, interest, and utility of physical activity relative to sedentary activities. Parents' report of negative tactic use was positively correlated with child reports of control, and negatively correlated with physical activity competence relative to sedentary activities. Finally, parents' report of family conflict was positively correlated with child pedometer counts, suggesting that increased conflict is accompanied by increases in youth physical activity.

#### *Identification of Parent-Child Relationship Clusters*

In order to examine the moderating role of youth perceptions of the parent-child relationship, cluster analysis was used to identify distinct types of parent-child relationships as reported by youth. Child-reported autonomy, conflict, and control were first examined using hierarchical cluster analysis in order to identify a plausible number of clusters in the data. Inspection of the resulting dendrogram revealed two distinct clusters within the data. Next, K-means cluster analysis was used to produce a two-cluster solution and assign cluster membership to cases. The K-means procedure produced a two-cluster solution with 86 cases assigned to one group and 82 cases assigned to the second group. The adequacy of the solution was cross-validated using discriminant function analysis on group membership. Overall, the resulting discriminant function was significant, Wilks' Lambda = 0.30,  $F = 125.78$ ,  $p < .001$ . Univariate  $F$ -tests revealed that means for each of the three variables significantly differed by group membership. The first group identified was characterized by equal levels of autonomy ( $M = 2.07$ ), conflict ( $M = 2.07$ ), and control ( $M = 2.13$ ). The second

group was characterized by high levels of autonomy ( $M = 2.65$ ), and equal levels of conflict ( $M = 1.35$ ) and control ( $M = 1.45$ ).

The standardized discriminant coefficients suggest that group membership was strongly positively weighted by conflict (.73) and control (.58) and negatively weighted by autonomy (-.49). The results indicate that youth in the first group would be characterized as experiencing higher levels of conflict and control. Youth in this group will be referred to as the *conflict* group in subsequent analyses and discussion. A child in the second group tends to experience a high degree of autonomy and relatively lower levels of conflict and control. Youth in this group will be referred to as the *autonomy* group in subsequent analyses and discussion.

#### *Construction of Composites for use in Path Analysis*

Principal components analysis (PCA) was used to construct a linear composite for the expectancy value variable. The decision to create a composite for this variable was based on statistical concerns. Inspection of correlations among youth expectancy-value measures revealed a high degree of association among expectancy-value scales, for both elementary and junior high school youth. A PCA analysis suggested that constructs measuring perceptions of ability (i.e., competence and expectations of success) were not statistically distinct from constructs measuring subjective task value (i.e., importance, liking, interest, and utility). The first principal component accounted for 52% of the variance in the items, with all items loading between .31 and .49. Therefore, in order to simplify estimated path analytic models, PCA was used to generate a linear composite of all six expectancy-value scales.

*Correlations among main study variables.* Table 13 presents correlations among the main study variables used in the path models. Although not in the theoretical model, child-reported parental tactic use was included to allow for the possibility of using these variables in an exploratory model. Several variables were correlated with youth physical activity and the composite of expectancy-value beliefs. Age was negatively correlated with youth expectancy-value beliefs and physical activity. Conversely, gender was positively related to physical activity, indicating that males tended to be more physically active. Child-reported positive and negative tactic use was positively related to youth physical activity. Child-reported parental sedentary control tactics was not related to youth physical activity and a marginally statistically significant correlation (i.e.,  $p < .08$ ) was observed with youth expectancy-value beliefs. None of the parent-reported tactic use variables were correlated with youth physical activity. Only youth negative affect was related to youth physical activity, whereas positive affect was related to youth expectancy-value beliefs. Parent reports of their own physical activity were related to both child-reported positive and negative tactic use, and to parent-reported positive tactic use. Parents' desire to change their child's physical activity was negatively related to both youth expectancy-value beliefs and positive affect, suggesting that as parents' desire increases, youth tend to report less positive affect, competence, and value of physical activity. A statistically significant positive correlation was observed between parents' report of family conflict. Family cohesion was positively correlated with parent-reported positive tactic use. Similar to the earlier CFA of the FES scale items, cohesion and conflict

Table 13.  
Correlations among Main Study Variables.

Variable	1	2	3	4	5	6	7	8	9	10
1. Child Age	-									
2. Child Gender (1 = male)	.02	-								
3. Child Body Mass Index	.27***	.15 <sup>†</sup>	-							
4. Child Latino Ethnicity	-.15 <sup>†</sup>	.06	.08	-						
5. Child Black Ethnicity	-.10	.12	-.06	-.11	-					
6. Parent Education	.09	.01	.05	-.14	.08	-				
7. Parent Gender	-.12	.00	.01	.00	-.12	-.01	-			
8. Child EV Beliefs (Composite)	-.24***	.06	-.14	.01	.01	.04	.01	-		
9. Child Positive Affect	-.14 <sup>†</sup>	-.05	.02	.03	.06	.11	.07	.41***	-	
10. Child Negative Affect	-.06	-.07	.07	.15 <sup>†</sup>	-.12	.04	.08	.05	.29***	-
11. CR Positive Tactics	-.13	.06	-.06	.11	.02	.10	.04	.49***	.55***	.18*
12. CR Negative Tactics	-.17*	.04	.10	.15 <sup>†</sup>	.01	.10	.00	.19*	.37***	.47***
13. CR Sedentary Control	-.18*	.12	.02	.03	.06	.05	-.03	.14 <sup>†</sup>	.21**	.24**
14. PR Positive Tactics	-.05	.10	.15	.09	-.03	.07	-.07	.22**	.20**	-.08
15. PR Negative Tactics	-.01	.12	.28**	.05	.10	.06	.06	.13	.07	-.03
16. PR Sedentary Control	-.11	.26***	.09	.00	.04	.05	-.02	-.06	-.09	-.05
17. PR Family Conflict	.00	.16*	.12	.00	.04	-.11	.10	.00	.03	.09
18. PR Family Cohesion	.03	.05	-.09	-.05	-.05	-.04	-.13	.13	.10	.05
19. PR Family Control	-.12	.01	.04	-.10	.09	.00	-.01	.00	.16*	-.04
20. Parent Desire to Change Child PA	-.02	-.02	.40***	-.01	.01	.03	.10	-.18*	-.15*	.10
21. Parent Physical Activity	-.05	-.01	.08	.16 <sup>†</sup>	.02	.01	.08	.04	.11	.06
22. Child Pedometer Counts	-.32***	.16*	-.20*	.07	.18*	.00	.02	.30**	.12	.19*

Note: CR = Child Self-Report, PR = Parent Self-Report, EV = Expectancy-value, PA = Physical activity

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

†  $p < .08$

Table 13.  
Correlations among Main Study Variables.

Variable	11	12	13	14	15	16	17	18	19	20	21
1. Child Age											
2. Child Gender (1 = male)											
3. Child Body Mass Index											
4. Child Latino Ethnicity											
5. Child Black Ethnicity											
6. Parent Education											
7. Parent Gender											
8. Child EV Beliefs (Composite)											
9. Child Positive Affect											
10. Child Negative Affect											
11. CR Positive Tactics	-.49***										
12. CR Negative Tactics	.27***	.56***									
13. CR Sedentary Control	.40***	.14 <sup>†</sup>	.13								
14. PR Positive Tactics	.03	.11	.10	.17*							
15. PR Negative Tactics	-.02	.06	.26***	.18*	.57***						
16. PR Sedentary Control	-.02	.05	.11	-.03	.02	.06					
17. PR Family Conflict	.17*	.03	.01	.24**	.08	-.07	-.25**				
18. PR Family Cohesion	-.03	-.02	.00	-.05	-.04	.05	-.04	.09			
19. PR Family Control	-.19*	-.03	-.04	-.12	.28**	.11	-.09	-.02			
20. Parent Desire to Change Child PA	.24**	.17*	.10	.43***	.12	.03	-.02	.08	.09		
21. Parent Physical Activity	.31***	.20*	.15 <sup>†</sup>	.07	-.05	.03	.19*	-.07	-.12	-.03	
22. Child Pedometer Counts											

Note: CR = Child Self-Report, PR = Parent Self-Report, EV = Expectancy-value, PA = Physical activity

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

<sup>†</sup>  $p < .08$

were negatively correlated. Finally, a statistically significant positive correlation was observed between the composite of expectancy-value beliefs and youth pedometer counts.

### *Path Analyses*

All path analyses were conducted by using SAS PROC TCALIS. Chi-square goodness-of-fit was combined across results and the  $D_d$  statistic proposed by Li, Meng, Raghunathan, and Rubin (1991) was used to assess the extent to which the specified model reproduced the observed covariance matrices among the main study variables. Three additional goodness-of-fit indices were also used to assess model fit: Root Mean Square Error of Approximation (RMSEA), Akaike Information Criterion (AIC), and the Comparative Fit Index (CFI). All additional goodness-of-fit measures were calculated using the average of the model chi-square, and independence model chi-square, where necessary.

*Theoretical model.* Figure 4 presents the theoretical model that was tested via path analysis<sup>1</sup>. For the sake of simplicity, the control variables were not included in the Figure. The model depicts the hypothesized relations among parent and youth variables. Youth physical activity was modeled as a function of youth expectancy-value beliefs, positive and negative affective reactions to parental influence attempts, and three control variables: child age, gender, and BMI. Likewise, youth expectancy-value beliefs, and positive and negative affective reactions were modeled as a function of parents' physical activity and parents' reported use of positive, negative, and sedentary control tactics. Finally, parent-reported tactic use was modeled as a function of parent-reported desire to

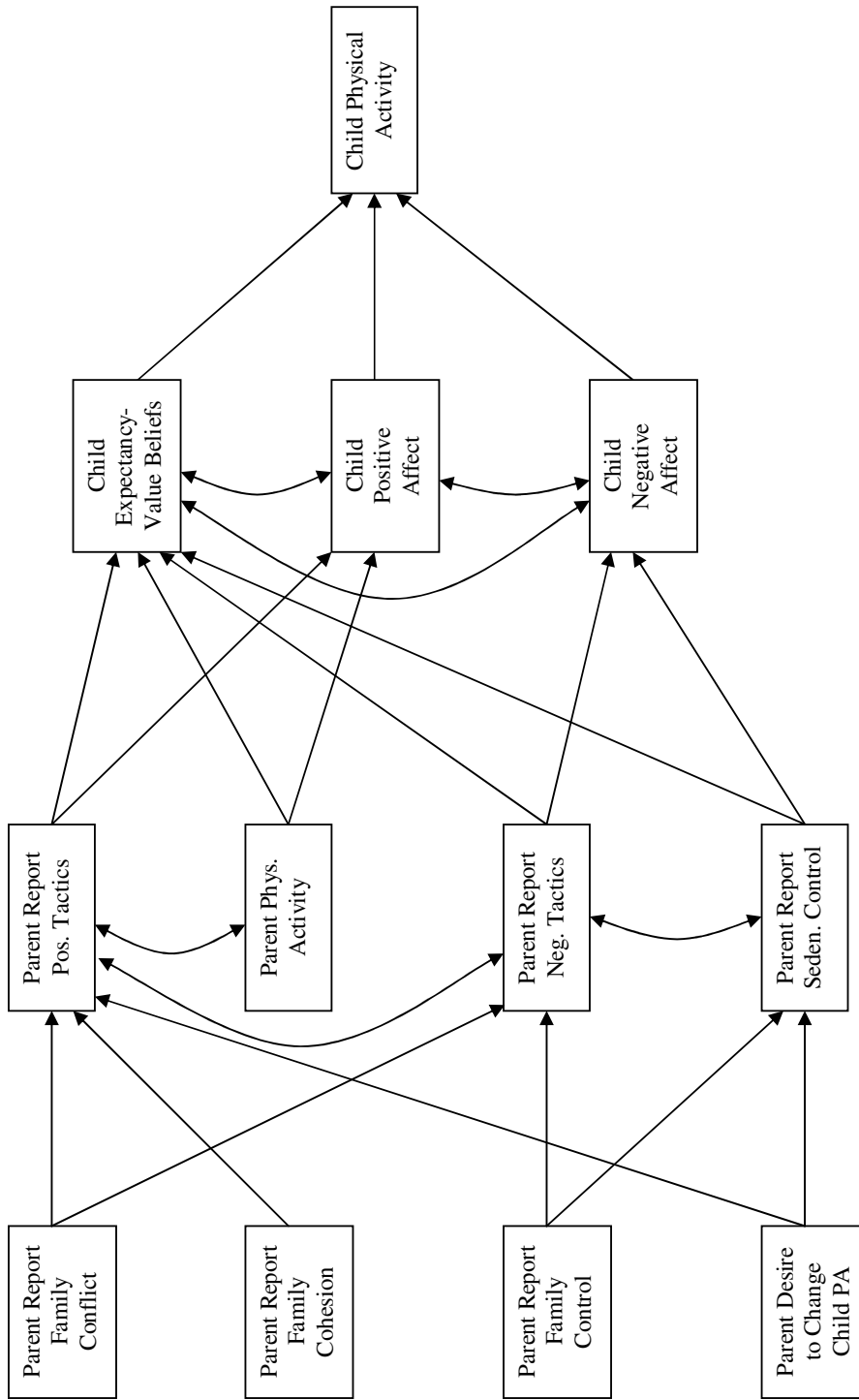


Figure 4. Theoretical path model representing the conceptual model depicted in Figure 1.  
 Note: Pathways for control variables and covariance among exogenous variables have been omitted for clarity.



change their child's level of physical activity and family characteristics. The model represents the previously described hypotheses concerning the direct effects and indirect effects of the main study variables.

Overall, the theoretical model provided poor fit to the data,  $D_d(63, 124.45) = 1.77, p = .004, RMSEA = .08, AIC = -3.20, CFI = .82$ . Figure 5 presents both standardized and unstandardized path coefficients for the model. As hypothesized, family cohesion was positively related to parent-reported positive tactic use ( $\beta = .23, p < .001$ ). Contrary to the hypothesized positive relationship, increases in the amount of parents' desire to change their child's physical activity were associated with decreased positive tactic use. ( $\beta = -.25, p < .001$ ). It was also hypothesized that family conflict would be positively related to parent-reported negative tactic use and negatively related to parent-reported positive tactic use; surprisingly neither relationship was statistically significant. As expected, parent-reported tactic use was positively related to both youth expectancy-value beliefs and positive affect ( $\gamma = .27, p = .001$  and  $\gamma = .24, p = .002$ , respectively). Parents' self-reported physical activity, a common predictor in studies on parental influence on youth physical activity, was unrelated to both youth expectancy-value beliefs and positive affect. Moreover, the relations between parent-reported negative tactic use and child-reported negative affect ( $\gamma = -.003, p = .96$ ) and youth expectancy-value beliefs ( $\gamma = -.10, p = .27$ ) were not statistically significant ( $p < .05$ ). Similarly, parent-reported use of sedentary control tactics was unrelated to negative affect ( $\gamma = -.001, p = .98$ ) and youth expectancy-value beliefs ( $\gamma = -.05, p = .58$ ). As hypothesized, youth expectancy-value beliefs were positively

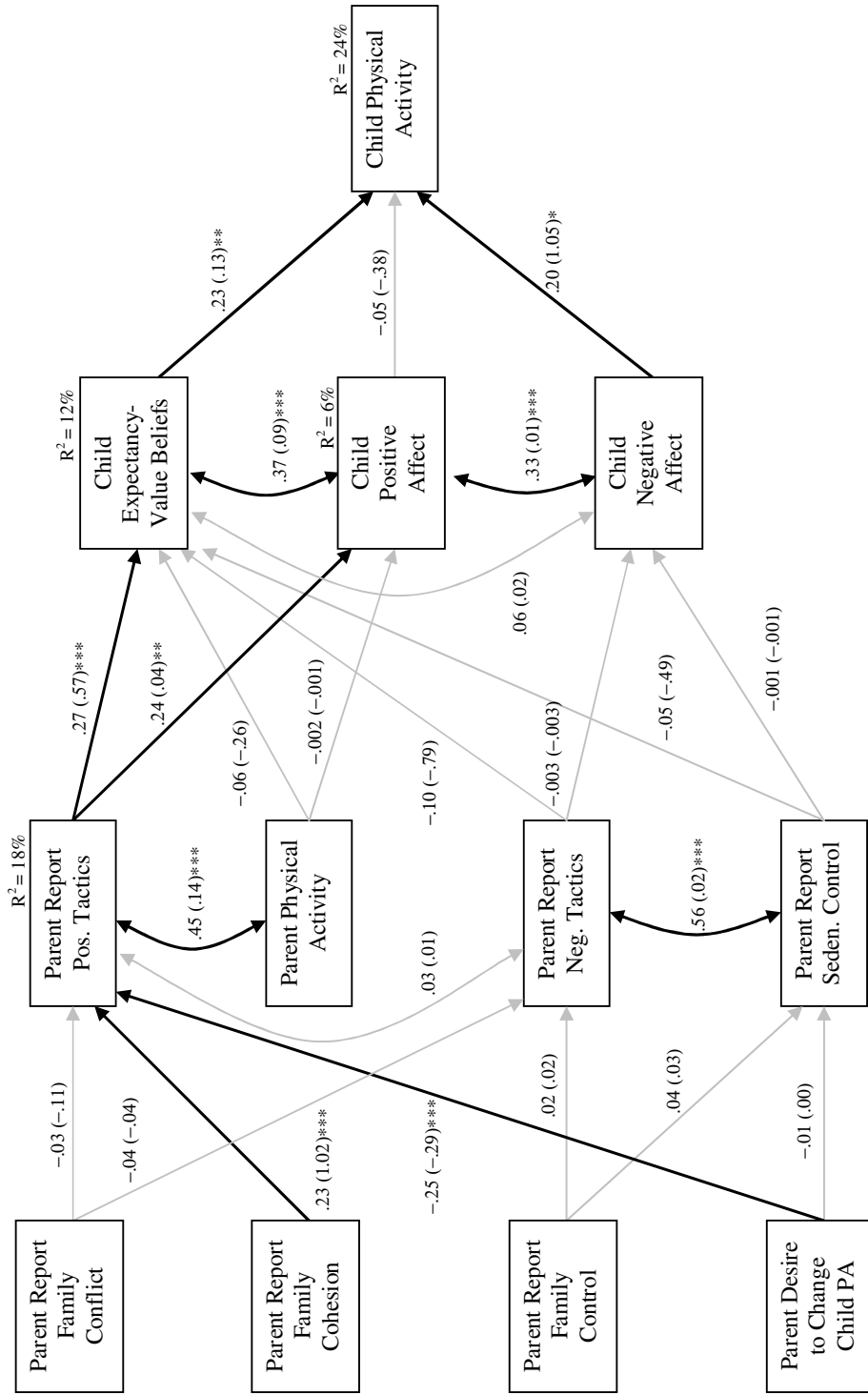


Figure 5. Standardized and unstandardized coefficients for the theoretical model depicted in Figure 4 predicting youth physical activity.

Note: Unstandardized coefficients are presented in parentheses and grey-tone lines represent non-significant pathways.

related to youth physical activity ( $\gamma = .23, p = .005$ ), however contrary to what was hypothesized, no significant statistical relation between positive affect and youth physical activity ( $\gamma = -.06, p = .49$ ) was observed. Unexpectedly, negative affect was positively related to youth physical activity ( $\gamma = .20, p = .03$ ).

Although not included in the Figure 5, youth age, gender, and BMI were used as control variables in the theoretical model. Several statistically significant relations were observed among the three control variables and endogenous variables. As expected, youth age was negatively related with youth pedometer counts ( $\beta = -.22, p < .01$ ), and expectancy value beliefs ( $\beta = -.18, p < .05$ ). Gender was also related to youth pedometer counts ( $\beta = .18, p < .01$ ), indicating that males were more physically active than females after controlling for other factors. Parents were also more likely to use sedentary control tactics with males than females ( $\beta = .25, p < .001$ ). Finally, youth BMI was positively related to both parent-reported positive tactics ( $\beta = .24, p < .001$ ), and negative tactics ( $\beta = .32, p < .001$ ). The results involving youth BMI suggest that parents tended to use more positive and negative tactics as their child's BMI increased. Interestingly, youth BMI was unrelated to youth expectancy-value beliefs and pedometer counts.

The model accounted for a marginal amount of variance ( $R^2$ ) in the endogenous variables. In terms of parental tactics, the amount of variance accounted for in the model was as follows: 18% of parent-reported positive tactics, 10% of parent-reported negative tactics, and 9% of parent-reported sedentary control tactics. It should be noted that the variance accounted for in parent-reported negative tactics and sedentary control tactics was primarily due to

their relations with control variables. Little to no variance in negative affect (< .01%), and only 6% of the variance in positive affect was explained by the model. The model accounted for 12% of the variance in youth expectancy-value beliefs and 24% of the variance in youth physical activity.

Finally, the theoretical model was trimmed by fixing non-significant pathways to zero and re-estimating the model (Figure 6). The trimmed theoretical model provided adequate fit to the data,  $D_d(79, 96.81) = 1.46, p = .04, RMSEA = .06, AIC = -29.47, CFI = .85$ . The trimmed model AIC value was lower compared to the original theoretical model indicating better fit. Moreover, a RMSEA of less than .08 typically indicates “good” model fit (Loehlin, 2004).

*Indirect effects.* Several indirect effects within the model depicted in Figure 5 were of interest. The indirect effect can be defined as the difference between the total effect and the direct effect ( $c - c'$ ; MacKinnon, 2008). In the present model, the total effects were examined after the variance attributable to control variables was removed. Next, the total effect was decomposed into direct ( $c'$ ) and indirect ( $c - c'$ ) components. In the present analysis, the total effect will be represented by  $c$ , the direct effect will be represented by  $\gamma$  or  $\beta$  depending on whether the variable is exogenous or endogenous, and the indirect effect by  $c - c'$ . If there is no direct effect of a variable within the model, then the total effect theoretically equals the indirect effect (MacKinnon, 2008).

Table 14 presents the total effects, the indirect effects, and tests of statistical significance for the indirect effects for the model depicted in Figure 5. Overall, 3 out of 16 indirect effects were statistically significant, with one indirect

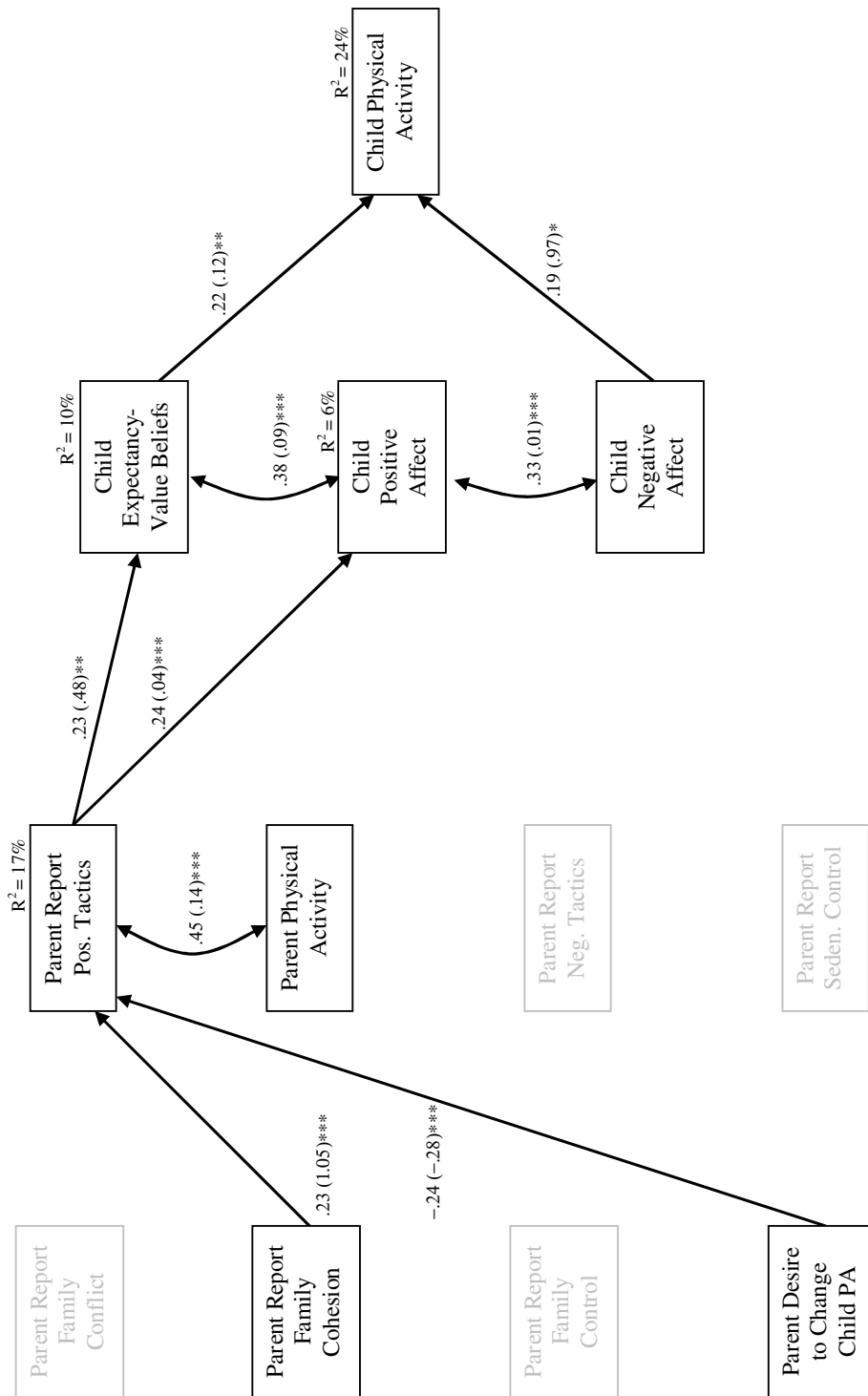


Figure 6. Standardized and unstandardized coefficients for the trimmed theoretical model depicted in Figure 5 predicting youth physical activity.

Note: Unstandardized coefficients are presented in parentheses.

Table 14.  
Initial Model Indirect and Total Effects.

Path	Total Effect <sup>a</sup>	Indirect Effect <sup>a</sup>	SE <sub>Indirect</sub>	z
Parent Desire to Change Child PA → PR Positive Tactics → Child EV Beliefs	-.162	-.165	.004	-2.460*
Parent Desire to Change Child PA → PR Positive Tactics → Child Positive Affect	-.012	-.012	<.001	-2.690**
Parent Desire to Change Child PA → PR Sedentary Control Tactics → Child EV Beliefs	-.162	.001	<.001	.139
Parent Desire to Change Child PA → PR Sedentary Control Tactics → Child Negative Affect	<.001	<.001	<.001	.013
Parent Desire to Change Child PA → PR Positive Tactics → Child EV Beliefs → Child PA	-.016	-.021	<.001	-1.826 <sup>†</sup>
Parent Desire to Change Child PA → PR Positive Tactics → Child Positive Affect → Child PA	-.016	.004	<.001	.668
Parent Desire to Change Child PA → PR Sedentary Control Tactics → Child EV Beliefs → Child PA	-.016	<.001	<.001	.139
Parent Desire to Change Child PA → PR Sedentary Control Tactics → Child Negative Affect → Child PA	-.016	<.001	<.001	.013
PR Positive Tactics → Child EV Beliefs → Child PA	.061	.077	.001	2.148*
PR Positive Tactics → Child Positive Affect → Child PA	.061	-.016	.001	-.674
PR Negative Tactics → Child EV Beliefs → Child PA	-.109	-.106	.010	-1.031
PR Negative Tactics → Child Neg. Affect → Child PA	-.109	-.003	.007	-.031
PR Sedentary Control Tactics → Child EV Beliefs → PA	-.066	-.066	.015	-.543
PR Sedentary Control Tactics → Child Negative Affect → Child PA	-.066	-.001	.011	-.013
Parents PA → Child EV Beliefs → Child PA	-.036	-.036	.002	-.744
Parents PA → Child Positive Affect → Child PA	-.036	<.001	<.001	.025

Note: PR = Parent Self-Report, PA = Physical Activity, EV = Expectancy-Value

<sup>a</sup> Unstandardized estimate

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

<sup>†</sup>  $p < .08$

effect of marginal statistical significance ( $p < .08$ ). It was hypothesized that tactic use would fully mediate the relation between the amount parents want to change their child's physical activity and youth expectancy-value beliefs, youth affective reactions, and youth physical activity. The indirect effects in Table 14 suggest partial support for this hypothesis. Parents' desire to change their child's physical activity had indirect effects on youth expectancy-value beliefs and positive affect; both of which were mediated by parents' report of positive tactic use. Examining the difference between the total effect and the indirect effect suggests that parents' desire to change their child's physical activity did not exert direct effects on positive affect, youth expectancy-value beliefs, or youth physical activity. The indirect effect of parents' desire to change their child's physical activity on youth expectancy-value beliefs and positive affect were statistically significant and negative. The results suggests that as parents' desire to change youth physical activity increases, there is decreased use of positive tactics by parents, which in turn, was related to increases in positive affect and youth expectancy-value beliefs. Finally, none of the indirect effects involving parent-reported sedentary control tactics were statistically significant.

The second hypothesis stated that youth expectancy-value beliefs and affective reactions would fully mediate the relationship between parents' report of positive tactics, negative tactics, and sedentary control tactics and youth physical activity. Based on the results in Table 14, only one indirect pathway supported this hypothesis. Youth expectancy-value beliefs fully mediated the relation between parents' report of positive tactics and youth physical activity, as

evidenced by the significant indirect effect,  $c - c' = .08$ ,  $p = .03$ . Again, a comparison of the total effect and indirect effect suggest no direct effect of positive tactics on youth physical activity. Due to the lack of direct effects between parent-reported sedentary control and negative tactics and the hypothesized mediators, none of the indirect effects of these variables on youth physical activity were statistically significant.

Finally, it was hypothesized that the relations between parents' physical activity and youth physical activity should be fully mediated by youth expectancy-value beliefs and affective reactions. None of the hypothesized pathways were statistically significant. The overall total effect between parents' physical activity and youth physical activity was small; the total effect ( $c = -.036$ ) was mostly comprised of the indirect effect ( $c - c' = -.036$ ) through youth expectancy-value beliefs.

#### *Exploratory Analyses*

Due to the poor fit of the theoretical model, exploratory analyses were conducted with a focus on whether an alternate set of relationships emerged when child-reported parental tactic use replaced parent-reports in the model depicted in Figure 4.

The child-report model fit was poor,  $D_d(63, 432.52) = 1.99$ ,  $p < .001$ ,  $RMSEA = .08$ ,  $AIC = 5.81$ ,  $CFI = .84$ . Figure 7 presents both standardized and unstandardized path coefficients for the child-report model. Examination of the pathways revealed two additional significant relationships: (a) child report of negative tactic use was positively related to negative affect,  $\gamma = .46$ ,  $p < .001$ ; and



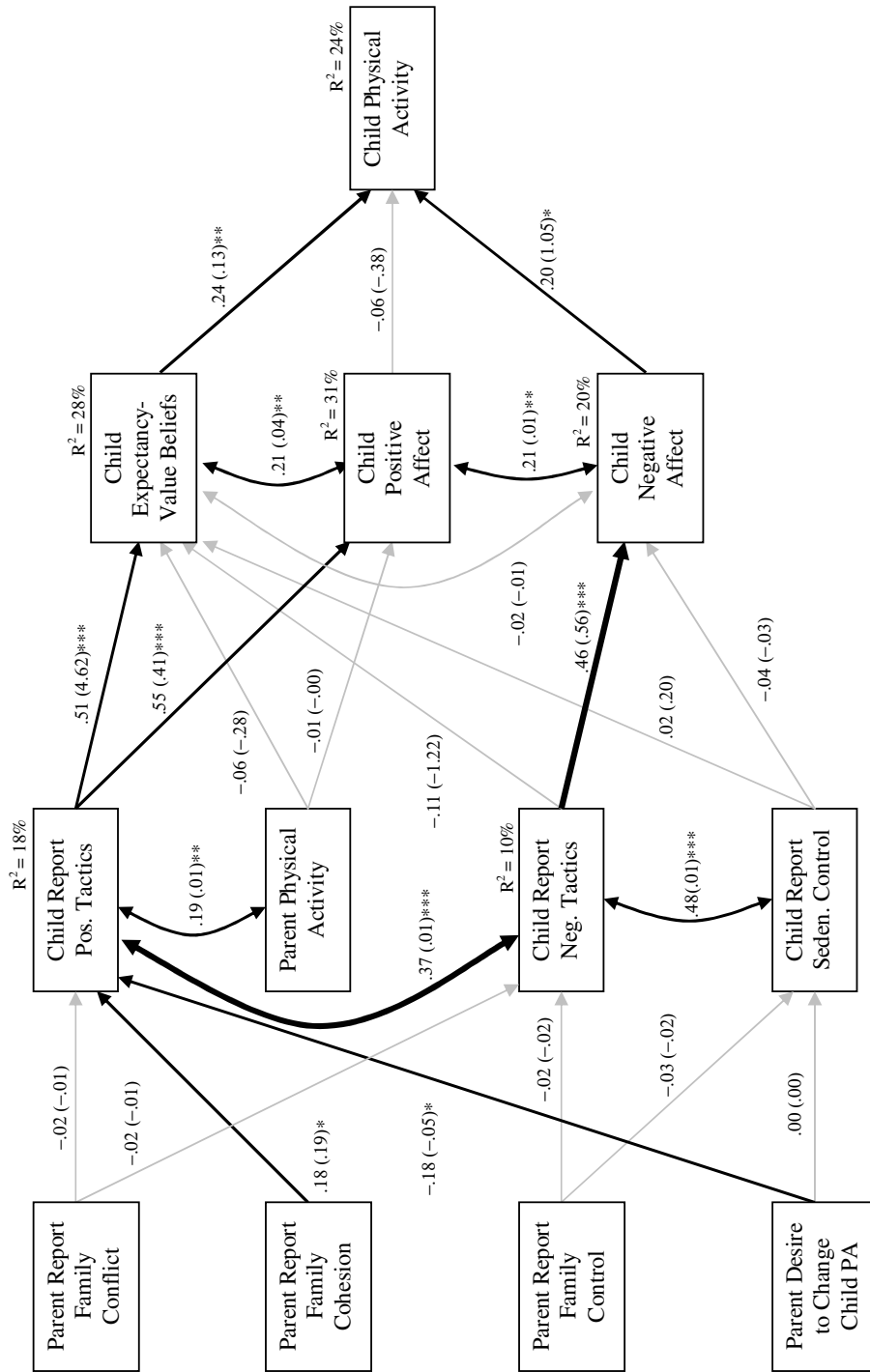


Figure 7. Standardized and unstandardized coefficients for the exploratory path model utilizing child-reported parental tactic use variables.  
 Note: Unstandardized coefficients are presented in parentheses, grey-tone lines represent non-significant pathways, and bold lines represent additional significant pathways.

(b) child report of negative tactic use was positively related to child report of positive tactic use,  $\theta = .37, p < .001$ . Finally, the child-report model accounted for 24% of the variance in youth physical activity, 28% of the variance in youth expectancy-value beliefs, and 31% of the variance in positive affect, and 20% of the variance in negative affect.

Similar to the theoretical model, the child-report model was trimmed by fixing non-significant pathways to zero and re-estimating the model (Figure 8). The trimmed child-report model provided adequate fit to the data,  $D_d(85, 274.47) = 1.50, p = .001, RMSEA = .06, AIC = -34.15, CFI = .88$ . All of the fit indices improved except for  $D_d$ , which did not improve. The AIC for the trimmed model was compared to the original child-report model and suggests that the former provides a better fit to the data.

*Indirect effects for child report model.* Table 15 presents the total effects, the indirect effects, and tests of statistical significance for the indirect effects within the model (Figure 7). Results were similar to the initial model in terms of statistical significance, except the magnitude of the indirect effects of child-reported tactics tended to be larger in the exploratory model. One additional indirect effect did emerge; the indirect effect of child-reported negative tactic use on youth physical activity via negative affect was statistically significant ( $c - c' = .58, p < .001$ ).

The model including parent-reported tactic use (Figure 5) fit the data better than the model with child-reported parental tactic use (Figure 7). Although neither model fit the data well, the former model's RMSEA and AIC values were



Table 15.  
*Child Self-Report Model Indirect and Total Effects.*

Path	Total Effect <sup>a</sup>	Indirect Effect <sup>a</sup>	SE <sub>Indirect</sub>	z
Parent Desire to Change Child PA → CR Positive Tactics → Child EV Beliefs	-.225	-.225	.010	-2.211*
Parent Desire to Change Child PA → CR Positive Tactics → Child Positive Affect	-.020	-.020	<.001	-2.249*
Parent Desire to Change Child PA → CR Sedentary Control Tactics → Child EV Beliefs	-.225	<.001	<.001	-.021
Parent Desire to Change Child PA → CR Sedentary Control Tactics → Child Negative Affect	<.001	<.001	<.001	.021
Parent Desire to Change Child PA → CR Positive Tactics → Child EV Beliefs → Child PA	-.022	-.030	<.001	-1.745
Parent Desire to Change Child PA → CR Positive Tactics → Child Positive Affect → Child PA	-.022	.008	<.001	.667
Parent Desire to Change Child PA → CR Sedentary Control Tactics → Child EV Beliefs → Child PA	-.022	<.001	<.001	-.021
Parent Desire to Change Child PA → CR Sedentary Control Tactics → Child Negative Affect → Child PA	-.022	<.001	<.001	.021
CR Positive Tactics → Child EV Beliefs → Child PA	.466	.624	.056	2.632**
CR Positive Tactics → Child Positive Affect → Child PA	.466	-.157	.051	-.696
CR Negative Tactics → Child EV Beliefs → Child PA	.422	-.165	.019	-1.194
CR Negative Tactics → Child Negative Affect → Child PA	.422	.586	.073	2.174*
CR Sedentary Control Tactics → Child EV Beliefs → Child PA	-.011	.028	.009	.299
CR Sedentary Control Tactics → Child Negative Affect → Child PA	-.011	-.036	.006	-.454
Parents PA → Child EV Beliefs → Child PA	-.036	-.037	.002	-.896
Parents PA → Child Positive Affect → Child PA	-.036	.003	.001	-.135

Note: CR = Child Self-Report, PA = Physical Activity, EV = Expectancy-Value

<sup>a</sup> Unstandardized estimate

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

†  $p < .08$

considerably lower than the latter model's values. Therefore, the model including parent-reported tactic use was used to examine the influence of moderator variables.

#### *Moderator Analysis*

To investigate the effects of moderators, path models were estimated simultaneously in multiple groups using a *stacked* format. Three sets of potential moderators were examined separately: conflict vs. autonomy, male vs. female, and elementary vs. junior high school groups. The comparison between the elementary and junior high school groups represented a test for the moderating effect of child age on model pathways. Within each stacked model, variance among the endogenous variables was allowed to vary between groups. For each hypothesis related to a given moderator, pathways within the model depicted in Figure 5 were tested for equivalence between groups. Table 16 presents tests for the hypothesized differences among pathways for each stacked group. None of the hypothesized differences among pathways were significantly different. With regard to the hypothesized direct effect of tactic use on youth physical activity within the elementary school group, no statistically significant direct effects of parent-reported tactic use were present within the model for either group.

Table 16.  
*Difference Tests for Figure 5 Pathways by Moderator*

Moderator	$\Delta^a$	$D_d$	$p$
<b>Conflict vs. Autonomy</b>			
PR Positive Tactics → Child EV Beliefs	-.267	.741	.389
PR Negative Tactics → Child EV Beliefs	-2.376	2.961	.085
PR Sedentary Control Tactics → Child EV Beliefs	1.522	.794	.373
PR Positive Tactics → Child Positive Affect	-.032	1.570	.210
PR Negative Tactics → Child Negative Affect	-.282	3.053	.081
PR Sedentary Control Tactics → Child Negative Affect	.345	2.921	.087
<b>Female vs. Male</b>			
Parent Desire to Change Child PA → PR Positive Tactics	-.050	.073	.787
Parent Desire to Change Child PA → PR Sedentary Control Tactics	-.011	.138	.711
PR Positive Tactics → Child EV Beliefs	-.254	.779	.377
PR Negative Tactics → Child EV Beliefs	-.676	.250	.617
PR Sedentary Control Tactics → Child EV Beliefs	2.193	1.560	.212
<b>Elementary vs. Junior High School</b>			
PR Sedentary Control Tactics → Child EV Beliefs	1.810	1.478	.224
PR Sedentary Control Tactics → Child Negative Affect	.219	1.573	.210

Note: CR = Child Self-Report, PA = Physical Activity, EV = Expectancy-Value

<sup>a</sup> Difference in Unstandardized Estimates

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

†  $p < .08$

## Chapter 4

### DISCUSSION

The aim of the present study was to expand existing models of children's achievement motivation for engaging in physical activity by addressing gaps in the current literature. Three gaps were identified including: (a) the omission of youth affect as a mediator in current models, (b) a narrow focus on positive parental influence tactics, and (c) the lack of investigation of the moderating role of the socio-emotional climate on the relation between parental influence tactics and child outcomes. The current study also included an examination of the direct and indirect effects of parents' desire to change the level of their child's physical activity and the effects of child age, gender, and perceptions of relationship with parent as moderators of the relation between parental influence tactics and child outcomes.

The discussion focuses on developing a rationale for expanding Eccles' (1993) conceptualization of the Parental Socialization sub-model. To this end, two goals were developed: (1) present a theoretical justification for the two distinct pathways through which parental influence tactics were found to be related to youth motivational and behavioral outcomes in the physical activity domain; and (2) explore the roles that parents' desire to change the level of their child's physical activity and family cohesiveness play in the development of children's physical activity beliefs and behavior. A secondary goal of this discussion is to re-examine several age and gender trends that have been found in the extant

literature on youth physical activity and provide a multiple-informant examination of the socio-emotional environment and parental use of influence tactics.

### *Parental Socialization of Achievement Motivation*

When examining the socialization of achievement motivation within the framework established by Eccles and colleagues (1998), it is important to consider the relation between the broader Expectancy-Value model (Eccles-Parsons, et al., 1983) and the Parental Socialization sub-model presented in Figure 9 (Eccles, 1993; Fredricks, & Eccles, 2004). Eccles and colleagues' (1983) model of achievement motivation was originally developed to understand the effects of ability and value beliefs on children's academic achievement. The Expectancy-Value model suggests that individual activity choice, persistence, and performance are a function of two expectancy-value beliefs: perceptions of ability and subjective task value (Eccles-Parsons, et al., 1983). The broader model also suggests that expectancy-value beliefs are influenced by social agents. In the case of children, researchers have focused on the influence of parents due to the robust link between parental achievement-related beliefs and youth expectancy-value beliefs (Eccles, Wigfield, & Schiefele, 1998). Eccles (1993) developed the Parental Socialization sub-model to explain how achievement-related beliefs are socialized within the broader Expectancy-Value framework. The Parental Socialization sub-model focuses on several mechanisms through which expectancy-value beliefs are socialized. The mechanisms represent various fundamental processes through which socialization occurs; for example, parents may reinforce youth physical activity with verbal encouragement.



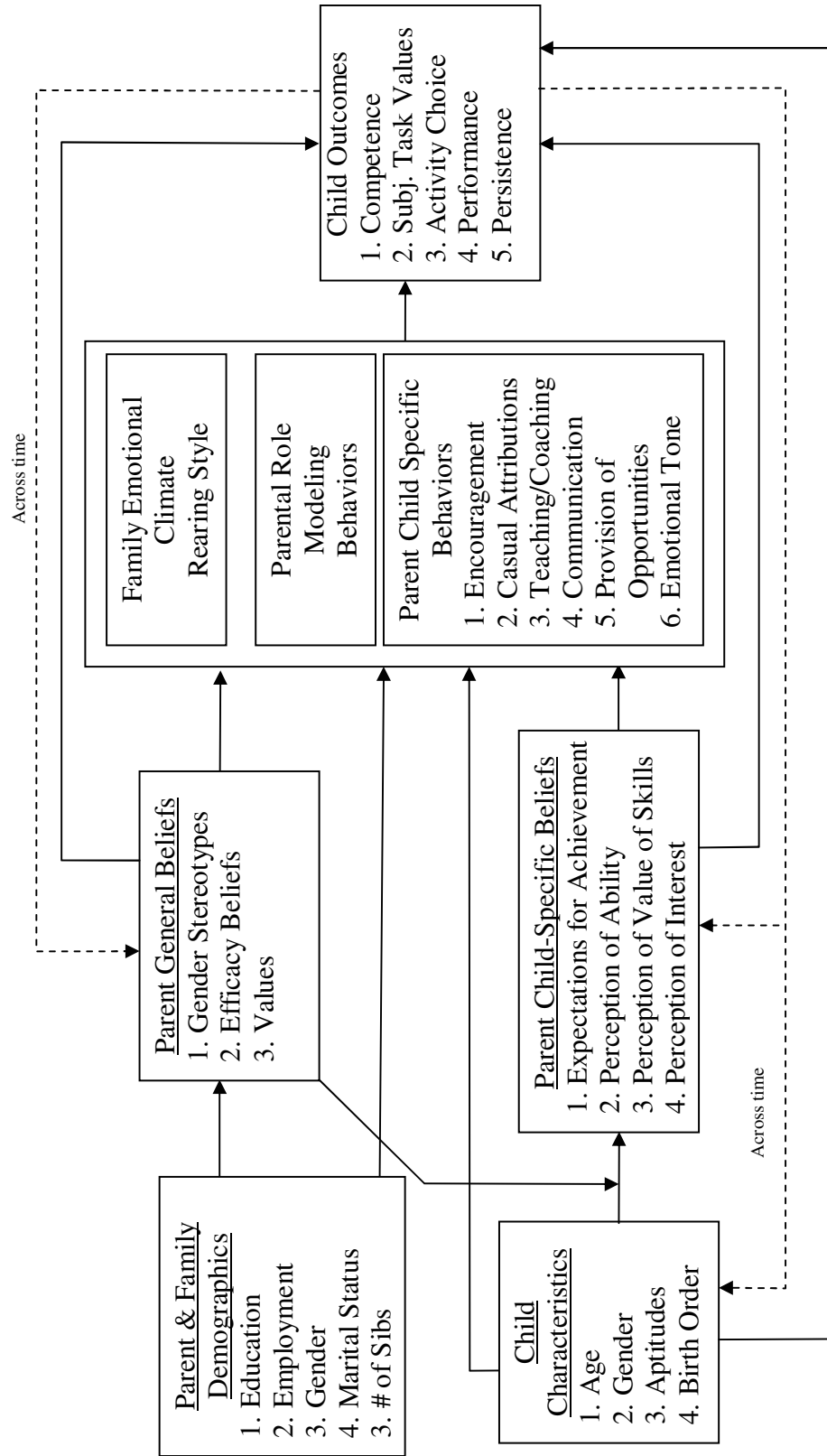


Figure 9. Eccles' Parental Socialization sub-model of Achievement Motivation as depicted in Fredricks and Eccles (2004).

The Parental Socialization sub-model in Figure 9 suggests that parents may influence youth achievement motivation in two principal ways: by providing experiences for their child and by interpreting these experiences for their child (Fredricks & Eccles, 2004). Early studies examined parent role modeling as a possible mechanism through which expectancy-value beliefs were socialized (e.g., Eccles-Parsons, Adler, & Kaczala, 1982). Subsequent research suggested additional child-specific behaviors as possible mechanisms; such as parents' use of encouragement, communication of causal attributions, or provision of opportunities (Eccles, Wigfield, & Schiefele, 1998). Within the sub-model, parents' child-specific behaviors serve to communicate parents' general and child-specific beliefs regarding a particular achievement domain. Therefore, parents' child specific behaviors are thought to mediate the relationship between parent and child beliefs.

What is not apparent in Figure 9 is the notion that youth expectancy-value beliefs predict activity choice, persistence, and performance (see Child Outcomes box, Figure 9). Such a notion is consistent with the broader Expectancy-Value model, and suggests that youth expectancy-value beliefs serve as mediators of the relation between parents' child-specific behaviors and youth outcomes. Therefore, according to the sub-model, parents' child specific behaviors may have direct or indirect effects on youth activity choice, persistence, or performance. For example, parents might encourage their child to engage in activities they value, or provide messages that communicate their perception of the child's interest or

ability. In turn, such behaviors directly influence youth expectancy-value beliefs, and may directly influence achievement outcomes.

The relations depicted in Figure 9 represent the established pathway through which parental child-specific behaviors influence youth achievement motivation. As noted earlier, however, there may be alternate pathways through which the socialization of children's achievement motivation occurs. One such pathway may involve affective responses to socialization attempts.

### *The Role of Affect*

Eccles' broader Expectancy-Value model (Eccles-Parsons et al., 1983) suggests that affective memories have direct effects on youth expectancy-value beliefs. Affective memories were defined as the affect associated with prior experiences within a given activity. For example, an individual might recall an unpleasant prior experience in a math course, or participation in a sport. Despite the identified role of affect in the broader model, the Parental Socialization sub-model omits affect altogether. In light of the clear theoretical rationale for examining the role of affect within an expectancy-value framework, I predicted that increases in positive affective reactions to parental influence attempts would be related to increases in youth physical activity. In addition, I hypothesized that negative affect would be negatively related to youth physical activity. The results were counterintuitive; positive affect was unrelated to youth physical activity, whereas negative affect was positively related to youth physical activity. Current theories of how affect may influence behavior, and more importantly the

formation of beliefs, may provide an explanation for the pattern of observed relationships.

Over the last three decades researchers have been examining how mood or affect influence human cognition and behavior (Forgas, 2008). Several models of how affect influence cognitive processes have emerged from this research. One model, the mood-as-input or affect-as-information model, may explain the findings of the current study. The mood-as-input model suggests that affect or mood serves as important motivational information (Martin, Ward, Achee, & Wyer, 1993). Martin and colleagues argue that affect can serve as a signal of whether individuals are enjoying their current goal-directed behavior. The authors conducted two experiments demonstrating that under various stop rules, individuals interpreted induced positive and negative mood states consistently with the mood-as-input model. The specific stop rule investigated was “Am I enjoying this task?” The results demonstrated that individuals who experienced negative affect terminated engagement in the task sooner than participants who experienced positive affect. A later study by George and Zhou (2002) replicated these effects in a non-experimental design, but the effect was conditional on participants’ perceived clarity of feelings. In the present study negative affective reactions were negatively related to parent-reported youth sedentary behavior. The mood-as input model would suggest that youth cease their sedentary behavior when negative parental tactics trigger negative affect. How do youth process the experience of negative affect in these social influence situations? Forgas (2002) has argued that the mood-as-input model relies on the misattribution of affect.

That would suggest that negative affect attributable to parents' use of a given tactic (i.e., negative tactics) is misattributed to sedentary activity. If youth misattribute affect in such social situations, then engagement in physical activity may be used to alleviate the negative mood experienced as a consequence of the social interaction (Kanning & Schlicht, 2010).

One issue with the mood-as-input model is that it does not explain why positive affect was unrelated to physical activity. According to the mood-as-input model, positive affect should be *inversely* related to physical activity, especially if youth are applying the "Am I enjoying this task?" stop rule to sedentary activity. Rather than mood serving as information, per se, it may be likely that positive affective reactions prime positive beliefs about physical activity. The priming effects of mood have long been documented in research investigating the effect of affect on cognition (Bower, 1981; Forgas, 2002). There is some evidence for this conclusion, as positive affective reactions positively co-varied with youth expectancy-value beliefs whereas negative affective reactions were unrelated to youth expectancy-value beliefs. Therefore, at least with regard to affect, the mood-as-input model provides only a partial explanation for the current results. Fortunately, attempts have been made to bridge the gap between the mood-as-input and affect-priming models.

The Affect Infusion Model (AIM; Forgas, 1995) may explain the effects of both positive and negative affect by combining the affect-as-information and mood-priming models. The AIM suggests that affect is likely to be "infused" with cognition when the processing requirements of a situation are open and

constructive or when informational search is necessitated by social pressures (Forgas, 2002). Open and constructive cognitive states would seem appropriate for the formation of new beliefs or the internalization of attitudes, beliefs, and behaviors transmitted from one generation to another. Fiedler and Bless (2001) elaborate on the specific mechanisms by suggesting that the cognitive effects of affect can be understood in terms of accommodation and assimilation. Negative affect leads to accommodation: a processing shift that emphasizes a focus on external demands or threats, and bottom-up type of information processing. Weaker mood-congruent memories are likely along with cognitive elaboration. By contrast, positive affect leads to assimilation: which prompts one to be curious, use heuristics, make active inferences, and apply internalized prior information. Moreover, the AIM stresses that these effects should vary as function of the task, person, or context (Forgas, 2008). The AIM therefore is integrative because instead of relying exclusively on the informational effects of mood, it incorporates other contextual factors that moderate the influence of mood on how youth respond to parental influence attempts (Martin, 2000). Overall, the AIM provides an information processing framework for understanding why parental use of positive tactics and negative tactics operate through different pathways.

*Summary.* A major finding in the present study was the observation that negative affective reactions were a positive predictor of youth physical activity. It was also notable that positive affect, to a lesser extent, was positively related to expectancy-value beliefs and unrelated to youth physical activity. The Affective Infusion Model would suggest that the manner in which affect is related to

expectancy-value beliefs and youth outcomes within the Parental Socialization sub-model may vary depending on the valence of the affect experienced. How would an application of the AIM explain the current findings? First, the model may explain why only positive affect was correlated with expectancy-value beliefs. Positive affect may function in two ways: as information in the construction of beliefs, or as primers of mood-congruent beliefs about physical activity. The explanation fits well within the original Expectancy-Value model, which suggests that affective memories should predict expectancy-value beliefs. Second, negative affect may be signaling information about the external stimulus; that stimulus could be the child's social interaction with parents or their current activity. In either scenario, youth affective reactions to parental tactic use may prompt various stop rules that result in motivation to terminate a sedentary activity or to initiate physical activity.

#### *Parents' Tactic Use*

Another contribution of the present study was the examination of three different types of child-specific behaviors within the Expectancy-Value framework: positive, negative, and sedentary control behaviors. It was expected that youth expectancy-value beliefs and affective reactions would be related to all three types of parental influence tactics, including parent-reported physical activity. Support for the relation between positive tactics and youth expectancy-value beliefs was found across models using parent and child reports of influence tactics. By contrast, neither the use of negative tactics nor the use of sedentary control tactics were related to youth expectancy-value beliefs.

The results provide further support for the Parental Socialization sub-model presented in Figure 9. For example, Fredricks and Eccles (2005) found, in a series of hierarchical regressions, that parental encouragement and purchasing of equipment had small relations (i.e.,  $< .30$ ) with youth competence and value beliefs. Moreover, the authors found no relation between parents' own engagement in sport and youth competence and value beliefs. Similarly, the present study also found no relation between parental physical activity and youth expectancy-value beliefs. One notable difference is that while Fredricks and Eccles found a direct effect of parental encouragement on youth participation in sport, the present study found no direct effects of positive influence tactics. However, this conclusion is limited due to Fredricks and Eccles' analysis; competence and value beliefs were not examined as mediators of the relationship between parental influence tactics and youth participation in sports. It should also be noted that the findings of the present study also are consistent with studies investigating (a) the relation between youth physical activity beliefs and behavior (e.g., Brustad, 1993); and (b) studies examining the mediational role of youth self-perceptions in the physical activity domain (e.g., Trost, et al. 2003).

Recall that research examining the effects of coaching behavior suggests that negative coaching behaviors have a negative impact on youth sports-related beliefs and attitudes (Curtis, Smith, & Smoll, 1979; Smith & Smoll, 1997). The results of the present study found the opposite; there were no direct effects of negative tactic use on expectancy-value beliefs, and the indirect effect of parents' negative tactic use on youth physical activity was positive. The difference



between negative coaching and parental behavior may be due to the context and consequences of such behavior. First, youth may perceive a coach's negative behavior as more legitimate in the context of physical activity compared to parents, and this may contribute to the greater effect of negative coaching behaviors have on attitudes. Second, coaching behavior may have direct consequences for a youth's opportunity to participate with the team or on the field. Finally, coaching behaviors are more likely to be public, and comments or actions may bring about negative social attention.

In the model using child-reported negative influence tactics, both positive and negative tactic use were related to youth affect. As hypothesized, positive influence tactics (whether parent- or child-reported) were positively related to positive affective reactions. Similarly, negative influence tactics were positively related to negative affective reactions. In addition to the direct effect of affect on youth physical activity, it was also expected that youth affective reactions would mediate the relation between parental tactic use and youth physical activity. Negative affect fully mediated the relation between parents' use of negative tactics and youth physical activity in the model using child-reported parental influence tactics.

It is not uncommon in research on children using parent and child reports to find stronger relations between child as opposed to parent reports of parental behavior and outcomes. For example, in a study of adolescent smoking behavior, Chassin and colleagues (2005) found that youth reports (but not parent reports) of parental uses of discussion and punishment were related to increases in smoking.

A similar difference in the statistical significance of child versus parent reports and performance has been observed in the academic achievement domain (Pelegrina, Garcia, Linares, & Casanova, 2003). Second, these results are generally consistent with similar models examining social control of health behaviors (Tucker, Orlando, Elliott, & Klein, 2006). Social control models of health behavior change have suggested that positive and negative influence tactics have domain-specific effects on affect (Okun, Huff, August, & Rook, 2007). Moreover, affective reactions within social control models have been consistently demonstrated to mediate the relation between social influence attempts and change in health behaviors.

Although not an influence tactic per se, parent physical activity has been widely examined as a predictor of youth physical activity and physical activity-related beliefs. The investigation of parents' physical activity has primarily been driven by the notion that modeling is a key mechanism through which youth are socialized (Pugliese & Tinsley, 2007). In the present study, parent-reported physical activity was unrelated to youth expectancy-value beliefs. The results were unexpected given that prior research has suggested that parental modeling of physical activity has positive, albeit small, relations with youth perceptions of attraction and competence in the physical activity domain (Welk, Wood, & Morss, 2003). Prior research on youth physical activity has also suggested that different mechanisms (i.e., modeling vs. encouragement vs. providing opportunities) may have differential effects as youth age (Pugliese & Tinsley, 2007); however no moderating effect of age was found. It should be noted that

increases in reported parent physical activity were related to increased use of positive influence tactics, suggesting that physically active parents may be more likely to promote physical activity in the home (Wilson, Spink, & Priebe, 2010). Parents' physical activity may not be perceived as relevant by youth, therefore diminishing any likely effects of modeling. However, parents who are active may still encourage their children to play sports, engage in physical play, or exercise.

*Summary.* Positive and negative influence tactics contribute to the socialization of youth physical activity, albeit through different pathways. As suggested by the Parent Socialization sub-model (Eccles, 1993), expectancy-value beliefs represent the primary mediator through which positive influence tactics impact youth physical activity. Negative affective reactions to parents' use of negative influence tactics represents a second pathway through which youth physical activity may be socialized. In the long-term, each pathway may serve a different function. Positive tactics, by directly influencing expectancy-value beliefs, may produce a more stable developmental trajectory with regard to physical activity. In contrast, negative tactics may be used to produce short-term behavior change. That is, parents may use negative tactics to get their child "back on track" with regard to their physical activity, as opposed to promoting the long-term value of physical activity. Because the functions of positive and negative tactic use may vary, it is important to examine whether different variables predict parent use of different types of tactics. In the present study, parents' perception of the parent-child relationship and desire to change their child's physical activity were examined as predictors of parental tactic use.

### *Parents' Desire to Change Their Child's Physical Activity*

Conceptually, parents' desire to change their child's physical activity most likely represents motivation to take action. It was expected that parents desire to increase their child's physical activity would be positively related to the use of positive tactics and attempts to control or limit sedentary activities. Although no relationship was found between parents' desire and sedentary control tactics, there was a negative relation with positive tactic use. That is, as parents indicated a greater desire to increase their child's physical activity, they were less likely to use positive tactics. Parents' desire to change the level of their child's physical activity was the only exogenous factor to have an indirect effect on youth expectancy-value beliefs and affective reactions. The indirect effects of parental beliefs have been examined in a few studies. Brustad (1993) found that parental encouragement mediated the relationship between parents' own beliefs concerning physical activity and children's attraction to physical activity. A more recent study by Trost and colleagues (2003) found that the relation between parent-perceived importance of physical activity and youth self-efficacy was fully mediated by parental support. A major difference between the present study and these earlier studies is that the indirect effect was negative; increases in parents' desire to change their child's physical activity resulted in a decrease in youth positive affect and expectancy-value beliefs.

Parents' desire to change their child's physical activity may result from the perception of their child's health status. The basis for this conclusion was the strong positive correlation ( $r = .40$ ) between youth BMI and parents' desire to

increase their child's activity. Numerous studies have demonstrated links among parents' health values, perception of child health vulnerability, and parent health behavior on behalf of their children (Tinsley, 2003). Parents' desire may represent motivation to act on socialization goals or expectations regarding health and fitness for their children. The moderate, positive correlation ( $r = .28$ ) between youth BMI and negative influence tactics suggests that negative tactics may be a more common experience for youth with a poorer health status. Another possibility is that parents may be switching from positive to negative tactics when the former is ineffective at increasing physical activity levels. Parents may simply be motivated to act on the prior ineffectiveness of influence attempts. In response, parents may switch to tactics involving greater control or power assertion in an effort to attain desired outcomes (Bugental & Grusec, 2006). However, the lack of a pathway between parents' desire to change their child's physical activity and negative tactics limits the ability to fully discern whether parents may be switching tactic use.

Recent research suggests parents are less confident about changing youth obesity-related behavior as children engage in more sedentary behavior (Taveras, Mitchell, & Gortmaker, 2009). A lack of confidence may manifest itself as inconsistency in the use of positive tactics. Another possibility is that parents do not consider an increase in tactic use necessary or are not able to engage in some forms of positive tactics. For example, parents who engage in higher levels of positive tactic use, and presumably have more active children, may not perceive a need to change their child's physical activity. Conversely, parents who engage in

lower levels of positive tactic use may perceive a need increase their child's physical activity, but lack the means to engage in some of the positive tactics commonly measured. Purchasing equipment, paying club fees, or even transporting youth can be perceived as barriers by parents who value physical activity in the home (Thompson, et al., 2010).

*Summary.* Parents' desire to change their child's physical activity has not been previously explored within the realm of physical activity. Parents' desire may reflect ineffective prior influence attempts. Parent responsiveness to the effectiveness of their influence attempts emphasizes the theoretical importance of understanding socialization in terms of a bi-directional process (Kuczynski, 2003). A bi-directional model would suggest that youth responses to socialization attempts feedback into parental choice of influence tactics. Therefore, it may be interesting to examine parents' desire as a mediator of the relation between prior attempts and current attempts in a longitudinal design. However, parents' desire to change their child's physical activity may also reflect the organizing context of unmet socialization goals or the perception of their child's situation or characteristics. The negative relation between parents' desire to change their child's behavior and positive tactics may also reflect a lack of parental confidence as behavior change agents. Such explanations underscore the need to consider parents' socialization goals or perceptions of agency in models of socialization of youth physical activity (Grusec, Goodnow, & Kuczynski, 2000).

*Social-Emotional Climate*

Parents' perceptions of the family environment were investigated as possible predictors of tactic use. It was hypothesized that parents who perceive higher levels of conflict with their child will utilize fewer positive tactics and more negative tactics. However, parental reports of family conflict were unrelated to either parent-reported positive or negative tactic use. In addition, it was expected that family cohesion would be positively related to positive tactics use and that parents' report of control would be positively related to negative tactic use and sedentary control tactics. While parent-reported cohesion was positively related to parent-reported use of positive influence tactics, parent-reported control was unrelated to parental influence tactics. The results were similar across models utilizing either parent-reported or child-reported influence tactics.

The failure of conflict and control to predict parental tactic use was unexpected given the original conceptualization of the constructs by Moos (1974). For example, negative influence tactics consisted of measuring parental pressure, punishment, and use of anger. Moos and Moos (1974, 1986) defined the FES conflict scale as a measure of openly expressed anger or aggression among family members. However, a single negative tactic item, "Have [you] gotten upset or angry when your child does not do physical activities", captured the use of anger. By contrast, Moos and Moos (1974, 1986) defined cohesion within families as being characterized by the level of supportive interaction among members. The current measure of positive tactics included behaviors such as encouragement, co-activity, purchasing equipment, and providing transportation for the purpose of engagement in physical activity. All of the positive tactics, in varying ways, are

supportive of physical activity, and can be understood as manifestations of family cohesiveness. The lack of overlap between the FES conflict scale and the measure of negative tactic use may have contributed to the absence of a relation between these measures.

The majority of negative tactics items, as well as all of the sedentary control items, fall under Moos and Moos' definition of control which is defined as the extent to which various rules and conditions are implemented to manage the family (Moos & Moos, 1974, 1986). Despite this conceptual overlap, statistically significant positive relations were not observed. FES control scale scores did not predict negative or sedentary control tactic use. The FES control scale scores were also unrelated to youth expectancy-value beliefs and youth pedometer counts. The most likely reason may be the low reliability found in the FES scale measuring control. Correlations involving scales with low reliability tend to be attenuated and this may have obscured the relation between family-level control and other endogenous variables in the model.

Another possibility is that while some parents may use more coercive tactics to engage their children in physical activity, the conflict associated with these attempts are minor compared to the conflict generated in other areas of family life. The FES scales are a global measure of the family environment, whereas measurements of tactic use were domain-specific. Consideration should be given to the fact that parental influence tactics were posited as a mediator of the effects of the family environment on youth expectancy-value beliefs and affective reactions. It may be possible that the family environment has direct effects on



youth physical activity, and that domain-specific influence tactics do not function as a mediator. Some evidence of this is given by the statistically significant positive correlation between parent-reported family conflict and youth pedometer counts. The latter explanation would not be without precedence; Chassin and colleagues (2005) found that smoking-specific parental behaviors did not mediate the effect between parenting style and youth smoking behavior. Instead, parenting style had independent direct effects on youth smoking behavior above and beyond smoking-specific parenting behaviors. For example, youth may engage in physical activity to avoid a high-conflict environment.

*Summary.* Researchers within the socialization literature have argued for an increase in the examination of the parent-child relationship within models of socialization (Grusec, Goodnow, & Kuczynski, 2000). In the present study, family cohesion was the only statistically significant predictor of parental tactic use. Moreover, examination of the correlations revealed that family-level conflict may have direct effects on youth physical activity. Strong familial support may indicate a high level of parental responsiveness to youth needs and interests. Support and responsiveness in itself may communicate to youth parental values regarding physical activity or health. Recall that measures of tactic use were in terms of frequency, and low frequency tactic use may signal a lack of perceived parental value from the child's perspective.

#### *Moderators*

Youth gender, age, and perceptions of parenting style were posited to moderate the relation between parental tactic use and both expectancy-value

beliefs, and affective reactions. First, I expected to find that the relations between parental tactic use and expectancy-value beliefs would be stronger among males than females. The results did not provide any support for this prediction. This suggests that while gender differences may exist in terms of overall physical activity level, the extent to which parental influence tactics are related to youth physical activity beliefs does not vary between genders. Second, I expected to find that the relation between parents' desire to change their child's physical activity and parental tactic use would be stronger among males than females. However, the relation between parents desire to increase their child's physical activity and the use of positive tactics did not vary by gender. Research suggests that parents harbor gender-stereotyped beliefs with regard to physical activity (Fredricks & Eccles, 2005; Jacobs & Eccles, 1992), and this may translate into different expectations in terms of appropriate levels of activity. Recall that females were less active than males, and that there was no correlation between youth gender and parents' desire to change their child's physical activity. It is possible that parents may not perceive low activity levels as especially alarming for females and therefore may not desire to change their activity level.

Given that parents typically exert greater control over younger children than older youth, I expected that a direct effect of parental tactics on youth physical activity would be present within the elementary sample and be absent within the junior high school sample. However, none of the parental influence tactics had a direct effect on youth physical activity in either school sample. It should be noted that the total effects of positive parental influence tactics on youth physical

activity in previous studies have been modest-to-small (Pugliese & Tinsley, 2007). The authors suggested that such small effects might indicate the presence of mediators. The suggestion is consistent with the findings of the present study, in which expectancy-value beliefs fully mediated the effect of positive influence tactics on youth physical activity. The second hypothesis was that age would moderate the relationship between sedentary control tactics and both youth expectancy-value beliefs and affective reactions. However, neither pathway varied between the elementary and junior high school samples. In fact, sedentary control tactics were unrelated to youth expectancy-value beliefs and affective reactions.

Youth perceptions of conflict versus autonomy were also expected to moderate several pathways within the model. In terms of the relation between parental influence tactics and expectancy-value beliefs, I hypothesized that the positive relation between parental tactic use and expectancy-value beliefs would be stronger for youth who report higher levels of autonomy and lower levels of conflict than for youth who report low levels of autonomy and higher levels of conflict. Although the pathways within each group were not statistically significant, patterns among the findings were of interest. For example, the relation between parent-reported negative tactic use and expectancy-value beliefs were negative for youth who perceive high conflict with parents, whereas it was slightly positive for youth perceiving high autonomy. The result may explain why, in the parent reported model, the pathway linking parent-reported negative tactics and expectancy-value beliefs were not statistically significant. The positive

and negative parameter estimates cancel out when estimated across both groups in the parent-reported model. For parent-reported sedentary control tactics, the pattern was reversed. The relation between parent-reported negative sedentary control tactics and expectancy-value beliefs was positive for youth who perceive high conflict with parents, whereas it was slightly negative for youth perceiving high autonomy. The findings are consistent with the idea that parents' stylistic approach influences children's openness to socialization attempts (Darling & Steinberg, 1993). In families with greater conflict where parents' use of coercive or power-assertive tactics, youth may actively resist socialization. For youth in relatively higher autonomy-promoting environments, increases in control may be met with the same reaction.

*Summary.* In the present study, none of the moderator effects reached statistical significance. Nevertheless, the most promising variable involved youth perceptions of the parent-child relationship. The Parental Socialization sub-model does suggest parental influence strategies have direct effects on youth activity choice; a result that would have seemed most likely with younger children. However, no direct effects were found in elementary and junior high school samples. Despite the differences in physical activity levels between males and females, the present study also suggests that the socialization process may be similar for each. However, the result should be interpreted with caution, as gender-stereotyped beliefs were not included in the model.

### *Expanded Model of Parental Socialization of Achievement Motivation*

Increasingly, achievement motivation theories are being employed to explore domains beyond traditional achievement contexts such as sports, school academics, and the workplace (Elliot, 2005). Evidence suggests that even within a context not typically associated with achievement (i.e., recess) children report perceptions consistent with prominent achievement motivation models (Watkinson, Dywer, & Nielsen, 2005). The present study provides further evidence that achievement motivation models are viable even when utilized with broad measures of youth physical activity (i.e., pedometer counts). The Expectancy-Value model is based on the assumption that children's interpretations of reality have greater influence over their achievement-related choice and performance than actual experience (i.e., success and failure). Consistent with this assumption, the current study demonstrated that expectancy-value beliefs are predictive of youth engagement even when perceptions of ability and subjective-task value are assessed within a measurement framework focused on evaluating the target activity (i.e., physical activity) versus other specific competing activities (i.e., sedentary activity). The present study also suggests that affect may play a critical role in individuals' choice to engage in achievement-related activities, even after accounting for the effects of expectancy-value beliefs.

Originally conceptualized as affective memories, the role of affect has not been thoroughly investigated within the Expectancy-Value model despite numerous studies investigating how affect influences information processing (Forgas, 2008), task motivation (Martin, Ward, Achee, & Wyer, 1993), and belief

formation (Fiedler & Bless, 2001). Different affective states, or emotions, may represent the “situational meaning” or the relative importance of an outcome for an individual (Frijda, 1988, p. 349). Within this framework, affect may serve as an important signal as to the value of a given activity. An individual may experience different emotions at the possibility of engaging in various activities which prime congruent beliefs, or consider their affective state contemporaneously with a given activity, prompting disengagement if such activities are no longer enjoyable. The present study provides a starting point for understanding how the inclusion of affect may expand the explanatory power of the Parental Socialization sub-model. Moreover, the Affect Infusion Model provides a theoretical framework for understanding how affect may serve as an antecedent to the formation of expectancy value beliefs or may serve as a co-predictor of activity engagement.

Eccles’ (1993) Parental Socialization sub-model has contributed greatly to our understanding of how expectancy-value beliefs are socialized. Evidence suggests that socialization occurs through various pathways; however in practice, researchers have generally focused on positive parental behaviors. Recall that Eccles and colleagues’ (1993) stage-environment fit perspective hypothesizes that mismatches between the family environment and a child’s developmental needs can have deleterious effects on motivation. Although negative tactics were unrelated to expectancy-value beliefs, there was explanatory power to be gained from the inclusion of negative tactics in the model. Unexpectedly, the inclusion of such tactics resulted in what could be argued as a positive outcome; there was a

positive indirect effect of negative tactics on youth physical activity. Negative social influence tactics represent another set of behavioral options for parenting in the management of children's leisure time activities, and may be an important part of a youth's family environment. Excluding such tactics in models of socialization creates a mismatch between models of parenting and actual parenting, and may compromise the ability for researchers to gain a full understanding of the socialization process. Finally, the inclusion of negative tactics would bring the Parental Socialization sub-model more in-line with current models of social influence.

The present study has identified two possible pathways by which parents influence youth physical activity. One pathway involves expectancy-value beliefs for which the Parental Socialization sub-model provides an existing framework for understanding how such beliefs mediate the relationship between parents' child-specific behavior and youth physical activity. The second pathway involves positive and negative affect. Both pathways together with the results involving parents' desire to change their child's physical activity and family-level cohesion, provide evidence for expanding the Parental Socialization sub-model.

The Parental Socialization sub-model presented in Figure 10 includes several revisions beyond unpacking youth expectancy-value beliefs and outcomes (see Figure 9). First, the expanded model now includes the role of affect (Figure 10, A.). Second, parents' child-specific behavior has been reorganized and now includes negative influence tactics (Figure 10, B.). The reorganization is not meant to deemphasize the mechanisms through which socialization occurs. The

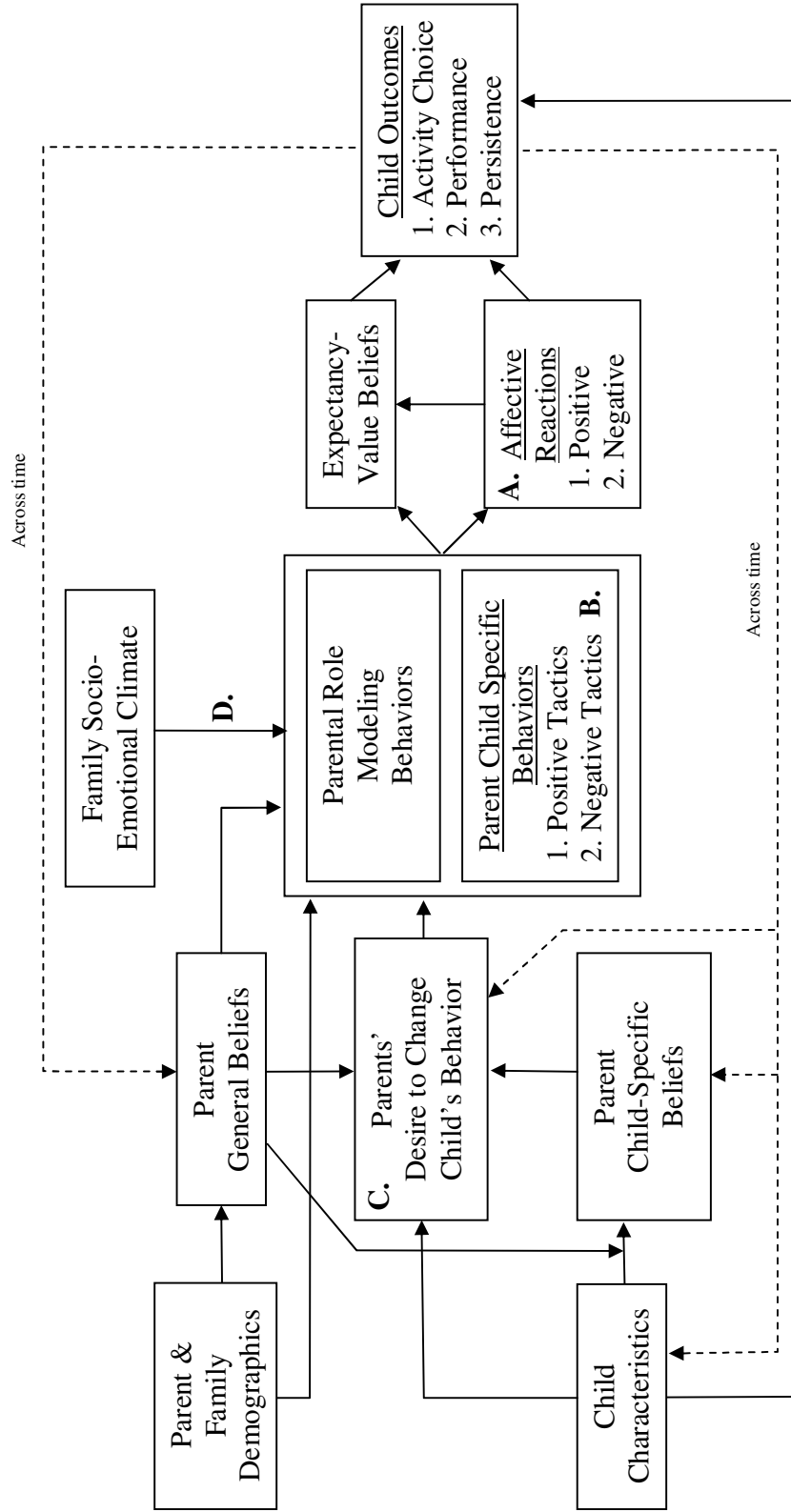


Figure 10. Expanded sub-model of Parental Socialization of Achievement Motivation.



purpose is to highlight the expanded set of child-specific behaviors. Third, parents' desire to change their child's physical activity is now posited as a mediator of several exogenous factors, including parental beliefs and child characteristics (Figure 10, C.). Moreover, parents' desire can be influenced by prior youth activity choices, performance, and persistence. Finally, consistent with the results of the present study, the influence of the socio-emotional climate is now depicted as having a direct effect on parental behaviors (Figure 10, D.).

*Theoretical implications.* The utility of Eccles' Parental Socialization sub-model (1993) stems from the incorporation of several theoretical directions in socialization research. First, the model proposes multiple pathways or mechanisms through which parents might socialize youth expectancy-value beliefs. For example, parents might try to model physical activity behavior or use encouragement to reinforce various beliefs. Second, parents' child-specific behaviors within the model reflect the broader theoretical characterization of parents as managers of their child's experiences (Parke & Buriel, 1998). Pathways exert influence differently, either operating directly (i.e., encouragement), or indirectly (i.e., role modeling) on beliefs or behavior. Third, the context that parents provide may also have effects through the provision of equipment, or an environment conducive to the desired outcome. Fourth, the incorporation of parent-child specific beliefs within Eccles' sub-model underscores the importance of parental perceptions or responsiveness to the characteristics and behavior of their child. Finally, the suggestion that parental perceptions and beliefs may also be a direct consequence of their child's prior beliefs and behaviors implies bi-

directional influences (Kuczynski, 2003). Overall, the sub-model is dynamic by incorporating a cadre of theoretically important notions regarding the socialization process.

Despite the robust theoretical nature of Eccles' Parental Socialization sub-model, the inclusion of affect within the expanded model (Figure 10.) has important theoretical implications with regard to models of health socialization and possibly socialization models in general. Research has suggested that there are individual differences with regard to youth responsiveness, or reactivity, to socialization (Belsky, 2005). However, this line of research has primarily involved biological factors or temperament as a possible moderator of the socialization process (Bugental, & Grusec, 2006). Other researchers investigating affective reactions have largely been intent on understanding the socialization of emotion regulation or understanding (Spinrad, Stifter, Donelan-McCall, & Turner, 2004). However, the present study examines affect as a mediator within the socialization process, not as a moderator or outcome.

Research on conscience development has examined affect as essential to the internalization of beliefs, values, and rules (Kochanska, 1993). Kochanska demonstrated that youth may be more receptive to socialization to the extent they are emotionally reactive to parental influence attempts. Parental responses to situations involving transgressions not only provide a cognitive framework for understanding, but can elicit relevant affective responses in their child (Thompson, 2006). The internalization of the experienced affect is central to the development of a conscience, which later serves a self-regulatory function.

Power-assertive or power-oriented influence tactics within the moral domain have been shown to be detrimental to internalization due their high saliency and tendency to evoke anger or resentment (Kochanska, 1993). In the event of high negative arousal, parents risk youth rejecting influence attempts or producing a lack of sufficient encoding of the parental message (Hoffman, 1983). Although negative tactics may bring about compliance with rules, internalization is less likely due to the lack of experiencing such affect as self-generated (Maccoby & Martin, 1983).

The present study suggests that the affective reactions of children to their parents' socialization attempts identified by researchers studying moral development have implications for other domains of development. The notion that youth affect may signal the situational meaning of parental socialization attempts, and therefore, facilitate the internalization of parents' general and child-specific beliefs, is missing from socialization models focused on behavior as solely the outcome of beliefs and values. The inclusion of affect also complements research in the health socialization domain which has found links between parental affect and youth health behaviors (Lees & Tinsley, 2000). Socialization may be more effective during interactions when both members of a dyad hold mutually positive affective states (Bugental & Grusec, 2006).

Although the present study applied a model developed within the academic domain to the health domain, research findings have suggested that the socialization of health behavior may be distinct from socialization in other areas such as in the academic or social areas (Lees & Tinsley, 2000). That negative

parental tactics had a positive indirect effect on youth physical activity supports the notion that when the perceived consequences of noncompliance are high, effective health socialization may involve greater power-assertive tactics (O'Neil & Parke, 1997, as cited in Lees & Tinsley, 2000). With the rise of obesity in youth, it is reasonable to believe parents may be beginning to perceive sedentary activity as having greater health consequences for their child. From a stage-environment fit perspective (Eccles & Midgely, 1989), the inclusion of negative tactics may enhance our understanding of how mismatches between an individuals' environment and needs have negative motivational consequences within the health socialization domain. Models of health behavior socialization may be well served by the inclusion parents' negative or controlling tactic use.

#### *Parent-Child and Parent-Parent Agreement*

The present study further contributes to the literature on parent-child agreement by providing an examination of both parent-child, and mother-father agreement on selected variables. Research has suggested that while parents and children do overlap in their respective reports, there are considerable differences, suggesting that family members have distinct perceptions of both the quality of their relationship and their behaviors (Cashmore & Goodnow, 1985). Although youth tend to report greater levels of negative parenting behaviors than parents, parent-child agreement across positive and negative parenting behaviors tends to be similar (Tein, Roosa, & Michaels, 1994). More recent research has demonstrated similar findings with regard to parental support, and parent behavioral and psychological control (Kuppens, Grietens, Onghena, & Michiels,

2009). With regard to agreement among mothers and fathers, research has demonstrated that compared to parent-child dyads, parent-parent dyads exhibit higher levels of agreement (Cashmore & Goodnow, 1985; Kuppens, Grietens, Onghena, & Michiels, 2009; Tein, Roosa, & Michaels, 1994). Researchers within the youth physical activity domain have in large part used either child-reports (e.g., Duncan, Duncan, Strycker, & Chaumeton, 2007) or parent-reports (e.g., Fredricks & Eccles, 2005) of influence tactics. In contrast, Kanters, Bocarro and Casper (2008) explicitly examined parent-child agreement with regard to parental influence on youth sports involvement. They found that youth and parents disagreed with regard to perceptions of parental pressure, with youth reporting greater levels of pressure than parents. Conversely, parents reported greater levels of parental support than youth. The absolute effect size for the mean difference for parental support was smaller than for parental pressure by a factor of two. The authors also examined the level of agreement between mothers and fathers and found that parents generally exhibit a high level of agreement.

Prior research on parent-child agreement generally suggest that: (a) parent-child agreement is generally low-to-moderate, with correlations ranging between -.10 to .31 (Cashmore & Goodnow, 1985; Tein, Roosa, & Michaels, 1994); (b) parental dyads generally agree more with regard to parenting practices than parent-child dyads; and (c) agreement is greater for positive than negative parenting behaviors within the physical activity domain. The findings in the present study generally concur with the literature on parent-child agreement. Correlations were generally modest and well within the range found in prior

research. Parent-child agreement was greatest regarding parents' positive tactic use followed by parents' use of sedentary control tactics. Conversely, agreement was quite low between parents and youth regarding parents' use of negative tactics and overall family conflict, but still within the range found in prior research. Mothers and fathers tended to agree more than parents and youth, following the same pattern of findings in previous research examining agreement between two parents (Cashmore & Goodnow, 1985).

It is not possible to determine the degree to which mothers, fathers, or their child provide a "right" or "wrong" perception of the family environment. The divergence in the measures per se should not be a basis for questioning the validity of the measures. Rather, the low levels of convergence between parent and child reports may suggest that individual members of the family have different perspectives. Recent research has suggested that youth can provide a much more varied perception of parenting than parent reports, and that a multi-informant design permits a more holistic study of socialization (Latendresse, Rose, Viken, Pulkkinen, Kaprio, & Dick, 2009). The findings of the present study underscore this notion; only by examining parent *and* child reports of parental tactic use was it possible to understand the role of negative parental tactics and negative affect within the socialization process.

#### *Age, Gender, and BMI Trends*

Although the present study was cross-sectional, youth physical activity and expectancy-value beliefs varied with age groups. The findings of the present study were consistent with epidemiological data demonstrating an inverse relation

between age and physical activity (Le Masurier et al., 2005; Pate, Long, & Heath, 1994; Sallis, 1993). Youth in the elementary school group were .82 of a standard deviation higher in number of steps taken than youth in the junior high school sample. Given that the schools used in the present study were located in both rural and suburban areas, it is interesting to compare the findings of the current study with the findings of a recent study of youth pedometer counts within suburban and rural areas (Johnson, Brusseau, Graser, Darst, & Kulinna, 2010). The study conducted by Johnson and colleagues (2010) found that youth from rural and suburban areas were similar with regard to average daily pedometer counts. Although age was confounded with metropolitan status in the present study, it is important to note that average daily pedometer counts for the rural elementary school group were similar to those found by Johnson and colleagues (2010).

There have been numerous explanations for the decline in activity as children age such as gender differences (Ridgers, Stratton, & Fairclough, 2006; Sallis, 1993; Telford, Salmon, Timperio, & Crawford, 2005), qualitative changes in play (Bailey, Olson, Pepper, Porszasz, Barstow, & Cooper, 1995; Pellegrini, & Smith, 1998), time use (Larson & Verma, 1999), and maturational status (Thompson, Baxter-Jones, Mirwald, & Bailey, 2003). Underlying many of the explanations of age trends in physical activity is the notion that the social responsibilities and activities of children entering adolescence have increased in importance over historical time. Research has also pointed to concurrent declines in youth beliefs and motivation concerning physical activity and sports participation (Wigfield, Eccles, Yoon, Harold, Arberton, & Blumenfeld, 1997).

In the present study, elementary school youth tended to report higher ratings on measures of perceptions of ability and subjective-value beliefs than youth from the junior high school sample. The results are generally consistent with the findings of Wigfield and colleagues (1997), who demonstrated across several domains including math, reading, music, and sports that expectancy-value beliefs decline throughout the elementary school years. The declines may be due to the tendency of younger children to overestimate their competence in a given activity, and to increase the accuracy of their estimates of competence with age (Dweck, 2002). Wigfield and colleagues (1997) also suggested that youth may receive less consistent feedback regarding value beliefs, resulting in less stability over time. Prior longitudinal research suggests that changes in physical activity may, in part, be due to youth beliefs about physical activity (Sallis, Alcaraz, McKenzie, & Hovell, 1999).

Age differences were also observed on measures of parental influence tactics and youth perceptions of the family environment. Despite reporting less autonomy on average, junior high school youth tended to report lower frequency of all three types of parental influence tactics than the elementary school children. Lower autonomy was related to an increase in both conflict and control, with older youth reporting greater conflict and control than younger children. At first, these results may seem counter-intuitive; however the perceived legitimacy of parental control becomes more salient as children age (Darling, Cumsille, & Penã-Alampay, 2005). Autonomy and personal control are key elements of development, and moderate amounts of conflict associated with increased



attempts to gain autonomy may be a sign of healthy development (Smetana, Crean, Campione-Barr, 2005). Therefore the results are consistent with the notion that, despite the lower frequency of influence attempts, older youth may perceive such attempts as an impediment to achieving autonomy. The present study also measured the use of influence tactics, the quality of the home environment, and youth physical activity from the parent perspective, which provided data for a multi-informant examination.

Physical activity and expectancy-value beliefs have also been shown to vary with gender (Eccles, Wigfield, Harold, & Blumenfeld, 1993; Johnson, et al., 2010; Wigfield, et al., 1997). Similar to prior research, the present study found that males were more active than females, with a standardized mean difference of 0.32. However, males and females did not differ with respect to measures of expectancy-value beliefs. It is unlikely gender differences varied by age as such interactions have not been found in both longitudinal and cross-sectional studies (Eccles, Wigfield, Harold, & Blumenfeld, 1993; Wigfield, et al., 1997). Moreover, researchers investigating expectancy-value beliefs suggest that gender differences tend to be constant over time, and are largely due to the strong gender-role socialization occurring early in childhood (Wigfield, et al., 1997).

The lack of a gender difference in perceptions of ability and subjective-task value may be due to how expectancy-value beliefs were measured. Recall that expectancy-value beliefs are conventionally measured in terms of self-evaluation (i.e., how good are you at physical activity?), and two forms of comparative evaluation; self vs. other, and target activity vs. “other activities”. Contrary to the

bulk of the studies on this topic, the present study only utilized a single form of comparative evaluation; youth were asked to compare physical activity to common sedentary activities. Research on self-perception has suggested that males tend to be more positively-biased when making either performance evaluations or self-other evaluations (Butler, 1998). Removing the self, and self-other evaluative component from the current measures of expectancy-value beliefs may have reduced the positive biases males tend to exhibit.

Although primarily a control variable, several interesting results involving youth BMI were found. Youth with high BMI scores tended to have parents who strongly desired to change their physical activity. Parents also tended to use more positive and negative tactics as youth BMI increased. Surprisingly, BMI was not related to youth expectancy-value beliefs or physical activity after controlling for other factors. As mentioned previously, parents may be responding to the perceived health status of their child. Recent evidence has suggested that encouragement to be active in order to lose weight may be counterproductive for youth. A study by Davison and Deane, (2010) found that encouragement in order to lose weight resulted in greater weight concerns and no change in moderate-to-vigorous activity in a longitudinal sample of early adolescent females. Although not captured in the present study, overweight or obese youth may experience parental influence tactics in the context of parental messages concerning weight control, thereby moderating the effectiveness of the influence tactics.

#### *Strengths & Limitations*

*Strengths.* Methodologically, the strength of the present study lies in multiple sources of data collection regarding youth physical activity. The use of an objective measure of youth physical activity (i.e., pedometers) is especially notable, given the prevalence and cost-effectiveness of self-report measures within the field. Moreover, both parent and child reports of parental tactic use were collected permitting an examination of the extent to which a parent and their child agree. Aside from methodological strengths, the present study has two key conceptual strengths. The examination of additional mediating processes, such as affective reactions, allows for greater understanding of how organisms respond to their environment and respond (MacKinnon, 2008). By contrast, the investigation of moderating variables enables researchers to examine how universal the effects within a given model may be under different contexts or conditions. Combined, the examination of additional mediating and moderating variables in the present study resulted in a conceptually broader parental socialization model of youth physical activity. Nevertheless, there were several limitations that should be considered when interpreting the findings.

*Limitations.* The present study has several limitations that would suggest caution when interpreting or generalizing the results. First, the present study relied on a cross-sectional design, collecting data from two different school-age groups. Although path analytic models appear to imply causality, cross-sectional designs limit the ability to make inferences regarding causality (Trochim & Donnelly, 2007). That is, it is important to note that some of these effects may be bi-directional. For example, the negative relation between parental desire to

change child physical activity and their use of positive tactics may reflect a dynamic in which parents desiring to increase their child's physical activity start out using positive tactics but, subsequently, reduce their use of positive strategies when they are ineffective. Second, the power to detect small effects was not large in the present study. In the path models, the smallest effect that attained statistical significance was .18. For example, the power to detect the small effect size of -.10 between parent-reported negative tactic use and youth expectancy-value beliefs (see Figure 5) in the current sample was less than .50 at an alpha level of .05 (Satorra, 1989). How much would the sample size need to be increased to achieve a .80 level of power? Based on a method described by Loehlin (2004), the present sample would need to increase to an N of 1,109, or approximately five-times the current sample size. Moreover, the sample sizes in the current study yielded even lower power to detect the effects of moderator variables. The third limitation in the present study concerns the low internal consistency observed for some of the scales. The limitation specifically applies to some of the Expectancy-Value scales, and Family Environment Scales. Low reliability introduces a greater amount of measurement error and therefore, effects are attenuated. Low reliability, combined with the sample size issues previously mentioned, may have inflated the Type II error rate. Fourth, it should be noted that expectancy-value beliefs are typically not aggregated into a single composite measure. The composite may have obscured different relations between the two primary dimensions (perceptions of ability and subjective task value) and parental influence tactics. Fifth, judging by the difference in the magnitude of the coefficients observed with parent and child

reports for pathways linking parental positive tactic use and positive affect and expectancy-value beliefs, it may be the case that the child-reported measures yielded over-estimates of the size of the relations due to method variance. However, it may still be valid to conclude that youth reports of parenting behavior are more predictive than parent reports of expectancy-value beliefs and affective reactions because youth perceptions are more relevant for their own choice to engage in physical activity. Sixth, there may be drawbacks in the present study to the use of comparative measures of expectancy-value beliefs. The sedentary activities available to youth may vary by demographic status or cultural background. Finally, the present study was based on a limited number of schools in the southwestern United States. The results may not generalize to families in more urban areas, or to areas with different ethnicities and socio-economic levels.

#### *Future Research*

In testing the model depicted in Figure 5, I explained 12 percent of the variance in child expectancy-value beliefs and 24 percent of the variance in child physical activity. The expanded model in Figure 10 provides a point of departure for future research on the socialization of youth physical activity. In the present study, affect was examined as a co-mediator of the relation between parental tactic use and youth physical activity. However, the Affect Infusion Model suggests that affect may have direct effects on both expectancy-value beliefs and youth physical activity. That is, affect may mediate the relation between parental tactic use and expectancy-value beliefs. There were two results that support this suggestion: 1) the lack of a relation between positive affect and youth physical

activity controlling for expectancy-value beliefs, and 2) the statistically significant total effect of positive affect on youth physical activity. In testing the mediational role of affect, it would be useful to measure perceptions of ability and subjective task value as separate constructs.

Future research could investigate the role of motivational climate in children's physical activity. Researchers investigating motivational climate have identified structural properties of the environment that may lead to positive motivational outcomes. For example, goal orientations represent the meaning or purpose of competence for an individual (Elliot, 2005) and are hypothesized to influence competence and expectancy for success in the Expectancy Value model (Eccles-Parsons et al., 1983). Task orientations have consistently shown a positive relation with perceptions of ability, parental task orientations, and positive affect with regard to sport (Biddle, Wang, Kavussanu, & Spray, 2003; Duda, 2005). Motivational climate consists of various structures within an individual's environment that support particular goal orientations. For example, the manner in which teachers evaluate students would represent a structure that may affect students' goal orientations (Ames, 1992). The majority of this work has been conducted within academic classroom settings; however, the construct has also been applied in other domains.

Duda (2005) has examined various structures implemented by coaches and demonstrated that perceived task and ego climates tend to correlate modestly with athletes' own task and ego orientation. The motivational climate parents create has also been investigated in the physical activity domain, and results suggest that

parents may create motivational climates fostering different goal orientations for boys and girls (White, Duda, & Hart, 1992). Skjesol and Halvari (2005) investigated whether the concept of motivational climate predicts older adolescents' actual physical activity. Results suggested that the perception of a mastery climate directly predicts involvement in physical activity. Both mastery and performance also had indirect effects through goal orientations on perceived competence and involvement in physical activity. Motivational climate is characterized as situational, and no study has investigated the extent to which the perceived motivational climate moderates the relation between parental behaviors and children's physical activity beliefs and behaviors. For example, parental encouragement may exert differential effects on competence depending on the motivational climate in which it occurs. Similarly, poor motivational climates may be characterized by stronger negative relationships between negative tactics use and youth physical activity beliefs and behavior.

Researchers might also consider focusing on youth health status as a predictor or moderator variable. It may be reasonable to examine the present model with youth BMI as a moderating factor. A recent study found that BMI moderated the effects between parental support and physical activity (Kitzman-Ulrich, Wilson, Lee Van Horn, & Lawman, 2010). Parental support was predictive of physical activity for normal-weight males, but was not predictive of physical activity in a sub-sample of over-weight males. In the present study youth BMI was related to several variables including negative parental influence tactics, parents desire to change their child's physical activity, and pedometers counts.

There may be a stronger relationship between negative tactics and physical activity beliefs, affect, and behaviors in overweight youth. Future research might consider investigating parental influence on youth physical activity using a broader range of parental behaviors, some of which may be more relevant for overweight youth.

Future research should also address psychometric and design issues. First, it may be of interest to include sedentary behavior as a co-outcome. Sedentary behavior is difficult to determine with pedometer counts. A pedometer conveys no information, for example, on the number of hours youth watch TV or play video games. The inclusion of sedentary behavior may provide an opportunity to examine a more complete picture of youth physical activity. There may be cross-domain effects that provide further insight into the process of developing a relatively active or sedentary behavioral pattern and shed further light on the role of affect and sedentary control tactics. Second, the scales used to measure parental tactics and affective reactions were based on a three-month retrospective recall. Retrospective recall methods have several shortcomings, including memory bias. This shortcoming could be addressed by using a daily diary methodology. Daily diary methods are a form of repeated measures assessment. Typically, participants are asked to complete various measurement scales at prearranged intervals. For example, youth might complete a daily diary “entry” at the end of each day. Such techniques may provide greater fidelity with regard to the frequency and type of parental influence tactics youth experience. Moreover, youth may be directed to



indicate their affective reaction to an influence attempt, and how they responded (i.e., did they comply?).

Third, future research could employ another repeated measures approach-- the classic prospective longitudinal design. There are several types of questions that might be investigated with a longitudinal design. One question pertains to cross-lagged effects emerging over time. For example, an inverse relationship between youth physical activity and negative tactics may occur at later waves of data collection. A second type of question pertains to bi-direction effects. For example, child physical activity level may influence parent's desire to change child physical activity and, parental desire to change child physical activity may affect child physical activity level. A third type of question involves predictors of trajectories in children's physical activity level. For example, does negative affect predict the course of physical activity over time?

### *Practical Implications*

The present research reaffirms the majority of recommendations for parents, that is, greater use of positive tactics, such as encouragement, is related to increases in youth physical activity. Researchers interested in designing interventions might consider targeting overall family cohesiveness or support. Cohesiveness might be increased by engaging the entire family unit in extracurricular activities. Active parents tend to use positive tactics more so than inactive parents. Targeting mutual family support, and creating an active family environment might be critical given that parents who desire to change their child's physical activity are the less likely to use positive tactics. It is counter-intuitive to

find that parents can be effective by using punitive actions, discouragement, or pressure to influence child physical activity. Negative tactics that emphasize appropriate stop-rules for sedentary behaviors may be effective. However, further research should be conducted before recommending that parents engage in negative tactics to motivate youth to be active because the duration of effects may vary for different types of tactics.

### *Conclusion*

The goal of the present study was to expand on an existing model of children's achievement motivation for engaging in physical activity. Evidence was found to support an expanded Parental Socialization sub-model (Eccles, 1993) that includes an explicit focus on youth affective reactions to parental influence attempts. The results suggest that additional explanatory power is gained by including a broader range of parental influence tactics and youth affective reactions in models of achievement motivation. In addition, recent models on the interaction between affect, cognition, and behavior (i.e., AIM) may provide a framework for continued investigation of the role of affect in achievement motivation models, and more broadly parental socialization of youth physical activity. The findings of the present study reinforce several of the prior recommendations aimed at parents with sedentary children. In the future, it may be important to acknowledge that although parents may desire to change their child's behavior, some may not be using effective influence tactics. Consequently, interventions that focus on effective tactics might be developed for this group of parents. Although there were several limitations, the strengths of the present study

included the collection of parent and child self-report measures, and the use of an objective physical activity measure. By expanding Eccles Parent Socialization sub-model, the present study has identified several factors to consider in future research on parental socialization of child physical activity beliefs and behaviors including youth affective reactions to parental influence attempts, parents' negative tactics use, parents' desire to change their child's physical activity, and family cohesion.

## NOTES

<sup>1</sup> An alternate model was estimated in which youth expectancy-value beliefs were separated into two linear composites: one indexing *competency* and another indexing *subjective task value*. The final model was identical to the model depicted in Figure 5, and fit the data well,  $D_f(42, 54.91) = 1.22, p = 0.25$ , RMSEA = .053, AIC = -21.96, CFI = .95. The model differed in two ways: (1) Only the pathway between positive tactics and subjective task value was statistically significant,  $\beta = .29, p < .001$ , and (2) neither *competency* nor *subjective task value* were statistically related to youth physical activity ( $\beta = .13, p = .19$ , and  $\beta = .14, p = .15$ , respectively). Therefore the decision was made to present a model in which youth expectancy-value beliefs was statistically related to the youth physical activity.

## REFERENCES

- Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84*, 261-271.
- Atlantis, E., Barnes, E. H., & Singh, M. A. (2006). Efficacy of exercise for treating overweight in children and adolescents: A systematic review. *International Journal of Obesity, 30*, 1027-1040.
- Bailey, R. C., Olson, J., Pepper, S. L., Porszasz, J., Barstow, T. J., & Cooper, D. M. (1995). The level and tempo of children's physical activities: An observational study. *Medicine and Science in Sports and Exercise, 27*, 1033-1041.
- Barfield, J. P., Rowe, D. A., & Michael, T. J. (2004). Interinstrument consistency of the Yamax Digi-Walker pedometer in elementary school-aged children. *Measurement in Physical Education & Exercise Science, 8*, 109-116.
- Barnes, P. M. (2007). Physical activity among adults: United States, 2000 and 2005. *U.S. Department of Health and Human Services, Centers for Disease Control, National Center of Health Statistics*.
- Barnett, N. P., Smoll, F. L., & Smith, R. E. (1992). Effects of enhancing coach-athlete relationships on youth sport attrition. *The Sport Psychologist, 6*, 111-127.
- Bar-Or, O., & Rowland, T. W. (2004). *Pediatric exercise medicine*. Champaign, IL: Human Kinetics Publishers.
- Barradas, D. T., Fulton, J. E., Blanck, H. M., & Huhman, M. (2007). Parental influences on youth television viewing. *The Journal of Pediatrics, 151*, 369-373.
- Bartko, W. T., & Eccles, J. S. (2003). Adolescent participation in structured and unstructured activities: A person-oriented analysis. *Journal of Youth and Adolescence, 32*, 233-241.
- Baumrind, D. (1991). Parenting styles and adolescent development. In J. Brooks-Gunn, R. Lerner, & A. C. Petersen (Eds.), *The encyclopedia of adolescence*. New York: Garland.

- Belsky, J. (2005). Differential susceptibility to rearing influences: An evolutionary hypothesis and some evidence. In B. Ellis & D. Bjorklund (Eds.), *Origins of the social mind: Evolutionary Psychology and Child Development*. New York: Guilford.
- Biddle, S., & Armstrong, N. (1992). Children's physical activity: An exploratory study of psychological correlates. *Social Science in Medicine*, *34*, 325-331.
- Biddle, S., Wang, J., Kavussanu, M., & Spray, C. (2003). Correlates of achievement goal orientations in physical activity: A systematic review of research. *European Journal of Sport Science*, *3*, 1-19.
- Bower, G. H. (1981). Mood and memory. *American Psychologist*, *36*, 129-148.
- Brustad, R. J. (1988). Affective outcomes in competitive sport: The influence of intrapersonal and socialization factors. *Journal of Sport and Exercise Psychology*, *10*, 307-321.
- Brustad, R. J. (1993). Who will go out and play? Parental and psychological influences on children's attraction to physical activity. *Pediatric Exercise Science*, *5*, 210-223.
- Brustad, R. J. (1996). Attraction to physical activity in urban schoolchildren: Parental socialization and gender influences. *Research Quarterly for Exercise and Sport*, *67*, 316-323.
- Bugental, D. B., & Grusec, J. E. (2006). Socialization theory. In N. Eisenberg (Ed.), *Handbook of Child Psychology: Social, emotional, and personality development*. NY: Wiley
- Butler, R. (1998). Age trends in the use of social and temporal comparison for self-evaluation: Examination of a novel developmental hypothesis. *Child Development*, *69*, 1054-1073.
- Calfas, K. J., & Taylor, W. C. (1994). Effects of physical activity on psychological variables in adolescents. *Pediatric Exercise Science*, *6*, 406-423.
- Cashmore, J. A., & Goodnow, J. T., (1985). Agreement between generations: A two-process approach. *Child Development*, *56*, 493-501.

- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Report, 100*, 126-131.
- Chassin, L., Presson, C. C., Rose, J., Sherman, S. J., Davis, M. J., Gonzalez, J. L. (2005). Parenting style and smoking-specific parenting practices as predictors of adolescent smoking onset. *Journal of Pediatric Psychology, 30*, 333-344.
- Cherney, I. D., & London, K. (2006). Gender-linked differences in the toys, television shows, computer games, and outdoor activities of 5- to 13-year old children. *Sex Roles, 54*, 717-726.
- Collins, W. A., & Steinberg, L. (1998). Adolescent development in interpersonal context. In D. William & N. Eisenberg (Eds.), *Handbook of child psychology: Social, emotional, and personality development*. Hoboken, NJ: John Wiley & Sons, Inc.
- Cox, A., & Whaley, D. (2004). The influence of task value, expectancies for success, and identity on athletes' achievement behaviors. *Journal of Applied Sport Psychology, 16*, 103-117.
- Crews, D. J., Lochbaum, M. R., & Landers, D. M. (2004). Aerobic physical activity effects on psychological well-being in low-income Hispanic children. *Perceptual and Motor Skills, 98*, 319-324.
- Curtis, B., Smith, R. E., & Smoll, F. L. (1979). Scrutinizing the skipper: A study of leadership behaviors in the dugout. *Journal of Applied Psychology, 64*, 391-400.
- Darling, N., Cumsille, P., & Penã-Alampay, L. (2005). Rules, legitimacy of parental authority, and obligation to obey in Chile, the Philippines, and the United States. *New Directions for Child and Adolescent Development, 108*, 47-60.
- Darling, N., & Steinberg, L. (1993). Parenting style as context: An integrative model. *Psychological Bulletin, 113*, 487-496.
- Davison, K. K., Cutting, T. M., & Birch, L. L. (2003). Parents' activity-related parenting practices predict girls' physical activity. *Medicine and Science in Sports and Exercise, 35*, 1589-1595.

- Davison, K. K., & Deane, G. D. (2010). The consequence of encouraging girls to be active for weight loss. *Social Science & Medicine*, *70*, 518-525.
- Deci, E. L. (1975). *Intrinsic motivation*. New York: Plenum Press.
- Deeter, T. E. (1989). Development of a model of achievement behavior for physical activity. *Journal of Sport & Exercise Psychology*, *11*, 13-15.
- Dempsey, J. M., Kimiecik, J. C., & Horn T. S. (1993). Parental influence on children's moderate-to-vigorous physical activity participation: An expectancy-value approach. *Pediatric Exercise Science*, *5*, 151-167.
- Duda, J. L. (2005) Motivation in sport. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation*. New York: Guilford Press.
- Duke, J., Huhman, M., & Heitzler, C. (2003). Physical activity levels among children aged 9-13 years: U.S. 2002. *Mortality and Morbidity Weekly Report*, *52*, 785-788.
- Duncan, S. C., Duncan, T. E., Strycker, L. A., & Chaumeton, N. R. (2007). A cohort-sequential latent growth model of physical activity from ages 12 to 17 years. *Annals of Behavioral Medicine*, *33*, 80-89.
- Dweck, C. S. (2002). The development of ability conceptions. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation*. San Diego, CA: Academic Press.
- Eaton, D. K., Kann, L., Kinchen, S., Ross, J., Hawkins, J., Harris, W. A., Lowry, R., McManus, T., Chyen, D., Shanklin, S., Lim, C., Grunbaum, J. A., & Wechler, H. (2006). Youth risk behavior surveillance --- United States, 2005. *Morbidity and Mortality Weekly Report*, *55*, 1-108.
- Eccles, J. S. (1993). School and family effects on the ontogeny of children's interests, self-perceptions, and activity choices. In J. Jacobs (Ed.), *Nebraska Symposium on Motivation, 1992, Developmental Perspectives on Motivation*. Nebraska: University of Nebraska Press.
- Eccles, J. S. (2005). Subjective task values. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation*. New York: Guilford Press.



- Eccles-Parsons, J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectations, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivation*. San Francisco: W. H. Freeman.
- Eccles-Parsons, J. S., Adler, T. F., & Kaczala, C. M. (1982). Socialization of achievement attitudes and beliefs: Parental influence. *Child Development*, *53*, 310-321.
- Eccles, J. S., & Harold, R. D. (1991). Gender differences in sport involvement: Applying the Eccles et al. Expectancy-Value model. *Journal of Applied Sport Psychology*, *3*, 7-35.
- Eccles, J. S., Jacobs, J. E., Harold, R. D., Yoon, K. S., Arbreton, A., & Freedman-Doan, C. (1993). Parents and gender-role socialization during the middle childhood and adolescent years. In S. Oskamp, & M. Costanzo (Eds.), *Gender Issues in Contemporary Society*. Newbury Park: Sage Publications.
- Eccles, J. S., & Midgley, C. (1989). Stage/environment fit: Developmentally appropriate classrooms for early adolescents. In R. E. Ames & C. Ames (Eds.), *Research on motivation in education* (Vol. 3, pp. 139-186). San Diego, CA: Academic Press.
- Eccles, J. S., & Wigfield, A. (1995). In the mind of the actor: The structure of adolescent's achievement task values and expectancy related beliefs. *Personality and Social Psychology Bulletin*, *21*, 215-225.
- Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*, 109-132.
- Eccles, J. S., Wigfield, A., Harold, R., & Blumenfeld, P. (1993). Age and gender differences in children's achievement self-perceptions during the elementary school years. *Child Development*, *64*, 830-847.
- Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and personality development* (5<sup>th</sup> Ed., pp. 1017-1094). New York, NY: Wiley.
- Eisenberg, N., Cumberland, A., Spinrad, T. L., Fabes, R., Shepard, S. A., Reiser, M., Murphy, B. C., Losoya, S. H., & Guthrie, I. K. (2001). The relations of regulation and emotionality to children's externalizing and internalizing problem behavior. *Child Development*, *4*, 1112-1134.

- Elliot, A. J. (2005). A conceptual history of the achievement goal construct. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation*. New York: Guilford Press.
- Enders, C. (2003). Using the EM algorithm to estimate coefficient alpha for scales with item level missing data. *Psychological Methods, 8*, 322-337.
- Enders, C. (2006). A primer on the use of modern missing-data methods in psychosomatic medicine research. *Psychosomatic Medicine, 68*, 427-436.
- Fiedler, K., & Bless, H. (2001). The formation of beliefs in the interface of affective and cognitive processes. In N. Frijda, A. Manstead, & S. Bem (Eds.), *The influence of emotions on beliefs*. New York, NY: Cambridge University Press.
- Flegal, K. M., Carroll, M. D., Ogden, C. L., & Johnson, C. L. (2002). Prevalence and trends in obesity among US adults, 1999-2000. *Journal of the American Medical Association, 288*, 1723-1727.
- Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin, 117*, 39-66.
- Forgas, J. P. (2002). Feeling and doing: affective influences on interpersonal behavior. *Psychological Inquiry, 13*, 1-28.
- Forgas, J. P. (2008). Affect and cognition. *Perspectives on Psychological Science, 3*, 94-101.
- Fredricks, J. A., & Eccles, J. S. (2002). Children's competence and value beliefs from childhood through adolescence: Growth trajectories in two male-sex-typed domains. *Developmental Psychology, 38*, 519-533.
- Fredricks, J. A., & Eccles, J. S. (2004). Parental influences on youth involvement in sports. In M. R. Weiss (Ed.), *Developmental sport and exercise psychology: A lifespan perspective*. Morgantown, WV: Fitness Information Technology.
- Fredricks, J. A., & Eccles, J. S. (2005). Family socialization, gender, and sport motivation and involvement. *Journal of Sport Psychology, 27*, 2-31.
- Frijda, N. H. (1988). The laws of emotions. *American Psychologist, 43*, 349-358.

- Gable, S., & Lutz, S. (2000). Household, parent, and child contributions to childhood obesity. *Family Relations*, 49, 293-300.
- Gentile, D. A., & Walsh, D. A. (2002). A normative study of family media habits. *Journal of Applied Developmental Psychology*, 23, 157-178.
- George, J. M., & Zhou, J. (2002). Understanding when bad moods foster creativity and good ones don't: The role of context and clarity of feelings. *Journal of Applied Psychology*, 87, 687-697.
- Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences*, 10, 141-146.
- Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). The inner resources for school performance: Motivational mediators of children's perceptions of their parents. *Journal of Educational Psychology*, 83, 508-517.
- Grusec, J. E., Goodnow, J. J., & Kuczynski, L. (2000). New directions in analyses of parenting contributions to children's acquisition of values. *Child Development*, 71, 205-211.
- Hallal, P. C., Victoria, C. G., Azevedo, M. R., & Wells, J. C. K. (2006). Adolescent physical activity and health. *Sports Medicine*, 36, 1019-1030.
- Henze, N. & Zirkler, B. (1990). A class of invariant consistent tests for multivariate normality, *Communications in Statistics - Theory and Methods*, 19, 3595-3617.
- Hoffman, M. (1983). Affective and cognitive processes in moral internalization. In E. Higgins, D. Ruble, & W. Hartup (Eds.), *Social cognition and social development* (pp. 236-274). New York: Cambridge University Press.
- Huston, A. C., Donnerstein, E., Fairchild, H., Feshbach, N. D., Katz, P. A., Murray, J. P., et al. (1992). *Big world, small screen: The role of television in American society*. Lincoln, NE: University of Nebraska Press.
- Jacobs, J. E., & Eccles, J. S. (1992). The impact of mothers' gender-role stereotypic beliefs on mothers' and children's ability perceptions. *Journal of Personality and Social Psychology*, 63, 932-944.

- Jacobs, J. E., Vernon, M. K., Eccles, J. S. (2005). Activity choices in middle childhood: The roles of gender, self-beliefs, and parent's influence. In J. L. Mahoney, R. W. Larson, & J. S. Eccles (Eds.), *Organized activities as contexts of development*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Jago, R., Watson, K., Baranowski, T., Zakeri, I., Yoo, S., Baranowski, J., & Conry, K. (2006). Pedometer reliability, validity and daily activity targets among 10- to 15-year-old boys. *Journal of Sports Sciences, 24*(3), 241-251.
- Janz, K. F., Burns, T. L., & Levy, S. M. (2005). Tracking of activity and sedentary behaviors in childhood: The Iowa bone development study. *American Journal of Preventive Medicine, 29*, 171-178.
- Janz, K. F., Burns, T. L., Torner, J. C., Levy, S. M., Paulos, R., Willing, M. C., & Warren, J. J. (2001). Physical activity and bone measures in young children: The Iowa bone development study. *Pediatrics, 107*, 1387-1393.
- Johnson, T. G., Brusseau, T. A., Graser, S. V., Darst, P. W., & Kulinna, P. H. (2010). Step Counts of 10- to 11-Year-Old Children by Ethnicity and Metropolitan Status. *Journal of Physical Activity and Health, 7*, 355-363.
- Kanning, M., & Schlicht, W. (2010). Be active and become happy: An ecological momentary assessment of physical activity and mood. *Journal of Sport & Exercise Psychology, 32*, 253-261.
- Kanters, M. A., Bocarro, J., & Casper, J. (2008). Supported or pressured? An examination of agreement among parent's and children on parent's role in youth sports. *Journal of Sport Behavior, 31*, 64-80.
- Kerner, M. S., & Kurrant, A. (2003). Leisure-time physical activity: Operationally defined as time, work, and intensity. *Measurement in Physical Education and Exercise Science, 7*, 227-241.
- Kimiecil, J. C., & Horn, T. S. (1998). Parental beliefs and children's moderate to vigorous physical activity. *Research Quarterly for Exercise and Sport, 69*, 163-176.
- Kimiecik, J. C., Horn, T. S., & Shurin, C. S., (1996). Relationships among children's beliefs, perceptions of parents' beliefs, and their moderate to vigorous physical activity. *Research Quarterly for Exercise and Sport, 67*, 324-337.

- Kitzman-Ulrich, H., Wilson, D. K., Lee Van Horn, M., & Lawman, H. G. (2010). Relationship of body mass index and psychosocial factors on physical activity in underserved adolescent boys and girls. *Health Psychology, 29*, 506-513.
- Klesges, R. C., Hanson, L. H., & Haddock, C. K. (1990). Effects of obesity, social interactions, and physical environment on physical activity in preschoolers. *Health Psychology, 9*, 435-449.
- Klesges, R. C., Malott, J. M., Boschee, P. F., & Weber, J. M. (1986). The effects of parental influences on children's food intake, physical activity, and relative weight. *International Journal of Eating Disorders, 5*, 335-346.
- Kochanska, G. (1993). Toward a synthesis of parental socialization and child temperament in early development of conscience. *Child Development, 64*, 325-347.
- Kohl, H. W., Fulton, J. E., & Casperson, C. J. (2000). Assessment of physical activity among children and adolescents: A review and synthesis. *Preventive Medicine, 31*, S54-S76.
- Kuczynski, L. (2003). Beyond bidirectionality: Bilateral conceptual frameworks for understanding dynamics in parent-child relations. In L. Kuczynski (Ed.), *Handbook of Dynamics in Parent-Child Relationships*. Thousand Oaks, CA: Sage.
- Kuppens, S., Grietens, H., Onghena, P., & Michiels, D. (2009). Measuring parenting dimensions in middle childhood: Multitrait-multimethod analysis of child, mother, and father ratings. *European Journal of Psychological Assessment, 25*, 133-140.
- Larson, R. W., & Verma, S. (1999). How children and adolescents spend time across the world: Work, play, and developmental opportunity. *Psychological Bulletin, 125*, 701-736.
- Latendresse, S. J., Rose, R. J., Viken, R. J., Pulkkinen, L., Kaprio, J., & Dick, D. M. (2009). Parental socialization and adolescents alcohol use behaviors: Predictive disparities in parents' versus adolescents' perceptions of the parenting environment. *Journal of Clinical Child & Adolescent Psychology, 38*, 232-244.

- Lees, N. B., & Tinsley, B. J. (2000). Maternal socialization of children's preventive health behavior: The role of maternal affect and teaching strategies. *Merrill-Palmer Quarterly: Journal of Developmental Psychology*, *46*, 632-652.
- Le Masurier, G. C., Beighle, A., Corbin, C. B., Darst, P. W., Morgan, C., & Pangrazi, R. P. (2005). Pedometer-determined physical activity levels of youth. *Journal of Physical Activity & Health*, *2*, 159-168.
- Lewis, M. A. & Rook, K. S. (1999). Social control in personal relationships: Impact on health behaviors and psychological distress. *Health Psychology*, *18*, 63-71.
- Li, K. H., Meng, X. L., Raghunathan, T. E., & Rubin, D. B. (1991). Significance levels from repeated p-values with multiply imputed data. *Statistica Sinica*, *1*, 65-92.
- Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*, 1198-1202.
- Loehlin, J. C. (2004). *Latent variable models*. 4th edition. Mahwah, NJ: Lawrence Erlbaum Associates.
- Logic, M., Okun, M. A., & Pugliese, J. A. (2009). Expanding the mediational model of the effects of health-related social control. *Journal of Applied Social Psychology*, *39*, 1373-1396.
- Louie, L., & Chan, L. (2003). The use of pedometry to evaluate the physical activity levels among preschool children in Hong Kong. *Early Child Development and Care*, *173*, 97-107.
- Maccoby, E. E., & Martin, J. A. (1983). Socialization in the context of the family: Parent-child interaction. In E.M. Hetherington (Ed.), *Handbook of child psychology* (4<sup>th</sup> Ed.) Vol. 4, (pp. 1-102). New York: Wiley.
- MacKinnon, D. P. (2008). *Introduction to statistical mediation analysis*. New York, New York: Lawrence Erlbaum & Associates.
- Mardia, K. V. (1980). Measures of multivariate skewness and kurtosis with applications, *Biometrika*, *57*, 519--529.

- Martin, L. L. (2000). Moods don't convey information: moods in context do. In J. P. Forgas (Ed.), *Feeling and thinking: the role of affect in social cognition* (pp. 153–177). New York: Cambridge University Press.
- Martin, L. L., Ward, D. W., Achee, J. W., & Wyer, R. S. (1993). Mood as input: People have to interpret the motivational implications of their moods. *Journal of Personality and Social Psychology, 64*, 317-326.
- McCullagh, P., Matzkanin, K. T., Shaw, S. D., & Maldonado, M. (1993). Motivation for participation in physical activity: A comparison of parent-child perceived competencies and participation motives. *Pediatric Exercise Science, 5*, 224-233.
- McHale, S. M., Crouter, A. C., & Tucker, C. J. (1999). Family context and gender role socialization in middle childhood: Comparing boys and girls and sisters and brothers. *Child Development, 70*, 990-1004.
- McHale, S. M., Kim, J. Y., Whiteman, S., & Crouter, A. C. (2004). Links between sex-typed time use in middle childhood and gender development in early adolescence. *Developmental Psychology, 40*, 868-881.
- McKee, D. P., Boreham, C. A. G., Murphy, M. H., & Neville, A. M. (2005). Validation of the Digiwalker(tm) pedometer for measuring physical activity in young children. *Pediatric Exercise Science, 17*, 345-352.
- McMurray, R. G., Harrell, J. S., Bangdiwala, S. I., & Hu, J. (2003). Tracking of physical activity and aerobic power from childhood through adolescence. *Medicine and Science in Sports and Exercise, 35*, 1914-1922.
- Molnar, D. (2004). The prevalence of the metabolic syndrome and type 2 diabetes mellitus in children and adolescents. *International Journal of Obesity, 28*, S70-S74.
- Moore, L. L., Di Gao, A. S., Bradlee, M. L., Cupples, L. A., Sundarajan-Ramamurti, A., Proctor, M. H., Hood, M. Y., Singer, M. R., & Ellison, R. C. (2003). Does early physical activity predict body fat throughout childhood? *Preventive Medicine, 37*, 10-17.
- Moos, R. H. (1974). *The social climate scales*. Palo Alto, CA: Consulting Psychologists Press.
- Moos, R. H., & Moos, B. (1974). *Family Environment Scale Preliminary Manual*. Palo Alto, CA: Consulting Psychologists Press.

- Moos, R. H., & Moos, B. (1986). *Manual for the Family Environment Scale* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.
- National Association for Sport and Physical Education (2006). *Shape of the Nation Report, 2006*. Oxon Hill, MD: AAHPERD.
- Ogden, C. L., Carroll, M. D., Curtin, L. R., McDowell, M. A., Tabak, C. J., & Flegal, K. M. (2004). Prevalence of overweight and obesity in the United States, 1999–2004. *Journal of the American Medical Association, 295*, 1549–1555.
- Okun, M. A., Huff, B. P., August, K., & Rook, K. (2007). Testing hypotheses distilled from four models of the effects of health-related social control. *Basic and Applied Social Psychology, 29*, 185-193.
- O'Neil, R., & Parke, R. D. (1997). Parent perceptions of neighborhoods as determinants of parenting strategies. Paper presented at the meeting of the Society for Research in Child Development, Washington, DC.
- Parke, R. D., & Buriel, R. (1998). Socialization in the family: Ethnic and ecological perspectives. In D. William & N. Eisenberg (Eds.). *Handbook of child psychology: Social, emotional, and personality development*. Hoboken, NJ: John Wiley & Sons, Inc.
- Parke, R. D., Morris, K., Schofield, T., Leidy, M., Miller, M., & Flyr, M. (2006). Parent-child relationships: Contemporary perspectives. In P. Noller & J. A. Feeney (Eds.), *Close relationships: Functions, forms and processes*. Hove, England: Psychology Press/Taylor & Francis.
- Pate, R. R., Long, B. J., & Heath, G. (1994). Descriptive epidemiology of physical activity in adolescents. *Pediatric Exercise Science, 6*, 434–447.
- Pelegrina, S., Garcia, A., Linares, M., & Casanova, P. (2003). Adolescents and their parents' perceptions about parenting characteristics: Who can better predict the adolescent's academic competence? *Journal of Adolescence, 26*, 651-665.
- Pellegrini, A. D., & Smith, P. K. (1998). Physical activity play: The nature and function of a neglected aspect of play. *Child Development, 69*, 577-598.
- Persson, A., Kerr, M., & Stattin, H. (2007). Staying in or moving away from structured activities: Explanations involving parents and peers. *Developmental Psychology, 43*, 197-207.



- Pino, C. J., Simons, N., & Slawinoski, M. J. (1984). *The children's version of the family environment scale manual*. Aurora, NY: Slosson Educational Publications, Inc.
- Pugliese, J. A., & Tinsley, B. J. (2007). Parental socialization of child and adolescent physical activity: A meta-analysis. *Journal of Family Psychology, 21*, 331-343.
- Ramirez-Marrero, F. A., Smith, B. A., Sherman, W. M., & Kirby, T. E. (2005). Comparison of methods to estimate physical activity and energy expenditure in African American children. *International Journal of Sports Medicine, 26*, 363-371.
- Reilly, J. J., Methaven, E., McDowell, Z. C., Hacking, B., Alexander, D., Stewart, L., & Kelnar, C. J. (2003). Health consequences of obesity. *Archives of Disease, 88*, 748-752.
- Ridgers, N. D., Stratton, G., & Fairclough, S. J. (2006). Physical activity levels of children during school playtime. *Sports Medicine, 36*, 359-371.
- Roberts, D. F., Foehr, U. G., Rideout, V. J., & Brodie, M. (1999). *Kids & media @ the new millennium*. Menlo Park, CA: Kaiser Family Foundation. Retrieved November 19, 2008, from <http://www.kff.org>.
- Robinson, T. N. (1999). Reducing children's television viewing to prevent obesity. *Journal of the American Medical Association, 282*, 1561-1567.
- Roosa, M. W. & Beals, J. (1990). Measurement issues in family assessment: The case of the Family Environment Scale. *Family Process, 29*, 191-198.
- Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys*. New York: Wiley.
- Ryan, R. E., & Blanchard, C. M. (2008). Do sedentary motives adversely affect physical activity? Adding cross-behavioural cognitions to the theory of planned behaviour. *Psychology and Health, 23*, 789-805.
- Sallis, J. F. (1993). Epidemiology of physical activity and fitness in children. *Critical Reviews in Food Science and Nutrition, 33*, 403-408.

- Sallis, J. F., Alcaraz, J. E., McKenzie, T. L., & Hovell, M. F. (1999). Predictors of change in children's physical activity over 20 months. *American Journal of Preventive Medicine, 16*, 222-229.
- Sallis, J. F., McKenzie, T. L., and Alcaraz, J. E. (1993). Habitual physical activity and health-related physical fitness in fourth grade children. *American Journal of Diseases of Children, 147*, 890-896.
- Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise, 32*, 963-975.
- Sallis, J. F., Zakarian, J. M., Hovell, M. F., & Hofstetter, C. R. (1996). Ethnic, socioeconomic, and sex differences in physical activity among adolescents. *Journal of Clinical Epidemiology, 49*, 125-134.
- Satorra, A. (1989). Alternative test criteria in covariance structure analysis: A unified approach. *Psychometrika, 54*, 131-151.
- Scanlan, T. K., Babkes, M. L., & Scanlan, L. A. (2005). Participation in sport: A developmental glimpse at emotion. In J. L. Mahoney, R. W. Larson, & J. S. Eccles (Eds.), *Organized activities as contexts of development*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Scanlan, T. K., & Lewthwaite, R. (1984). Social psychological aspects of competition for male youth sport participants: Determinants of personal performance expectancies. *Journal of Sport Psychology, 7*, 389-399.
- Schafer, J. L. & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods, 7*, 147-177.
- Schneider, P. L., Crouter, S. E., & Bassett Jr., D. R. (2004). Pedometer measures of free-living physical activity: Comparison of 13 models. *Medicine & Science in Sports Exercise, 36*, 331-335.
- Schunk, D. H., & Pajares, F. (2002). The development of academic self-efficacy. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation*. San Diego, CA: Academic Press.
- Schunk, D. H., & Pajares, F. (2005). Competence perceptions and academic perceptions. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation*. New York: Guilford Press.

- Shaibi, G. Q., Cruz, M. L., Ball, G. D., Weigensberg, M. J., Salem, G. J., Crespo, N. C., & Goran, M. I. (2006). Effects of resistance training on insulin sensitivity in overweight Latino adolescent males. *Medicine and Science in Sports and Exercise*, *38*, 1208-1215.
- Sharp, E. H., Caldwell, L. L., Graham, J. W., & Ridenour, T. A. (2006). Individual motivation and parental influence on adolescent's experiences of interest in free time: A longitudinal examination. *Journal of Youth and Adolescence*, *35*, 359-372.
- Skjesol, K., & Halvari, H. (2005). Motivational climate, achievement goals, perceived sport competence, and involvement in physical activity: Structural and mediator models. *Perceptual and Motor Skills*, *100*, 497-523.
- Smetana, J. G., Crean, H. F., & Campione-Barr, N. (2005). Adolescents' and parents changing conceptions of parental authority. *New Directions for Child and Adolescent Development*, *108*, 31-46.
- Smith, R. E., & Smoll, F. L. (1990). Self-esteem and children's reactions to youth sport coaching behaviors: A field study of self-enhancement processes. *Developmental Psychology*, *26*, 987-993.
- Smith, R. E., & Smoll, F. L. (1997). Coaching the coaches: Youth sports as a scientific and applied behavioral setting. *Current Directions in Psychological Science*, *6*, 16-21.
- Spinrad, T. L., Stifter, C. A., Donelan-McCall, N., & Turner, L. (2004). Mothers' regulation strategies in response to toddlers' affect: Links to later emotion self-regulation. *Social Development*, *13*, 40-55.
- Springer, A. E., Hoelscher, D. M., Castrucci, B., Perez, A., & Kelder, S. H. (2009). Prevalence of physical activity and sedentary behaviors by metropolitan status in 4th-, 8th-, and 11th-grade students in Texas. *Preventing Chronic Disease*, *6*, 1545-1151.
- Steinberg, L., Lamborn, S. D., Dornbusch, S. M., & Darling, N. (1992). Impact of parenting practices on adolescent achievement: Authoritative parenting, school involvement, and encouragement to succeed. *Child Development*, *63*, 1266-1281.
- Stranger, J. D., & Gridina, N. (1999). *Media in the home: The fourth annual survey of parents and children*. Philadelphia: Annenberg Public Policy Center, University of Pennsylvania.

- Stucky-Ropp, R. C., & DiLorenzo, T. M. (1993). Determinants of exercise in children. *Preventive Medicine, 22*, 880-889.
- Tabachnick, B. G. & Fidell, L. S. (2001). *Using multivariate statistics*. Boston, MA: Allyn and Bacon.
- Taveras, E. M., Mitchell, K., & Gortmaker, S. L. (2009). Parental confidence in making overweight-related behavior changes. *Pediatrics, 124*, 151-158.
- Tein, J., Roosa, M., & Michaels, M. (1994). Agreement between parent and child reports on parental behaviors. *Journal of Marriage and the Family, 56*, 341-355.
- Telford, A., Salmon, J., Timperio, A., & Crawford, D. (2005). Examining physical activity among 5- to 6- and 10- to 12-year-old children: The children's leisure activities study. *Pediatric Exercise Science, 17*, 266-280.
- Thompson, R. A. (2006). The development of the person: Social understanding, relationships, self, conscience. W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Social, emotional, and personality development* (N. Eisenberg, Vol. Ed.). New York: Wiley.
- Thompson, A. M., Baxter-Jones, A. D. G., Mirwald, R. L., & Bailey, D. A. (2003). Comparison of physical activity in male and female children: Does maturation matter? *Medicine and Science in Sports and Exercise, 35*, 1684-1690.
- Thompson, J. L., Jago, R., Brockman, R., Cartwright, K., Page, A. S., & Fox, K. R. (2010). Physically active families de-bunking the myth? A qualitative study of family participation in physical activity. *Child Care, Health & Development, 36*, 265-274.
- Tinsley, B. J. (2003). *How children learn to be healthy*. Cambridge, UK: Cambridge University Press.
- Trochim, W., & Donnelly, J.P. (2007). *The Research Methods Knowledge Base*. 3rd edition. Mason, OH: Thomson Publishing.
- Trost, S. G., Pate, R. R., Freedson, P. S., Sallis, J. F., and Taylor, W. C. (2000). Using objective physical activity measures with youth: How many days of monitoring are needed? *Medicine and Science in Sports and Exercise, 32*, 426-431.

- Trost, S. G., Sallis, J. F., Russell, R. P., Freedson, P. S., Wendell, T. C., & Dowda, M. (2003). Evaluating a model of parental influence on youth physical activity. *American Journal of Preventive Medicine, 25*, 277-282.
- Tucker, J. S., Orlando, M., Elliott, M. N., & Klein, D. J. (2006). Affective and behavioral responses to health-related social control. *Health Psychology, 25*, 715-722.
- Tudor-Locke, C., McClain, J. J., Abraham, T., Sisson, S. B., Washington, T. L. (2009). Pedometry methods for assessing free-living youth. *Research Quarterly in Exercise and Sports, 80*, 175-184.
- Ullrich-French, S., & Smith, A. L. (2006). Perceptions of relationships with parents and peers in youth sport: Independent and combined prediction of motivation outcomes. *Psychology of Sport and Exercise, 7*, 193-214.
- U.S. Department of Health and Human Services, U.S. Department of Agriculture. (2005). *Dietary Guidelines for Americans, 2005*. Washington, DC: U.S. Government Printing Office.
- Vandewater, E. A., Park, S. E., Huang, X., & Wartella, E. A. (2005). "No--You can't watch that": Parental rules and young children's media use. *American Behavioral Scientist, 48*, 608-623.
- Vierling, K. K., Standage, M., & Treasure, D. C. (2008). Predicting attitudes and physical activity in an "at-risk" minority sample: A test of self-determination theory. *Psychology of Sport and Exercise, 8*, 795-817.
- Walden, T. A., Harris, V. S., & Catron, T. F. (2003). How I feel: A self-report measure of emotional arousal and regulation for children. *Psychological Assessment, 15*, 399-412.
- Watkinson, E. J., Dywer, S. A., & Nielsen, A. B. (2005). Children theorize about reasons for recess engagement: Does expectancy-value theory apply? *Adapted Physical Activity Quarterly, 22*, 179-197.
- Weiss, M. R. (1993). Children's participation in physical activity: Are we having fun yet? *Pediatric Exercise Science, 5*, 205-209.
- Welk, G. J., Wood, K., & Morss, G. (2003). Parental influences on physical activity in children: An exploration of potential mechanisms. *Pediatric Exercise Science, 15*, 19-33.

- White, S. A., Duda, J. L., & Hart, S. (1992). An exploratory examination of the parent-initiated Motivational Climate Questionnaire. *Perceptual and Motor Skills, 7*, 875-880.
- Wigfield, A., & Eccles, J. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*, 265-310.
- Wigfield, A., & Eccles, J. S. (2002). The development of competence beliefs, expectancies for success, and achievement values from childhood through adolescence. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation*. San Diego, CA: Academic Press.
- Wigfield, A., Eccles, J. S., Yoon, K. S., Harold, R. D., Arberton, A. J., & Blumenfeld, P. C. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: A three year longitudinal study. *Journal of Educational Psychology, 89*, 451-469.
- Williams, J. M., Jerome, G. J., Kenow, L. J., Rogers, T., Sartain, T. A., & Darland, G. (2003). Factor structure of the Coaching Behavior Questionnaire and its relationship to athlete variables. *Sport Psychologist, 17*; 16-34.
- Wilson, K. S., Spink, K. S., & Priebe, C. S. (2010). Parental social control in reaction to a hypothetical lapse in their child's activity: The role of parental activity and importance. *Psychology of Sport and Exercise, 11*, 231-237.
- Xiang, P., McBride, R., Guan, J., & Solmon, M. (2003). Children's motivation in elementary physical education: An expectancy-value model of achievement choice. *Research Quarterly for Exercise and Sport, 74*, 25-35.

APPENDIX A  
ACTIVITY LOG

Date \_\_\_\_\_ Teacher \_\_\_\_\_

ID# \_\_\_\_\_ School \_\_\_\_\_

**How did you get to school this morning (circle one):**

Walk Bike Car/Truck Bus Other \_\_\_\_\_

**How did you get home from school yesterday (circle one):**

Walk Bike Car/Truck Bus Other \_\_\_\_\_

How many steps did you take...

	STEPS
Until you arrived at school?	

	STEPS
Until before lunch?	
Until after lunch?	

	STEPS
Until before Physical Education Class?	
Until after Physical Education Class?	

	STEPS
Until you left school for the day?	



APPENDIX B  
YOUTH SURVEY MEASURES

**[Relative Task Competence]**

We want to know what you think about doing physical activities.

**Physical activities are doing things like playing sports, exercising or playing games.**

1. Compared to school work, how good are you at doing physical activities?

<b>not at all good</b>		<b>somewhat good</b>		<b>very good</b>
1	2	3	4	5

2. Compared to playing video games, how good are you at doing physical activities?

<b>not at all good</b>		<b>somewhat good</b>		<b>very good</b>
1	2	3	4	5

3. Compared to using the computer/internet, how good are you at doing physical activities?

<b>not at all good</b>		<b>somewhat good</b>		<b>very good</b>
1	2	3	4	5

4. Do you expect to improve more at doing physical activities or at doing school work?

<b>improve more at school work</b>		<b>about the same</b>		<b>improve more at physical activities</b>
1	2	3	4	5

5. Do you expect to get improve more at doing physical activities or at playing video games?

<b>improve more at video games</b>		<b>about the same</b>		<b>improve more at physical activities</b>
1	2	3	4	5

6. Do you expect to improve more at doing physical activities or at using the computer/internet?

<b>improve more at computer/internet</b>		<b>about the same</b>		<b>improve more at physical activities</b>
1	2	3	4	5

7. Compared to school work, how important is being good at doing physical activities?

<b>not at all important</b>		<b>somewhat important</b>		<b>very important</b>
1	2	3	4	5

8. Compared to playing video games, how important is being good at doing physical activities?

<b>not at all important</b>		<b>somewhat important</b>		<b>very important</b>
1	2	3	4	5

9. Compared to using the computer/internet, how important is being good at doing physical activities?

<b>not at all important</b>		<b>somewhat important</b>		<b>very important</b>
1	2	3	4	5

10. Compared to school work, how much do you like doing physical activities?

<b>a little</b>				<b>a lot</b>
1	2	3	4	5

11. Compared to playing video games, how much do you like doing physical activities?

<b>a little</b>		<b>somewhat</b>		<b>a lot</b>
1	2	3	4	5

12. Compared to using the computer/internet, how much do you like doing physical activities?

<b>a little</b>		<b>somewhat</b>		<b>a lot</b>
1	2	3	4	5

13. Compared to watching TV, how much do you like doing physical activities?

<b>a little</b>		<b>somewhat</b>		<b>a lot</b>
1	2	3	4	5

14. Compared to school work, how interesting is doing physical activities?

<b>very boring</b>				<b>very interesting</b>
1	2	3	4	5

15. Compared to playing video games, how interesting is doing physical activities?

<b>very boring</b>				<b>very interesting</b>
1	2	3	4	5

16. Compared to using the computer/internet, how interesting is doing physical activities?

<b>very boring</b>				<b>very interesting</b>
1	2	3	4	5

17. Compared to watching TV, how interesting is doing activities?

<b>very boring</b>				<b>very interesting</b>
1	2	3	4	5

18. How useful are doing physical activities for

	<b>not at all useful</b>		<b>somewhat useful</b>		<b>very useful</b>
a. spending time with friends?.....	1	2	3	4	5
b. making you feel good about yourself?....	1	2	3	4	5
c. staying healthy/fit?.....	1	2	3	4	5
d. playing games?.....	1	2	3	4	5
e. being liked by others?.....	1	2	3	4	5
f. learning new things?.....	1	2	3	4	5

### [Parental Influence Tactics]

Think about how often your parent or parents have tried to get you to play sports, exercise more frequently, or be more active during the past three months.

**During the past three months, how often have your parents...**

		Never	Rarely	Often
21.	Drove you to a place where you can do physical activities or play sports?	1	2 3	4 5
22.	Pressured you to play sports, exercise or do physical activities?	1	2 3	4 5
23.	Made you feel bad about <b>not</b> playing sports, exercising or do physical activities?	1	2 3	4 5
24.	Punished you for <b>not</b> doing physical activities?	1	2 3	4 5
25.	Exercised or played sports with you?	1	2 3	4 5
26.	Bought you sports or exercise equipment?	1	2 3	4 5
27.	Have gotten upset or angry when you do <b>not</b> do physical activities?	1	2 3	4 5
28.	Repeatedly reminded you to <b>not</b> to watch TV or play video games?	1	2 3	4 5
29.	Told you that exercising, playing sports, or being active would show you cared for them?	1	2 3	4 5
30.	Encouraged you to play sports, exercise or be more active?	1	2 3	4 5
31.	Scared you with the consequences of <b>not</b> doing physical activities?	1	2 3	4 5
32.	Discouraged you from watching TV or playing video games?	1	2 3	4 5
33.	Restricted your time watching TV or playing video games?	1	2 3	4 5
34.	Made you go outside and do physical activities?	1	2 3	4 5
35.	Punished you for watching TV or playing video games?	1	2 3	4 5

**[Affect aroused by parental influence attempts (Modified HIF) ]**

Please rate the sentences below for how true each was of you in the past three months **when your parent tries to get you to play sports, exercise, or be active.**

	not at all true of me		somewhat true of me		very true of me
36. I was happy very often	1	2	3	4	5
37. I was excited sometimes	1	2	3	4	5
38. I was sad very often	1	2	3	4	5
39. I was scared sometimes	1	2	3	4	5
40. I was mad very often	1	2	3	4	5
41. I was happy sometimes	1	2	3	4	5
42. I was excited very often	1	2	3	4	5
43. I was sad sometimes	1	2	3	4	5
44. I was scared very often	1	2	3	4	5
45. I was mad sometimes	1	2	3	4	5

## [Relationship Quality]

### Things About My Parents

We are interested to know more about your parent(s).

Each number is followed by four statements that describe four different types of parents. Read the four statements about the four types of parents, and **decide which one is the best description of your own parent or parents**. Different people's parents are different, and we want to know about yours.

Now please think about your parent or parents and compare her to these descriptions of people's parents. If you do not ever spend time with your parents but another relative lives in your household instead, please respond about that relative. So, begin with number 59, and read the four descriptions. If your parents is most like the parents in the first statement, then circle the letter **a** in front of that statement. If they are most like the parents in the second statement, then circle the letter **b** in front of that statement. If they are most like the parents in the third statement, then circle the letter **c** in front of that statement. If they are most like the parents in the fourth statement, then circle the letter **d** in front of that statement.

59.   a.    My parents **always explain** to me about the way I should behave.
- b.    My parents **sometimes explain** to me about the way I should behave.
- c.    My parents **sometimes make** me behave because they're the boss.
- d.    My parents **always make** me behave because they're the boss.
60.   a.    My parents **always get very upset** if I don't do what I'm supposed to right away.
- b.    My parents **sometimes get very upset** if I don't do what I'm supposed to right away.
- c.    My parents **sometimes try to understand** why I don't do what I'm supposed to right away.
- d.    My parents **always try to understand** why I don't do what I'm supposed to right away.



61. a. My parents **never punish** me; they **always talk** to me about what was wrong.
- b. My parents **hardly ever punish** me; they **usually talk** to me about what was wrong.
- c. My parents **usually punish** me when I have done something wrong **without talking to me very much.**
- d. My parents **always punish** me when I have done something wrong **without talking to me at all.**
62. a. My parents **always tell** me what to do.
- b. My parents **sometimes tell** me what to do.
- c. My parents **sometimes** like me to **decide for myself what to do.**
- d. My parents **always** like me to **decide for myself what to do.**
63. a. My parents **always think it's OK** if I make mistakes.
- b. My parents **sometimes think it's OK** if I make mistakes.
- c. My parents **always get angry** if I make mistakes.
- d. My parents **sometimes get angry** if I make mistakes.
64. a. My parents **always get upset** when I don't do well in school.
- b. My parents **sometimes get upset** when I don't do well in school.
- c. My parents **hardly ever get upset** when I don't do well in school.
- d. My parents **never get upset** when I don't do well in school.

## Things About My Family

Each number is followed by three statements that describe 3 families. Read the three statements about the three families, and **decide which one is the best description of your family**. Different people's families are different, and we want to know about yours.

If the description is most like the family in the first statement, then circle the letter **a** in front of that statement. If they are most like the description in the second statement, then circle the letter **b** in front of that statement. If they are most like the family in the third statement, then circle the letter **c** in front of that statement.

65.   a.   Everybody's happy all of the time and we are always together and we share our feelings about one another.
- b.   Everybody's happy some of the time but not very together. We don't share our feelings about each other.
- c.   Everybody's sad, and we are not very together. We don't share our feelings about one another.
66.   a.   In my family if we get angry at one another we don't really argue about a problem. Instead, we ignore each other.
- b.   In my family if we get angry at one another we yell at each other a lot.
- c.   In my family if we get angry at one another we discuss the problem quietly.
67.   a.   If the kids in my family cause problems, my parents usually yell and then send us to our rooms.
- b.   If the kids in my family cause problems, my parents are angry but don't yell or spank us.
- c.   If the kids in my family cause problems, my parents usually yell and punish us right away by spanking us.

68. a. If we are having an argument in my family we usually have a big fight and try to beat up each other.
- b. If we are having an argument in my family my parents usually stop and fight by sending us away to our rooms.
- c. If we are having an argument in my family our parents usually help us solve the problem by having us talk and make up.
69. a. Both of my parents decide on what rules we follow in our family.
- b. My father or my mother decide on what rules we follow in our family.
- c. My family all decides together on what rules we follow in our family.
70. a. If we break the rules in our family, we usually talk about what was wrong and how we acted.
- b. If we break the rules in our family, we get yelled at and warned not to break the rules again, or else we'll be punished.
- c. If we break the rules in our family, we get yelled at and punished right away.
71. a. In my family, we have to finish our jobs before we can start to have fun.
- b. In my family, sometimes we don't finish all our jobs before we can start to have fun.
- c. In my family, we usually don't have to do any of our jobs before we can start to have fun.

APPENDIX C  
PARENT SURVEY MEASURES



11. Highest grade **father** completed in school: \_\_\_\_\_

12. Occupation of **mother** \_\_\_\_\_

- Full time       Part time

13. Occupation of **father** \_\_\_\_\_

- Full time       Part time

14. With which ethnicity or race do you think the **mother** most closely identifies?

- |   |                                       |
|---|---------------------------------------|
| <input type="radio"/> White                             | <input type="radio"/> Middle Eastern  |
| <input type="radio"/> Hispanic / Latino                 | <input type="radio"/> Native American |
| <input type="radio"/> African American                  | <input type="radio"/> Other _____     |
| <input type="radio"/> Asian American / Pacific Islander |                                       |

15. With which ethnicity or race do you think the **father** most closely identifies?

- |   |                                       |
|---|---------------------------------------|
| <input type="radio"/> White                             | <input type="radio"/> Middle Eastern  |
| <input type="radio"/> Hispanic / Latino                 | <input type="radio"/> Native American |
| <input type="radio"/> African American                  | <input type="radio"/> Other _____     |
| <input type="radio"/> Asian American / Pacific Islander |                                       |

16. What are the ages and gender of **other children** that may live in your household?

- |    | Age   | Gender                       |                            |
|----|-------|------------------------------|----------------------------|
| 1. | _____ | <input type="radio"/> Female | <input type="radio"/> Male |
| 2. | _____ | <input type="radio"/> Female | <input type="radio"/> Male |
| 3. | _____ | <input type="radio"/> Female | <input type="radio"/> Male |
| 4. | _____ | <input type="radio"/> Female | <input type="radio"/> Male |
| 5. | _____ | <input type="radio"/> Female | <input type="radio"/> Male |
| 6. | _____ | <input type="radio"/> Female | <input type="radio"/> Male |
| 7. | _____ | <input type="radio"/> Female | <input type="radio"/> Male |
| 8. | _____ | <input type="radio"/> Female | <input type="radio"/> Male |

**Your answers to the following questions should be about the child who brought this survey home.**

**(Please check the circle that applies)**

**[Parents' desire to change their child's physical activity]**

1. How much do you want to change **your child's** level of physical activity?

(Please check the one that applies)

- don't want to change at all
- want to increase moderately
- want to increase very much
- want to decrease moderately
- want to decrease very much

**[Parent Report of Child PA]**

**Your Child's Activity**

During the past 7 days, **how many days** has your child done each of the physical activities listed for **at least 15 minutes at a time**? If your child has done a physical activity that is not listed, please add it at the end of the list.

**Number of Days**

- |                             |       |
|-----------------------------|-------|
| 2. Walking                  | _____ |
| 3. Foursquare               | _____ |
| 4. Gymnastics               | _____ |
| 5. Volleyball               | _____ |
| 6. Horseback Riding         | _____ |
| 7. Dancing                  | _____ |
| 8. Hiking / Climbing        | _____ |
| 9. Tennis / smashball       | _____ |
| 10. Baseball or Softball    | _____ |
| 11. Basketball              | _____ |
| 12. Football                | _____ |
| 13. Frisbee / Kickball      | _____ |
| 14. Jumping Rope            | _____ |
| 15. Running / Jogging       | _____ |
| 16. Soccer                  | _____ |
| 17. Skateboarding / Skating | _____ |
| 18. Swimming Laps           | _____ |
| 19. Bicycling               | _____ |
| 20. Aerobic Dance           | _____ |
| 21. OTHER_____              | _____ |



**[Parent's Report of Children's Sedentary Activity]**

22. How much time does your child usually spend on a typical weekday doing school work?
- none
  - less than 1 hour
  - 1-2 hours.
  - 3-4 hours
  - 5 hours or more
23. How much time does your child usually spend on a typical weekday watching TV?
- none
  - less than 1 hour
  - 1-2 hours.
  - 3-4 hours
  - 5 hours or more
24. How much time does your child usually spend on a typical weekday playing video games?
- none
  - less than 1 hour
  - 1-2 hours.
  - 3-4 hours
  - 5 hours or more
25. How much time does your child usually spend on a typical weekday using the computer/internet?
- none
  - less than 1 hour
  - 1-2 hours.
  - 3-4 hours
  - 5 hours or more

**[Parental Tactics]**

<b>During the past three months, how often have you</b>		<b>Never</b>	<b>Rarely</b>			<b>Often</b>
26.	Drove your child to a place where he/she can do physical activities or play sports?	1	2	3	4	5
27.	Pressured your child to play sports, exercise or do physical activities?	1	2	3	4	5
28.	Made your child feel bad about <b>not</b> playing sports, exercising or do physical activities?	1	2	3	4	5
29.	Punished your child for <b>not</b> doing physical activities?	1	2	3	4	5
30.	Exercised or played sports with your child?	1	2	3	4	5
31.	Bought your child sports or exercise equipment?	1	2	3	4	5
32.	Have gotten upset or angry when your child does <b>not</b> do physical activities?	1	2	3	4	5
33.	Repeatedly reminded your child <b>not</b> to watch TV or play video games?	1	2	3	4	5
34.	Told your child that exercising, playing sports, or being active would show you cared for them?	1	2	3	4	5
35.	Encouraged your child to play sports, exercise, or be more active?	1	2	3	4	5
36.	Scared your child with the consequences of <b>not</b> doing physical activities?	1	2	3	4	5
37.	Discouraged your child from watching TV, or playing video games?	1	2	3	4	5
38.	Restricted your child's time watching TV or playing video games?	1	2	3	4	5
39.	Made your child go outside and do physical activities?	1	2	3	4	5
40.	Punished your child for watching TV or playing video games?	1	2	3	4	5



[Family Environment Scale]

Family Life

There are 78 statements on the next pages. They are statements about families. You are to decide which of these statements are true of your family and which are false. **If you think the statement is true or mostly true of your family, circle T. If you think the statement is false or mostly false of your family, circle F.**

You may feel that some of the statements are true for some family members and false for others. **Circle T if the statement is true of most members. Circle F if the statement is false for most members.** If the members are evenly divided, decide what is the overall stronger impression and answer accordingly.

**Remember,** we would like to know what your family seems like to **you**. So **do not** try to figure out how other family members see your family, but **do** give us your general impression of your family for each statement.

- 50. T F Family members really help and support one another.
- 51. T F Family members often keep their feelings to themselves.
- 52. T F We fight a lot in our family.
- 53. T F We don't do things on our own very often in our family.
- 54. T F We feel it is important to be best at whatever you do.
- 55. T F We spend most weekends and evenings at home.
- 56. T F Activities in our family are pretty carefully planned.
- 57. T F Family members are rarely ordered around.
- 58. T F We often seem to be killing time at home.
- 59. T F We say anything we want to around home.
- 60. T F Family members rarely become openly angry.
- 61. T F In our family, we are strongly encouraged to be independent.
- 62. T F Getting ahead in life is very important in our family.
- 63. T F We rarely go to lectures, plays, or concerts.
- 64. T F Friends often come over for dinner and visit.
- 65. T F We are generally very neat and orderly.
- 66. T F There are very few rules to follow in our family.
- 67. T F We put a lot of energy in what we do at home.

68. T F It's hard to "blow off steam" at home without upsetting somebody.
69. T F Family members sometimes get so angry they throw things.
70. T F We think things out for ourselves in our family.
71. T F How much money a person makes is not very important to us.
72. T F Learning about new and different things is very important in our family.
73. T F Nobody in our family is active in sports, Little League, bowling, etc.
74. T F It's often hard to find things when you need them in our household.
75. T F There is one family member who makes most of the decisions.
76. T F There is a feeling of togetherness in our family.
77. T F We tell each other about our personal problems.
78. T F Family members hardly ever lose their tempers.
79. T F We come and go as we want in our family.
80. T F We believe in competition and "may the best man win."
81. T F We are not that interested in cultural activities.
82. T F We often go to the movies, sports events, camping, etc.
83. T F Being on time is very important in our family.
84. T F There are set ways of doing things at home.
85. T F We rarely volunteer when something has to be done at home.
86. T F If we feel like doing something on the spur of the moment we often just pick up and go.
87. T F Family members often criticize each other.
88. T F There is very little privacy in our family.
89. T F We always strive to do things just a little better next time.

90. T F Everyone in our family has a hobby or two.
91. T F Family members have strict ideas about what is right and wrong.
92. T F People change their minds often in our family.
93. T F There is a strong emphasis on following the rules in our family.
94. T F Family members really back each other up.
95. T F Someone usually gets upset if you complain in our family.
96. T F Family members sometimes hit each other.
97. T F Family members almost always rely on themselves when a problem comes up.
98. T F Family members rarely worry about job promotions, school grades, etc.
99. T F Someone in our family plays a musical instrument.
100. T F Family members are not very involved in recreational activities outside of work or school.
101. T F Family members make sure their rooms are neat.
102. T F Everyone has an equal say in family decisions.
103. T F There is very little group spirit in our family.
104. T F If there is a disagreement in our family, we try hard to smooth things over and keep the peace.
105. T F Family members strongly encourage each other to stand up for their rights.
106. T F In our family we don't try that hard to succeed.
107. T F Family members often go to the library.
108. T F Family members sometimes attend courses or take lessons for some hobby or interest (outside of school).
109. T F In our family each person has different ideas about what is right and wrong.
110. T F Each person's duties are clearly defined in our family.

111. T F We can do whatever we want to in our family.
112. T F We really get along well with each other.
113. T F We are usually careful about what we say to each other.
114. T F Family members often try to one-up or out-do each other.
115. T F It's hard to be by yourself without hurting someone's feelings in our household.
116. T F "Work before play" is the rule in our family.
117. T F Watching T.V. is more important than reading in our family.
118. T F Family members go out a lot.
119. T F Rules are pretty inflexible in our household.
120. T F There is plenty of time and attention for everyone in our family.
121. T F There are a lot of spontaneous discussions in our family.
122. T F In our family, we believe you don't ever get anywhere by raising your voice.
123. T F We are not really encouraged to speak up for ourselves in our family.
124. T F Family members are often compared to with others as to how well they are doing at work or school.
125. T F Our main form of entertainment is watching T.V., using the computer, or listening to music.
126. T F Dishes are usually done immediately after eating.
127. T F You can't get away with much in our family.

## APPENDIX D

### COMBINING PARAMETERS IN MULTIPLE IMPUTATION



Rubin (1987) presents the following equations for combining parameters across  $m$  analyses. Parameter estimates were combined by calculating the mean of the estimates,

$$\bar{Q} = \frac{1}{m} \sum_{j=1}^m \hat{Q}_j.$$

where  $Q$  is the parameter estimate, and  $m$  is the number of imputed data sets. The standard error of the estimates were combined by first computing the within imputation variance,

$$\bar{U} = \frac{1}{m} \sum_{j=1}^m U_j.$$

where  $U$  is the standard error of the  $j$ th estimate, and  $m$  is the number of imputed data sets, and the between-imputation variance,

$$B = \frac{1}{m-1} \sum_{j=1}^m (\hat{Q}_j - \bar{Q})^2.$$

Total variance was then calculated using,

$$T = \bar{U} + \left(1 + \frac{1}{m}\right) B.$$

Significance tests were calculated by dividing each of the combined estimates by the square root of the combined total variance, which is distributed  $t$  distribution with degrees of freedom

$$df = (m-1) \left(1 + \frac{m \bar{U}}{(m+1)B}\right)^2.$$

## APPENDIX E

### COMBINING FIT INDICES IN MULTIPLE IMPUTATION

Li, Meng, Ragathanan, and Rubin (1991) present the following equations for combining chi-square statistics (either likelihood ratio or Wald) across  $m$  analyses. The test statistic is calculated using,

$$\hat{D}_d = \frac{\bar{d} / k - \left( \frac{m+1}{m-1} \right) \hat{r}_d}{1 + \hat{r}_d}$$

where the mean chi-square,  $\bar{d}$  -bar, is calculated using,

$$\bar{d} = \sum_{t=1}^m \chi_t^2 / m$$

and  $r_d$ , the sample variance of the square roots of the chi-square statistics over  $m$  data sets is calculated as,

$$\hat{r}_d = \left( 1 + \frac{1}{m} \right) \left[ \frac{1}{m-1} \sum_{t=1}^m \left( \sqrt{\chi_t^2} - \sqrt{\bar{d}} \right)^2 \right]$$

The test statistic has an  $F$  distribution where  $k$  is the numerator degrees of freedom and the denominator degrees of freedom is calculated using,

$$\nu_2 = k^{-3/m} (m-1) (1 + \hat{r}_d^{-1})^2$$