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FAMILY SOCIAL CAPITAL, MOTHER'S PERCEPTION OF CHILD'S PHYSICAL COMPETENCE, AND MOTHER'S ACCULTURATION AS DETERMINANTS OF CHILDREN'S PHYSICAL ACTIVITY LEVEL AND BODY MASS INDEX

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# FAMILY SOCIAL CAPITAL, MOTHER'S PERCEPTION OF CHILD'S PHYSICAL COMPETENCE, AND MOTHER'S ACCULTURATION AS DETERMINANTS OF CHILDREN'S PHYSICAL ACTIVITY LEVEL AND BODY MASS INDEX

By

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ABSTRACT

FAMILY SOCIAL CAPITAL, MOTHER'S PERCEPTION OF CHILD'S PHYSICAL COMPETENCE, AND MOTHER'S ACCULTURATION AS DETERMINANTS OF CHILDREN'S PHYSICAL ACTIVITY LEVEL AND BODY MASS INDEX

By

Olga J. Santiago

There is an epidemic of inactivity and overweight among children and adolescents in the United States. Social capital embedded in the family level (family social capital, FSC) has been consistently identified as an important factor for children's cognitive and social development; however it is unknown if FSC is associated with children's physical activity (PA) and weight status. Five waves of data (i.e., Kindergarten fall and spring, third grade, fifth grade and eighth grade) from the Early Childhood Longitudinal Study Kindergarten Class of 1998-99 (ECLS-K) was used to examine a possible association between FSC at Kindergarten (FSC-K) and child's PA and Body Mass Index (BMI) at eighth grade. The sample population for this study consisted of those children living with their biological mothers, and whom their mothers were the respondents (n=14,832). Exploratory factor analysis, hierarchical linear modeling, and structural equation modeling were used to test the study hypotheses. A latent construct of FSC-K was formulated following James Coleman operationalization of social capital at family level. The results of this study provide evidence for a positive significant association ($p < .05$) of FSC-K and children's PA level at eighth grade; however, there was not a significant association between FSC-K and child's BMI at eighth grade. This study also examined

other determinant factors at baseline of child's PA and BMI at eighth grade. The study findings show that mother's perception of child's PA in comparison with his/her peers at Kindergarten (MP-K) is significant associated with child's PA (direct and indirect effects) and with BMI (indirect effect) at eighth grade. Hispanic children and adolescents have been identified consistently as one of the ethnic groups with higher prevalence of inactivity and overweight. An additional aim of this study was to analyze potential determinant factors (measured at Kindergarten) for Hispanic children's PA and BMI (e.g., FSC-K, MP-K, mother's acculturation level) at several school grades (i.e., Kindergarten, third grade, fifth grade and eighth grade). After stratification, the Hispanic study sample, results suggest that gender, FSC-K, MP-K, mother's acculturation level, parent's country of birth, and previous PA level, are all associated with Hispanic children's PA. However, the associations among these variables vary by grade. Hispanic MP-K is consistently positively and significantly associated ($p < .05$) with child's PA and BMI concurrently and over time (Kindergarten, third grade, fifth grade and eighth grade). Another consistent determinant of child's PA is parents' place of birth; Hispanic children whose both parents were non-US-born were significantly ($p < .05$) less active than those with one or both US-born parents. The results of this study provide evidence that FSC, MP, and mother's acculturation (for Hispanics) are associated with child's PA behavior and BMI, however these associations vary in direction, magnitude, and by child's school grade. These study findings call for further studies to examine FSC and other determinant factor of child's PA and weight status, concurrently and over time; and to study this phenomena in a developmental (e.g., school grade) and socio-cultural context.

DEDICATION

To my family: especially to Carlos (my husband), Carlos Jr. (my son), Carelis (my daughter) and my parents. Thank you for your love and support during this journey.

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# LIST OF ABBREVIATIONS

| Abbreviation | |
|---|---|
| BMI | Body Mass Index |
| CDC | Centers for Disease Control and Prevention |
| CFI | Comparative Fit Index |
| ECLS-K | Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 |
| EFA | Exploratory Factor Analysis |
| FSC | Family social capital |
| FSC-K | Family social capital at Kindergarten |
| HLM | Hierarchical Lineal Model |
| ICC | Intra-class correlation coefficients |
| MA | Mexican American |
| MACC | Hispanic mother's acculturation level |
| MP | Mother's perception of child's physical activity in comparison with child's peers |
| MPK | Mother's perception of child's physical activity in comparison with child's peers at Kindergarten |
| MVPA | Moderate to vigorous physical activity |
| PA | Physical activity |
| RMSEA | Root Mean Square Error of Approximation |
| SE | Standard Error |
| SEM | Structural Equation Modeling |
| SES | Socioeconomic status |
| SPE | Standardized parameter estimates |

| | |
|---|---|
| TLI | Tucker Lewis Index |
| UPE | Unstandardized parameter estimates |
| US | United States |
| VPA | Vigorous physical activity |
| WLSE | Robust weighted least squares estimator |
| WLSMV | " weighted least square parameter estimates using a diagonal weight matrix with standard errors and mean- and variance- adjusted chi-square test statistic that use a full weight matrix" (Muthén & Muthén, 2009, p.484) |

# Chapter 1

## Introduction

Regardless of family socio-economic status (economic capital), social capital embedded in the family, from now on *family social capital* (FSC) at early childhood could be an effective means to prevent a child being obese and inactive during adolescence. The social capital concept (e.g., Coleman, 1987, 1990) takes into account family structure, family relationships, family-child time involvement, family-child social networks; and how these factors (individually or as a group) affect a child's outcomes (e.g., educational, well-being, school dropout) concurrently and over time. Following Coleman's (1987, 1988, 1990) conceptualization of social capital, in this study FSC includes aspects of the child's main socialization agent—the family (i.e., family relationships, family-child direct time involvement, child-family-school involvement), which facilitates the actions (e.g., physical activity behavior and sport participation) of the child (Coleman, 1990).

The main aim of this study was to examine a possible association of FSC (as a latent construct) in early childhood (Kindergarten) with children's physical activity (exercise and sport involvement) and weight status concurrently, and in the adolescence (eighth grade), and possible differences in these associations between Whites and Hispanics. Additionally, it examined if these associations remained after controlling for two potential determining factors of child's physical activity (PA) and weight status: the mother's perception of the child's physical activity level in comparison with his/her peers (MP), and the Hispanic mother's acculturation level (MACC). This study has as a

background previous research findings that support the positive association of social capital in a child's positive cognitive and behavioral outcomes, and child's health and wellbeing (e.g., Berntsson, Köhler & Vuille, 2006; ; Hoffer & Shagle, 2004; Kayitsinga, Martinez & Villarruel, 2009; Meier, 1999; Runyan et al., 1998; Wright, Cullen & Miller, 2001). The Early Childhood Longitudinal Study Kindergarten Class of 1998–99 (ECLS-K) was used to test this study's hypotheses and fulfill this study's aims.

This study contributed to knowledge by filling out some research gaps. First, the literature had shown the association and prediction capability of social capital on child's academic achievement (Hoffer & Shagle, 2004), social behaviors (Parcel & Menaghan, 1993), child's overweight, (Kayitsinga et al., 2009), and other well-being indicators (Runyan et al., 1998); however, no research was found that examined FSC as a potential determinant factor of children's PA level and weight status concurrently, longitudinally, and simultaneously (PA and weight status). Second, the association and prediction capability of some individual indicators of social capital with children's PA (Bagley, Salmon, & Crawford, 2006; DiLorenzo, Stucky-Roop, Vander Wall, & Gothman, 1998; Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007; Lindquist, Reynolds, & Goran, 1999; Sallis et al., 1993; Sallis, Prochaska, Taylor, Hills, & Geraci, 1999) or weight status (Gibson et al., 2007; Hesketh, Crawford, Salmon, Jackson, & Campbell, 2007; Kayitsinga et al., 2009; Zeller et al., 2007) have been shown, but no study was found measuring FSC as a latent construct and examining its association with children's PA and weight status neither longitudinally, nor simultaneously. Third, no longitudinal study was found examining MP, a psycho-social variable that has been found consistently as a strong predictor of child's PA and sport involvement (Bois, Sarrazin, Brustad,

Trouilloud, & Cury, 2002; Fredericks & Eccles, 2002; Fredericks & Eccles, 2005), as a predictor of child's PA and Body Mass Index (BMI), longitudinally and simultaneously; and as a control variable in the association of FSC and children's PA and weight status (measured by BMI). And fourth, most of the previous studies about children's PA and weight status determinant factors in the United States (US) have focused on Whites, are cross sectionals, have employed convenient samples, and so have limited the application and the generalizability of the findings in the Hispanic community.

The importance of this study is to provide an initial step of examining the association of FSC and child's PA and weight status. If these associations are supported and replicated by future studies, they will provide an empirical base for developing culturally sensitive interventions to strengthen FSC (family's relationships, family-child's direct-time involvement, and child-family-school involvement) during the early school years as a means of assuring child's positive outcomes in the areas of active lifestyle and normal weight status.

### *Nature of the Problem*

In the United States there is a high prevalence of inactivity among children and adolescents (Center for Disease Control and Prevention, [CDC], 2003). Hispanic children living in the US have a higher prevalence of inactivity and are more overweight than Whites (Butcher, Sallis, Mayer, & Woodruff, 2008; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Ogden, Carroll, & Flegal, 2008; Ogden, Flegal, Carroll, & Johnson, 2002; Singh, Yu, Siahpush, & Kogan, 2008; Balistreri & Van Hook, 2009). A recent national study found that Hispanic children (ages 6-17), with one or both non-US born parents, were the most physically inactive compared to Whites, African Americans and other

ethnic groups. Additionally, non-US born Hispanic children have the lowest likelihood of being physically active (Singh, Yu et al., 2008). Research findings suggest that Hispanic girls are at a disadvantage in their involvement in physical activities, because they have the lowest compliance rate with the national guidelines for PA (Butcher et al., 2008), and are the ethnic group least involved in sports (Erkut & Tracy, 2002; Brosnahan , Steffen, Lytle, Patterson, & Boostrom, 2004; Stovitz, Steffen, & Boostrom, 2008).

In addition to being identified as the group with the highest physical inactivity, Hispanic children (ages 2-19) in the US (specifically Mexican Americans) have been consistently found to be the ethnic group with the highest overweight prevalence (Ogden et al., 2002; 2008; 2010). In terms of race and gender interaction, Hispanic boys have been identified as the group with higher prevalence of overweight (Johnson et al., 2007). The need for interventions to increase children's PA levels and to decrease or prevent obesity in this minority group is clear. However it is important first to identify the determining factors at individual and family levels that influence or are associated with Hispanic children's PA and weight status during early childhood, from an ecologically and culturally sensitive perspective. Once these factors are identified, interventions targeting modifiable determinant factors of PA and obesity can be designed, implemented, and evaluated.

### *Relevance and Importance*

The prevalence of overweight children and adolescents increased significantly from 1999 to 2004 (Ogden et al., 2006). Mexican American (MA) was the ethnic group with the highest prevalence of overweight or risk-of-overweight in the age group of 2-19 years (56.2%) (Ogden et al., 2006). As summarized by several authors, obesity creates a

series of health-related problems for children and adolescents, such as hyperinsulinemia, poor glucose tolerance, increased risk of Type 2 diabetes, hypertension, sleep apnea, social exclusion, depression, and a lower health-related quality of life (Lobstein, Baur & Uauy, 2004; Schwimmer, Burwinkle, & Varni, 2003). Wang and colleagues suggest that if the upward trend of overweight and obesity continues, it is estimated that more than 80% of all American adults will be overweight or obese for 2030 (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008).

Hispanic children and adolescents, who have the highest prevalence of obesity and represented 22% of the nation's population of children in 2008 (U.S. Census Bureau [U.S. Census], 2009), should become a priority for our health care system in terms of prevention and intervention strategies. The proportion of Hispanic children in the US population will continue to increase; it is estimated to reach 39% of the population of children by 2050 (U.S. Census, 2009).

Suspected determinant factors for the increase of the obesity epidemic are the sedentary lifestyle and the lack of physical activity among children, adolescents, and adults. A significant inverse association has been found between PA and weight status among children and adolescents of diverse ethnic groups, including Hispanics (Gordon-Larsen, Adair, & Popkin, 2002; Patrick et al., 2004; Singh, Kogan,Van Dyck, & Siahpush, 2008). Because of the evidence linking childhood obesity with obesity later in life (Epstein et al., 1995; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997), interventions aimed at preventing adult obesity and its health-related consequences should begin during early childhood. Therefore, it is imperative to motivate Hispanic children at an early age to become and remain physically active. Due to the traditional importance of family

unity ("familism") among Hispanics, and the influence that parents have over their children's activities and environment during the early school years, it could be beneficial to include the family in health behavior interventions (Chong, 2002) targeted to increasing PA, decreasing sedentary behaviors, and preventing obesity.

## *Background*

### *Benefits of Physical Activity*

Increasing PA among sedentary children and adolescents could be a possible strategy to decrease and prevent obesity (Steinbeck, 2001). This strategy could also bring other developmental, physical, and mental health benefits to the youth population. The Physical Activity Guidelines Advisory Committee (U. S. Department of Health and Human Services, [HHS] 2008a) found a positive association between PA and cardio-respiratory fitness, favorable body composition, cardiovascular and metabolic health, and bone health among children and adolescents. Additionally, there appears to be an association between youth PA and reduced symptoms of depression and anxiety, higher self-esteem (HHS, 2008a), and positive social behaviors (Nelson & Gordon-Larsen, 2006). Even when the causal association and the temporal sequence of events (what comes first) are unknown, it seems that among those who participate in PA, other health-behaviors co-exist. For example, in a national sample studying 11,957 adolescents (seven grade to twelve grade), those who engaged in moderate to vigorous PA (MVPA) five or more times per week were less likely to smoke cigarettes, get drunk frequently or drive while drunk, use illegal drugs other than marijuana, be truant, or fail to wear a seatbelt (Nelson & Gordon-Larsen). Most of these risky behaviors, as well as PA behaviors, are determined by children's and family's characteristics, child-family

involvement, and child-family interaction with the environment (Miller, 2002; Resnick et al., 1997; Sallis, Proshaska & Taylor, 2000). When studying the influence of parents on the child's behavior, it is necessary to have a developmental perspective because during childhood, parents' influence on children's behavior could be stronger than during preadolescence or adolescence for reasons that include time spent together and children's physical and cognitive maturation (Fredericks & Eccles, 2004; Fry, 2000; Fry & Duda, 1997; Hill & Stafford, 1980). Early childhood is a good starting point for interventions designed to encourage PA and sport participation within the family context; therefore, FSC is a concept that could help to examine how one's family can influence a child's PA and weight status.

*Potential Contribution of Family Social Capital*

Social capital has been defined by several authors (e.g., Coleman, 1987, 1990; Putnam, 2000; Bourdieu, 1986); as pointed out by Robert Putnam, social capital's definitions have in common "the ways in which our lives are made more productive by social ties" (Putnam, 2000, p.19). This concept has been studied in its association with children's outcomes at the individual level (e.g., Coleman, 1988; Kayitsinga et al., 2009; Meier, 1999; Runyan et al., 1998; Wright et al., 2001) and collectively (e.g., Putnam, 2000; Kayitsinga et al., 2009). For the purpose of this study I have focused on FSC of the child at the individual level, embedded in the child's family.

Social capital is embedded in the "social relationships of a provider and a recipient" (Robinson, Schmid & Siles, 2002, p. 6); at the family level it is embedded in the social relationship of the parents with the child (Coleman, 1990). As noted by Coleman (1990), social organizations, in this case the family, "constitute *social capital*

[italics added], facilitating the achievement of goals [such as the child's involvement in physical activity and sport involvement] that could not be achieved in its absence or could be achieved only at a higher cost" (p.304). As noted by Robinson and colleagues (Robinson et al., 2002) the child belongs to a family and as soon as he/she born they "own" their family's social capital; and this "...social capital benefits accrue to the young child without any effort. But, as the child ages, he/she must invest to maintain the social capital" (p.16).

Social capital, and specifically FSC, has been associated with children's positive outcomes such as educational achievement (Israel, Beaulieu, & Hartless, 2001; Meier, 1999), prevention of delinquency (Wright et al., 2001), and prevention of school dropout (Coleman, 1988); and negatively associated with behavioral problems (Dufur, Parcel, & Mckune, 2008) and child's overweight (Kayitsinga et al., 2009). I hypothesized that it can also be associated positively with a child's PA and healthy weight status.

Some indicators of social capital that have been consistently used to operationalize this concept at the family level are (a) family structure (Coleman, 1988; Kayitsinga et al., 2009; Kim & Schneider, 2005; Israel et al., 2001; Meier, 1999; Parcel & Menaghan, 1993; Runyan et al., 1998); (b) the quality of the relationship of the child with the parents (Hoffmann & Dufur, 2008; Kombarakaran, 2002); (c) the time investment of the parents in the child's leisure time (Berntsson et al., 2006; Furstenberg & Hughes, 1995; Kayitsinga et al., 2009; Kim & Schneider; Kombarakaran, 2002; Wright et al., 2001); (d) indicators of a family social network such as the parents' involvement in the child's school (Furstenberg & Hughes, 1995; Hoffer & Shagle, 2004; Hoffmann & Dufur, 2008; Kayitsinga et al., 2009); (e) knowledge of the parents of the

child's classmates (Hoffer & Shagle, 2004; Kayitsinga et al., 2009; Kim & Schneider, 2005) or child's classmates (Dufur et al., 2008); and (f) extra- familiar social support (Furstenberg & Hughes, 1995; Kayitsinga et al., 2009; Offer & Schneider, 2007). To explain more effectively the potential mechanisms of how FSC can influence a child's behaviors in terms of PA and sport participation, as well as preventing child's obesity, the next section explains the potential mechanisms in two areas: those that are associated with the child-parent(s) dyad, and those that are related with the child-family-school triad.

*Parent-child dyads.* Parents' behaviors, attitudes, verbal persuasion (feedback), expectations, and a child's perceived competence can influence the child's behaviors directly or indirectly (e.g., through the child's self-efficacy) in different domains, including academics, sports participation, and PA (Bandura, 1977; Bois et al., 2002; Brustad, 1996; Fredericks & Eccles, 2002; Jacobs & Eccles, 1992; Trost et al., 2003). Parents can influence children's and adolescents' interests, enjoyment, motivation, perseverance, and participation in PA and sports through several means. These means include perceptions of the child's competence in PA/sport, behavioral modeling, encouraging children's participation, providing positive reinforcement (verbal persuasion) or incentives, providing social support (financial, transportation, information), and rules of television watching (Bois et al., 2002; Brustad, 1996; Dempsey, Kimiecik, & Horn, 1993; Fredericks & Eccles, 2002; McGuire, Hannan, Neumark-Sztainer, Falkner Cossrow & Story, 2002; Salmon, Timperio, Telford, Carver, & Crawford, 2005; Trost et al., 2003). Positive relationships of parents with the child and among parents, both indicators of FSC, could facilitate these means. A positive home

environment, such as family-cohesion, and parent-child communication have shown to predict children's moderate to vigorous physical activity (MVPA) per week (Ornelas, Perreira, & Ayala, 2007). Besides the relationship of the parents with the child (quality of the relationship), the time investment (quantity) of the parent on child's activities (indoor and outdoor) has shown to be inversely associated with the child being overweight (defined as BMI $\geq$ 95th percentile) (Kayitsinga et al., 2009); a possible mechanism is by preventing a sedentary lifestyle.

Social capital embedded in the family (FSC) can benefit the child concurrently and over time; Robinson and colleagues suggest that it is "endurable", not affected by the time as can be in other social structures (Robinson et al., 2002). However, since the family is part of a society, it is necessary to study the influence of the family on the child's behavior from an ecological perspective. The social capital concept takes into consideration the dynamics of the family with the external environment.

*Child-parent(s)-school network, the ecological model.* The interaction of the family, the child's main social entity, with other people or social organizations could facilitate or be detrimental to the child's PA behavior and weight status. Parents and children involvement in school and civic activities during their leisure time could bring opportunities to get information and social support for children's PA involvement, becoming an additional source of FSC. For example, the interaction of child and family in the outside-family environment (e.g., school) could help in coping with barriers for PA, such as access to facilities, or activities that the parents' socioeconomic status (SES) might not provide (e.g., community gyms or playgrounds); in providing opportunities for the child to be involved in sports or physical activities during their leisure time (e.g.,

YMCA, church camps); or in receiving support from the child's classmates' parents such as transportation, care for child's siblings, equipment, or financial support. Parental involvement in school has been positively associated with adolescent's participation in sport (Kombarakaran, 2002). The interaction of the parents in the school can provide protective environments for the child; parents of classmates help to control disruptive behaviors and encourage positive social behaviors in the school network (Coleman, 1990). One of these behaviors can be participation in sports, school and non-school based. Sport participation, after-school exercise programs, and being physically active are behaviors that have been identified as positive ones by parents and/or by children (e.g., Heitzler, Levin Martin, Duke, & Huhman, 2006; Johnson, Pilkington, Lamp, He, & Deeb, 2009; O'Dea, 2003). Independently if the parent's or the child's motivation for participation in PA or sports are extrinsic (e.g., socialization, popularity, mean for future scholarships) or not, the school social network serves as a source of actual and/or future support for the child's PA/sport involvement, becoming a source of social capital. Additionally, when parents help one another, an obligation is generated which is often expected to be reciprocated when necessary (Coleman, 1988).

The sympathetic relationship of the parents with other children's parents, or persons in the school's related networks (intergenerational closure, Coleman, 1988, 1990) can help the child presently and in the future. As suggested by Robinson and colleagues (Robinson et al., 2002): "It is sympathetic relationships that have capital's transformative potential to provide economical, social, validation, and reflective service." (p.10). Intergenerational closure has been negatively associated with the child's likelihood of being overweight (Kayitsinga et al., 2009).

As discussed in this section, child's social capital is embedded in the social relations in the family and outside the family: "... social capital in the raising of children is the norms, the social networks, and the relationships between adults and children that are of value for the child's growing up. Social capital exists within the family, but also outside the family, in the community." (Coleman, 1987, p. 36). FSC could contribute to the child's PA and healthy weight status through different mechanisms in the child's social networks, such as through information channels, norms, obligations, and expectations (Coleman, 1987, 1988, 1990). One factor at family level that might affect this contribution is the mother's perception of the child's PA level in comparison with his/her peers. Due to the consistent evidence of this psycho-social determinant factor in the child's sport participation, it is important to take it into consideration when studying family influence on child's PA and weight status.

*Mother's perceptions of child's physical activity level*

Studies using the Expectancy-value theory of achievement motivation (Eccles (Parsons) et al., 1983; Wigfield & Eccles, 2000) have shown that parents' perception of the child's sport ability is the "strongest unique relationship with children's beliefs and participation both currently and over time" (Fredericks & Eccles, 2005, p.3). This theory argues that choices, persistence, and performance of a child can be explained by his/her beliefs about how well he/she will do in a specific domain and the extent to which he/she values the activity (Eccles (Parsons) et al., 1983; Wigfield & Eccles, 2000); but parental perception can also influence these beliefs and values. A possible mechanism by which parental perception of a child's physical activity can influence the child's PA is by providing higher instrumental and emotional support to those perceived as having more

ability (Loprinzi & Trost, 2010). Besides being a potential determinant of a child's PA parent's perception of a child's PA level in comparison with his/her peers has been negatively associated with child's weight status (Rose & Bodor, 2006).

There could be race differences in the contribution of FSC and MP to child's PA and weight status. For example, among Hispanics, PA involvement can be constrained by other social factors, associated with social capital and social ties, such as immigration, acculturation, and language barriers (indicator of acculturation). Therefore, it is important to include acculturation and language in the study of FSC, MP, and PA and weight status with regard to Hispanic children.

*Acculturation among Hispanics*

Immigration brings with it the process of adapting to a new place, and sometimes extended hours of working for minimal wages, that could "translate into poverty and inferior schooling for the children" (Portes, 2002, p. 36), which in turn could affect children's PA involvement opportunities at school and neighborhood levels. Immigrants' behaviors can change as a consequence of the contact with other cultural groups (Berry, Poortinga, Segall, & Dasen, 2007); eating habits and physical activity can be some of those behaviors. The change of individual (or group) behaviors as consequences of the contact with other cultures is what is known as acculturation (Berry, 2005; Berry et al., 2007). Acculturation level has been related to a high prevalence of obesity and inactivity among Hispanic women and girls, and with a strong association between mother-daughter weight statuses (Hazuda, Haffner, Stern, & Eifler, 1988; Hernández-Valero, et al., 2007; Khan, Sobal, & Martorell, 1997).

Language, a strong indicator of acculturation level among adults (Escobar & Vega, 2000; Kang, 2006), has been identified as a barrier for Hispanics to access services such as healthcare (Pearson, Ahluwalia, Ford, & Mokdad, 2008; Solis, Marks, Garcia, & Shelton, 1990) as well as a barrier for the parents' involvement in the child's school (Smith, Stern, & Shatrova, 2008). Additionally, the language barrier can affect the child-parent-school network, and the opportunities of child's PA/sport involvement.

Language, among other factors, can influence Hispanic immigrants to move to Hispanic neighborhoods. There is a Hispanic clustering in Hispanic neighborhoods (Borjas, 1995). Data from the 2003 National Survey for Children's Health has shown that 30% of Hispanic parents perceive their neighborhoods as being unsafe for their children (Child Trends, n.d.). This can be an additional factor that can affect child's involvement in PA, safety has been identified as the most important factor to select where MA children (mean age 4.9) can play (Sallis, McKenzie, Elder, Broyles, & Nader, 1997). In summary, the social capital concept, parents' perception of the child's physical activity level in comparison with his/her peers, and parent's acculturation can help in examining how the family—the main social network of the child, can influence PA and weight status in children, both concurrently and over time.

### *Purposes of the Study*

This study used data from the Early Childhood Longitudinal Study Kindergarten Class of 1998–99 (ECLS-K), specifically the waves of Kindergarten (Time 1), third grade (Time 2), fifth grade, (Time 3) and eighth grade (Time 4) data, to pursue the following six aims of this study:

1. To examine a possible association between FSC at the Kindergarten (FSC-K) and the following variables:
    a. *child's PA-score* at eighth grade;
    b. *child's weight status (measured by Body Mass Index (BMI))* at eighth grade.
2. To examine a possible association between *mother's perception of child's PA level in comparison with child's peers at Kindergarten* (*MP-K*) and the following variables:
    a. *child's PA-score* at eighth grade;
    b. *child's weight status (BMI)* at eighth grade.
3. To examine possible race differences (Whites and Hispanics) in Aim 1 and Aim 2.
4. To examine if the association between *FSC-K* and child's *PA-score* and *BMI* at eighth grade is attenuated by *MP-K.*
5. To examine a possible association between Hispanic *mother's acculturation level* (MACC) at Kindergarten and the following variables:
    a. *child's PA- score* at eighth grade;
    b. *child's weight status (BMI)* at eighth grade.
6. To examine potential determinant factors at baseline (Kindergarten) of child's PA level and BMI at third grade, fifth grade and eighth grade, among Hispanic children.

Figure 1 shows a simplified conceptual model that guided the analysis of this study. *FSC-K*, a latent variable, was the main independent variable. Latent variables are

variables that are not directly observable or measured; they must be observed or measured indirectly, hence inferred." (Schumacker & Lomax, 1996, p.77). The latent construct FSC was measured by the indicators in boxes (*a*) to (*h*). Details about the operationalization of each one of these variables are presented in the Methods Chapter.

Figure 1 also presents the main model from Kindergarten (Time 1) to eighth grade (Time 4). Here, the main predictor variables are:

1. *FSC* at Kindergarten (Time 1);
2. *mother's perception of child's PA in comparison with his/her peers at Kindergarten (MP-K)*—a latent construct (Time 1);
3. *Hispanic mother's acculturation level at Kindergarten (MACC)*—a latent construct (Time 1).
4. *child's PA level* as reported by the mother (Times 1, 2 and 3); and
5. *child's BMI* (Times 1, 2 and 3).

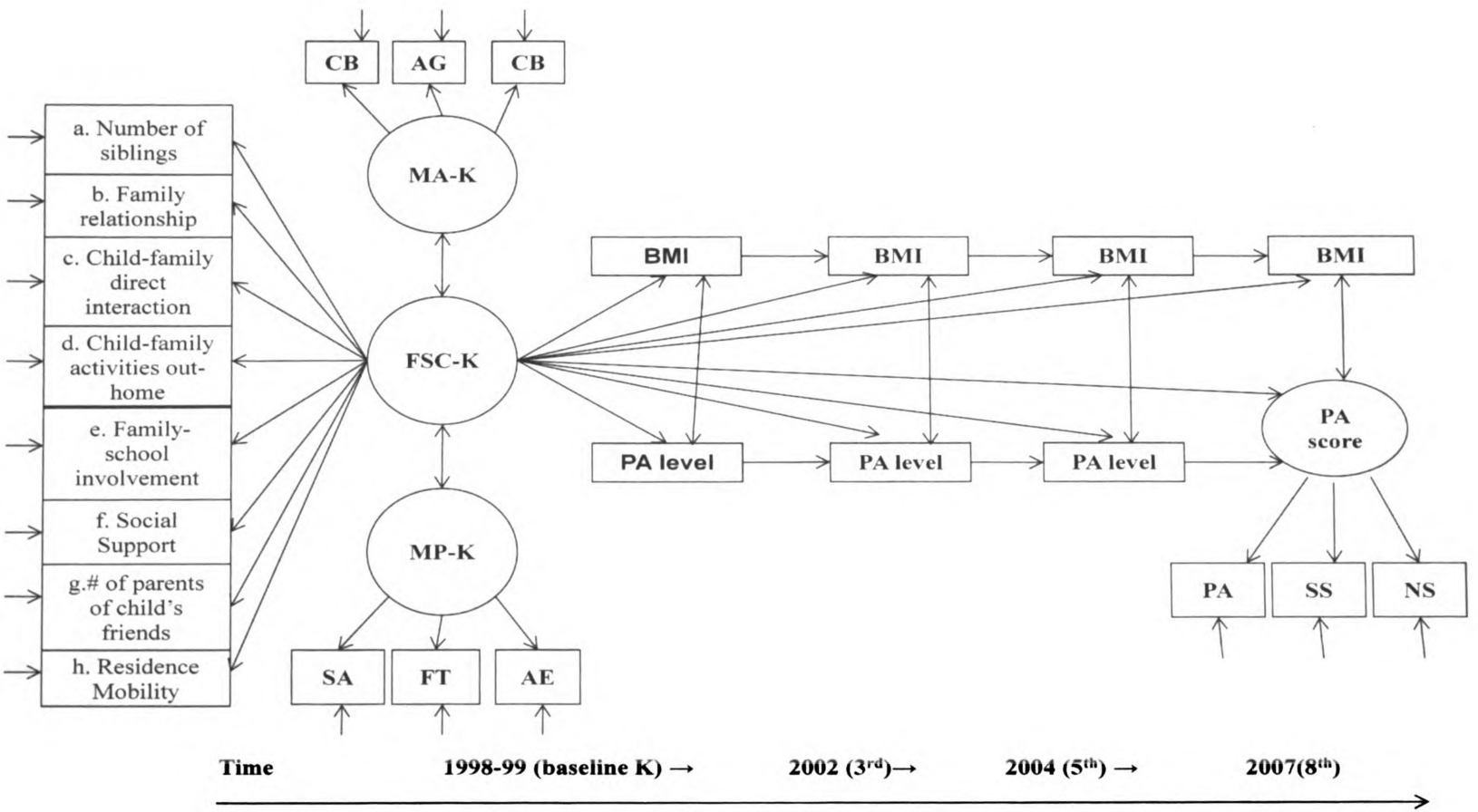


*Figure 1.* Conceptual Model. FSC-K=Family social capital; MP = Mother's perception; MACC = Mother's Acculturation; SA=Structured activities; FT=Free time; AE=Aerobic Exercise; PA = Days of the week >20 minutes MVPA; BMI= Body Mass Index; SS=School based sports; NS= Non-School based sports; CB= Country of Birth; AG= Age when moved to US; EK= English proficiency.

The dependent variables are:

1. *PA-score*—a latent construct (Time 4),
2. and *child's BMI* (Time 4).

Covariates at Time 1 (not presented in the simplified conceptual model) include, child's characteristics and behaviors (i.e., gender, race, disability status, hours of television watching per week), and family variables (i.e., family structure, number of siblings, mother's job status, family SES index, mother's perception of neighborhood attributes and safety, family rules for television hours, place of living [urbanicity and region], and parents' place of birth [Hispanics only]).

*Research Hypotheses*

ECLS-K was designed based on an ecological model of human development (Bronfenbrenner, 1979). It included surveys and interviews at individual, school, and community levels. These data facilitate testing the following hypotheses:

*Model 1. FSC and PA; FSC and BMI – Hypotheses*

To accomplish Aim 1, I examined whether or not family (context) as a child's main social network, facilitates child's PA level, sports participation, and child's BMI, through the FSC (as a latent construct). Based on the individual association of the FSC-K indicators (items *a* to *h*, Figure 1) with the child's PA and with child's BMI, I argue that there would be a positive association between children's PA and the latent construct FSC and a negative association between children's BMI and the latent construct FSC. This study is focused on examining if there was an association concurrently and over time of FSC and child's PA and BMI.

However, after controlling for other factors (e.g., previous PA level and previous BMIs), I expect a weaker association between FSC and child's PA level, among Hispanics for two reasons (Aim 3). First, this could help to explain in part the consistent race differences in PA level and sport involvement evidenced in the literature (refer to Chapter 2). And second, as concluded by Lin and Erickson (2008) after reviewing some social capital research, "unequal access to social capital begins at birth with importance ascribed statuses" (p.7); some of these statuses are family background (e.g., higher SES) and social locations (e.g., race or ethnicity) (Lin & Erickson, 2008).

I tested the following hypothesis to accomplish Aim 1 and Aim 3:

H1. There is a positive association between FSC-K and adolescents' PA-score at eighth grade (latent construct), after controlling for previous PA and BMI, and other potential confounders (e.g., race, gender, family socioeconomic index). (Aim 1a)

H2. There is a negative association between FSC-K and adolescents' BMI at eighth grade, after controlling for previous PA and BMI, and other potential confounders (e.g., race, gender, family socioeconomic index). (Aim 1b)

H3. The relationship between FSC-K and adolescent's PA-score at eighth grade (latent construct) is stronger for Whites than for Hispanics. (Aim 3)

H4. The negative relationship between FSC-K and adolescents' BMI at eighth grade is stronger for Whites than for Hispanics. (Aim 3)

*Model 2. FSC and MP*

Based on previous research findings with the theoretical framework of the expectancy-value theory of achievement motivation, by Eccles, Wigfield and colleagues (Eccles (Parsons) et al., 1983; Wigfield & Eccles, 2000) I argue that the mother's beliefs in early childhood, measured as the mother's perception of her child's PA level in comparison with the child's peers (MP), is associated with child's PA level and BMI

during adolescence. Possible mechanisms are providing more opportunities or influencing the child's self perception of PA abilities (Bois, Sarrazin, Brustad, Trouilloud, & Cury, 2005). Mothers, who perceive their children as more active than their peers, might provide more support to the child to play (Loprinzi & Trost, 2010) inside or outside, and/or to be involved in sports, than those mothers that perceive their children as being less active than their peers. MP can also influence children's beliefs in their abilities.

MP could help to explain race difference in child's PA level and BMI. After controlling for other factors (previous PA level and previous BMIs), I expect a weaker association between MP-K and child's PA level, among Hispanics (Aim 3); this could help to explain in part the consistent race differences in PA level, sport involvement and weight status, evidenced in the literature (refer to Chapter 2).

Parental perceptions of the child's ability in sport have been identified as the "strongest unique relationship with children's beliefs and participation both currently and over time" (Fredericks & Eccles, 2005, p.3). I also examined if it attenuates the association of *FSC-K* and *child's-PA* score and *child's BMI.* In terms of MP-K, I tested the following hypotheses to accomplish Aims 2 to 4:

> H5. There is a positive association between m*other's perception of her child's PA level in comparison with the child's peers at Kindergarten (MP-K) and child's PA- scores* at eighth grade, after controlling for previous PA levels and BMIs (at Kindergarten, third and fifth grade), and other possible confounders (e.g., gender, family SES ). (Aim 2)

> H6. There is a negative association between m*other's perception of her child's PA level in comparison with the child's peers at Kindergarten (MP-K)* and *child's BMI* at eighth grade after controlling for previous PA levels and BMIs (at Kindergarten, third grade and fifth grade), and other possible confounders (e.g., gender, family SES ). (Aim 2)

H7. The relationship between *mother's perception of her child's PA level in comparison with the child's peers at Kindergarten* and *child's PA-scores* at eighth grade will be stronger for Whites than for Hispanics. (Aim 3)

H8. The relationship between *mother's perception of her child's PA level in comparison with the child's peers at Kindergarten* and *child's BMI* at eighth grade will be stronger for Whites than for Hispanics. (Aim 3)

H9. *Mother's perception of her child's PA level in comparison with the child's peers at Kindergarten* attenuates the association between *FSC* at Kindergarten and *child's PA-score and BMI* at eighth grade. (Aim 4)

*Model 3: Hispanic Model — FSC, MP, and Mother's Acculturation level (MACC)*

Parents' and child's acculturation level has been associated with child's PA level (Liu, Probst, Harun, Bennett, & Torres, 2009; Unger, Reynolds, Shakib, Spruijt-Metz, Sun, & Johnson, 2004), as well as with child's BMI among Hispanics (Elder et al., 2009; Sussner, Lindsay, & Peterson, 2009). I argue that Hispanic parents with higher acculturation level (controlling for other covariates) might have fewer barriers (e.g., language, neighborhood safety) for access to information and to other resources (facilities, equipment, transportation). I also argue that children will be more active and have a lower BMI than those with less acculturated parents. I tested the following hypotheses to accomplish Aim 5:

H10. Hispanic m*other's acculturation level* (MACC) at Kindergarten is positively associated with the *child's PA- score* at eighth grade, after controlling for previous PA levels, and BMIs (at Kindergarten, third and fifth grade), and other possible confounders (e.g., gender, family SES ). (Aim 5)

H11. Hispanic m*other's acculturation level* (MACC) at Kindergarten is negatively associated with *child's BMI* at eighth grade, after controlling for previous PA levels, and BMIs (at Kindergarten, third grade, and fifth grade), and other possible confounders (e.g., gender, family SES). (Aim 5)

The test of these hypotheses (H10 and H11) also allows the examining of other factors at early childhood that are associated with later PA levels or BMI (Aim 6).

*Delimitations*

1. This study was limited to respondents who were categorized as biological mothers (which represents more than 80% of the total respondents) living with the child. Research results do not necessarily generalize to foster mothers or stepmothers.
2. ECLS-K has several waves: the fall and the spring of Kindergarten (1998-99), the fall and spring of first grade (1999-2000), the spring of third grade (2002), the spring of fifth grade (2004), and the spring of eighth grade (2007). Only the waves of fall and spring of Kindergarten, and spring of third grade, fifth grade, and eighth grade were analyzed, because the variables of interest were assessed at these points of time.
3. Only independent variables that were present in at least the two first waves of interest were included in the data analysis.
4. The proposed study included children from Kindergarten, third, fifth and eighth grades; generalizations of results can be done only for students in these grades.

*Limitations*

1. Assessments of ECLS-K began when children were at Kindergarten; other factors that could influence children's PA and/or BMI previous to Kindergarten experiences were not accessed.

2. PA (during Kindergarten, third grade and fifth grades) was measured by mother's report.
3. This study was limited to FSC; it did not include indicators of neighborhood or community level social capital, which could be associated with FSC, children's PA level, and weight status.
4. This study examined several family determinant factors of children's PA and weight status, mainly related to the child's mother. Mother's acculturation, mother's perception of child's physical activity in comparison with the child's peers, mother job status, mother's perception of neighborhood safety for child's to play, and family social capital indicators as reported by the mother, including "mother-child relationship" but not father-child relationship. In this study, 30% of the children were not living with the biological father, and 21% were living only with the biological mother. Father-child relationship was not assessed, which could affect the score of FSC. However, because of the age group and because the mother was the main respondent, for the purpose of this study a more determinant factor may be the relationship of the child with the mother. Additionally, 21% of the study sample were cases living only with the mother; research findings suggest that after the divorce or separation, the father's affection for the children decreases (Amato & Booth, 1996).
5. Other mother's variables that could be associated with children's PA behavior and weight status were not assessed. For example, PA and sedentary behavior, eating habits, PA beliefs and attitudes, and mother's weight status.

6. Indicators of sexual maturation or biological maturity status were not assessed.
7. In this study the variable race was recoded in four groups: Whites, African Americans, Hispanics, and others. The Hispanic study sample was not sub-classified by country of origin, because the study sample had mostly mothers of Mexican origin (n=659); all other Hispanic countries had less than 100 cases (e.g., Puerto Rico n=43; El Salvador n=48; Dominican Republic n= 42).

*Definitions*

*BMI* is calculated by dividing a child's body weight in kilograms by the child's height in meters squared. BMI is a "useful operating definition of overweight" (Bray, 2005). Some research studies and clinicians use the Centers for Disease Control and Prevention (CDC) guidelines to categorize the child's weight status, where the BMI number is plotted on CDC BMI-for-age growth charts. There are separate tables for males and females. CDC recently adopted a new categorization of weight status, following recommendations from an Expert Committee (please refer to Barlow and the Expert Committee, 2007, for more details).

*Physical Activity* involves "any bodily movement produced by the skeletal muscles that results in energy expenditure" (Carpersen, Powell, & Christenson, 1985).

*Physical Activity Guidelines.* In 2008 the U.S. Department of Health and Human Services (HHS, 2008b) published the *2008 Physical Activity Guidelines for Americans.* This was the first document from the HHS that set guidelines pertaining to the amount, types, and intensity of PA necessary for achieving health benefits. These guidelines have

a lifespan approach setting specific guidelines for children, adults, and older adults. After review of scientific evidence the guidelines for children are:

> Children and adolescents should do 60 minutes (1 hour) or more of PA daily.
> Aerobic: Most of the 60 or more minutes a day should be either moderate-or vigorous-intensity aerobic PA, and should include vigorous-intensity PA at least 3 days a week.
> Muscle-strengthening: As part of their 60 or more minutes of daily PA, children and adolescents should include muscle-strengthening PA on at least 3 days of the week.
> Bone-strengthening: As part of their 60 or more minutes of daily PA, children and adolescents should include bone-strengthening PA on at least 3 days of the week. (HHS, 2008b, p. vii)

*Social Capital.* For this study two definitions of social capital were adapted. One that I classified as being more broadly, defined by an interdisciplinary group of researchers at Michigan State University (Robinson et al., 2002); and the second one, more narrow, was focused on social capital embedded in the family, by James Coleman (1990). Both definitions illustrate how social capital is embedded in social ties and how it is productive. Robinson and colleagues (Robinson et al., 2002) defined social capital as "a person's or group's sympathy toward another person or group that may produce a potential benefit, advantage, and preferential treatment for another group of persons beyond that expected in an exchange relationship" (p. 19).

James Coleman (1990) conceived social capital as:

> ....social-structural resources as a capital asset for the individual, that is, as social capital. Social capital is defined by its functions. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure....social capital is productive, making possible the achievement of certain ends that would not be attainable in its absence....social capital inheres in the structure of relations between persons and among persons. (p. 302)

*Family social capital (FSC).* Following Coleman's (1990) definition of social capital, *FSC* "social capital in the raising of children is the norms, the social networks, and the relationships between adults and children that are of value for the child's growing up" (Coleman, 1987, p. 36) (please refer to Figure 1). Following Coleman's (1990) operationalization of social capital, I suggest the creation of a FSC latent construct that includes two main categories of the child's social networks: (1) child's personal social network— the family; and (2) child's public social network—the school (as categorized previously by Croninger and Lee, 1996). Each of these categories measure distinct aspects of social capital (i.e., social structure, intensity of relationships, child-family involvement, child-parents-school engagement). The details about the operationalization of each one of these variables is presented in the Methods Chapter. FSC is a latent construct with the following indicators:

A. Child's personal social network— the family:

1. Social structure:

   (a) number of siblings;

2. Relationships —intensity of the relationships in the family:

   (a) mother-child relationship —the intensity of the relationship between mother and child;

   (b) mother-partner relationship —the intensity of the relationship between mother-partner;

3. Direct interaction between child and family through activities of the child with the family during leisure time, inside and outside the home:

   (a) child-family activities;

(b) child-family activities outside the home.

B. Child's public social network:

1. family-school involvement;
2. social support for family involvement in school's activities;
3. social ties of parents with other parents of the child's school — "intergenerational closure" (Coleman, 1988; 1990);
4. Residence mobility – an indicator of stability of the social ties and networks.

*Tracking* has been defined as "the tendency of an individual to maintain their rank or position within a group over time." (Malina 2001, p.1).

# Chapter 2

## Literature Review

The following literature review is organized in two main sections: the first section presents the epidemiology of obesity and PA. This section shows the magnitude of the problem in terms of prevalence estimates and tracking of obesity from childhood to adulthood, and the low prevalence of PA, especially among Hispanic children. The second section is a review of the theories that can help test the research hypotheses involving potential determinant factors that are associated with children's PA and Body Mass Index.

### *Prevalence, Tracking, and Determinants of Overweight/Obesity Among Children and Adolescents*

#### *Prevalence of Overweight/Obesity among Children and Adolescents*

The prevalence of overweight among children and adolescents increased significantly from 1999 to 2004. In 2003-2004 the prevalence of overweight children and adolescents in the US was 17% (Ogden et al., 2006). In the age group 2-19 years old, Mexican American (MA) was the ethnic group with the highest BMI at the three highest BMI-for-age-percentile cut points; 38.9% in the ≥85th percentile, 20.8% in the ≥95th percentile, and 14.9% in the ≥97th percentile. More recent data from the NHANES 2007-2008 showed that Hispanics had the highest prevalence of "high weight" ( ≥95th percentile of CDC weight-for- recumbent-length growth charts) in most of the age groups: from birth to 2 years old (12.5%); 2-5 years old (14.2%); 6-11 years old (25.1%); and 2-19 years old (20.9%) (Ogden et al., 2010).

Hispanic adolescents (ages 11-15), together with other minorities, have a greater propensity of being at-risk for overweight or overweight (Patrick et al., 2004). Hispanic girls have been found to have a higher mean BMI percentile (Sweeney, Glaser, & Tedeschi, 2007), higher BMI, and higher percent of body fat (Freedman et al., 2008).

*Obesity Tracking*

Obesity has consequences for the child's present and future physical and mental health. A recent longitudinal study with MA children found that low-income MA overweight children, or at-risk-of-overweight status, track well during childhood and early adolescence (Olvera, Sharma, Suminski, Rodríguez, & Power, 2007). That is, they maintain their rank or position within their risk group over time (Malina, 2001). The percentage of obese children who are predicted to continue on the trend toward obesity until adulthood varies among studies. For example, it has been estimated as 40% by Epstein and colleagues (Epstein et al., 1995) and as 79 % by Whitaker et al. (1997). Obese parents also affect those estimates: the chance of obesity in adulthood ranged from 8% (1 or 2 year old) without obese parents to 79 % (10-14 year old) with at least one obese parent (Whitaker et al., 1997).

*Suspected Determinants of Overweight/Obesity*

Parental fatness, social factors, birth weight, timing or rate of maturation, PA, dietary factors, and other behavioral and psychological factors have been identified as risk factors that might affect adult obesity in industrialized countries when present during childhood (Parsons, Power, Logan, & Summerbell, 1999). This section of the literature review focuses on family factors and mothers' suspected determinant for children's BMI. It is beyond the scope of this review to discuss other factors such as nutritional, genetic,

environmental, food insecurity, and other non-family related suspected determinant factors for childhood overweight/obesity (please refer to Agras & Mascola, 2005; Oenema et al., 2007; Parson et al., 1999).

At the family level, the family structure, parent's education, family SES, and the number of siblings have been identified as suspected determinants of child's weight or BMI (Bhargava, Jolliffe, & Howard, 2008; Hernández-Valero et al., 2007; Johnson et al., 2009; Balistreri & Van Hook, 2009). Bhargava and colleagues (Bhargava et al., 2008) used the ECLS-K data (a national study) to examine the household's food insecurity score and its association with children's weight, for first, third, and fifth grade. They did not find an association between household's food insecurity score and child's weight; however, they found several family-level variables were associated with the child's weight: parents' educational level, family's SES, and number of siblings were negatively associated with the child's weight. Additionally, they found that Hispanic households had higher food insecurity, and Hispanic children were heavier than White children.

In terms of parents' educational level and family's SES (SES), Balistreri and Van Hook (2009) found an association between these variables and the child's BMI; however, their findings varied by the child's race, and parents' nativity (for Hispanics). They used data from various waves (from Kindergarten to fifth grade) of the ECLS-K. They reported that among Whites, BMI at Kindergarten was negatively associated with parent's education and family income. For Hispanics, BMI was negatively associated with parent's education, but only for children of immigrants; and with family's income, only for children of natives. These findings support the need to study the determinant

factors of BMI by race, and to take into account parental country of birth when studying BMI among Hispanics.

Hernández-Valero et al. (2007) found a negative association between maternal educational level and the child's BMI. They performed a cross-sectional study to evaluate the relationship between weight status of mothers and their children, with a mother-child dyads design, mothers being of MA origin. They had 438 dyads, including boys and siblings, and a broad age group (5-18 years old). Their emphasis was in maternal indicators, using as control variables the mother's physical condition, maternal education, maternal age, maternal acculturation, mother's country of birth, and parity. They limited the study to participants from low SES in Texas. After adjusting for covariates, they found a positive linear relationship between mother's weight and that of her child; and those mothers with less than high school had twice the likelihood of having an obese child.

In contrast, other studies among Hispanics have not found differences in the relationship of family SES or parents' educational level (Butte et al, 2007; Calderon, Johnston, Lee, & Haddad, 1996) with children's BMI. Butte and colleagues (Butte et al., 2007) performed a longitudinal study with Hispanic children (4-19 years old) in Texas. They studied the socio-demographic, metabolic, and behavioral factors that predict child's weight gain in one year. Neither family income nor paternal educational level were predictors of the child's weight gain. Calderon and colleagues (Calderon et al., 1996) designed a descriptive study of 36 MA girls, ages 9 to 12 years, where both parents were born in Mexico. Their sample included 36 dyads of biologically related mothers and daughters (18 "obese" and 18 "normal"). They defined "obese" as those over the

90th percentile of weight for height on the National Center for Health and Statistics growth chart. They followed Malina, Zavaleta, and Little's (1986) suggestion of measuring triceps skinfolds (TS) together with the BMI to verify obese or normal (25th to the 75th percentile) weight status in MA girls. Results revealed that girls' BMI, mothers' BMI, and girls' TS were statistically significantly different between obese and non-obese participants, and mothers' BMI was strongly associated with daughters' BMI. However there were not significant differences among groups in terms of annual family income (Calderon et al.).

Additional to family's SES indicators, family structure has been associated with children's BMI (Chen & Escarce, 2010; Johnson et al., 2009; Kayitsinga et al., 2009). For example, Johnson and colleagues found that children (Kindergarten to eighth grade) from single-parent families have a higher likelihood of being overweight ($\geq$ 95th BMI per age percentile) than children from two-parent families (Johnson et al., 2009). In a study with the ECLS-K data, Chen and Escarce (2010) examined the association between family structure and number of siblings with children's BMI and obesity in Kindergarten, third grade, and fifth grade; and BMI growth over time (Kindergarten to fifth grade). Their study suggested that these associations can be different depending on the child's age. In their study sample, children from single-mother families had a higher likelihood of being obese (following CDC definitions) than two-parent families, but only in fifth grade. Family structure did not influence the increase of BMI from Kindergarten to fifth grade. In terms of siblings, those children living with siblings had a lower BMI, and a lower likelihood of being obese, than those without siblings. Their study also showed that children with no siblings had a statistically significant larger increase (from Kindergarten

to fifth grade) in BMI (4.7 $kg/m^2$) than those with one or more siblings living with them. Kayitsinga and colleagues found similar results in terms of number of siblings and the likelihood of being overweight (Kayitsinga et al., 2009). They analyzed data from the Child Development Supplement to the Panel Study of Income Dynamics with their study sample consisting of children less than 18 years of age. They found a negative association between the number of siblings in the household and child's overweight (defined as BMI ≥95th percentile).

*Other mother-specific suspected determinants of overweight and obesity among children.* Maternal health-related behaviors and beliefs influence the child's weight status directly or indirectly. Mothers' smoking behavior (Harding, Teyhan, Maynard, & Cruickshank, 2008), assortative mating for obesity (Jacobson, Torgerson, Sjostrom, & Bouchard, 2007), waist circumferences (Jago et al., 2004); obesity (Butte et al., 2007; Kimbro, Brooks-Gunn, & McLannahan, 2007; Maffeis, Talamini, & Tato, 1998; Oliveira AM, Oliveira AC, Almeida, Oliveira N, & Adan, 2007) and BMI (Calderon et al., 1996; Jago et al., 2004), among others, have been correlated with being overweight and obese in childhood.

Maternal obesity is associated with children's obesity and with an earlier obesity age of onset across all race/ethnic groups (Gordon-Larsen, Adair, & Suchindran, 2007). A significant correlation between mothers' and children's BMI was found in several research studies with Hispanics (Calderon et al., 1996; Hernández-Valero et al., 2007; Olvera et al., 2007). For example, Olvera et al. (2007) conducted a longitudinal study which included 69 MA dyads (children and mother), mainly Catholic, in an inner-city neighborhood in the southwest. The component that added value to this study was the

analysis of trends of BMI in early childhood (4-8 years old) to mid-childhood (7-12 years old). Their variables were mothers' age, education, occupation, place of birth, family income, perceived weight problems for them or for their children, and height and weight. Similar to Hernández-Valero et al. (2007), they included only low-income MA and used CDC guidelines for their BMI analysis of children. They re-classified participants into two categories: normal-weight (< 85th percentile) and at-risk-for-overweight and overweight (≥ 85th). There was a steady increase in body weight and body height, as well as a rise in the prevalence of overweight or at risk of overweight, from Year 1 to Year 3. A significant correlation was found between children's BMI in Year 1 through Year 4. Child BMI at Year 1 predicted child BMI at Year 4, but only for those who had BMI ≥85th percentile in Year 1 (after adjusting for sex). A consistent positive relationship was found each year only between mothers' BMI and daughters' BMI, not for mothers/sons. The highest correlation was observed when daughters were 4-8 years of age, and the correlation coefficients tended to decrease as girls aged. Children (ages 4- 8) from mothers with higher BMIs were four times more likely to be overweight than children in this age group from mothers with lower BMIs. The authors suggested possible psychosocial and behavioral factors (such as peer influences), as explanations for the decrease in correlation of mothers' and daughters' BMI as daughters increase in age.

Maternal risk factors are not necessarily uniform across ethnicities. A study with European Americans (37%), African Americans (37%), and Hispanics (26%) in Texas found an association only between Hispanic mothers' BMI and their children's B MI (Jago et al., 2004). Results showed that Hispanic mothers had the highest BMI. The relationship between BMI and waist circumferences of mothers and children was

significant only among Hispanics. The consistently positive association between Hispanic mothers' and children's weight status suggests a genetic factor as well as an influence by mothers in their children's behavior.

The perception of their children's weight status is another maternal psychological factor that could affect Hispanic child obesity, as Hispanic mothers do not perceive their "overweight" children as being overweight. A study with Hispanic children six to seven years of age (79% of the mothers born in Mexico) revealed that 60% of the mothers assessed their obese children incorrectly, and 40% of the mothers with obese children did not recognize obesity as a health problem (Ariza, Chen, Binns, & Christoffel, 2004).

A significant relationship has been found between ethnicity and gender in terms of body size preferences. In a study with Native American, White, and Hispanic female adolescents (fifth grade to eighth grade), Hispanic was the group with the highest preference for a larger body size: 15% of Hispanic girls wanted to be larger (Lynch, Heil, Wagner, & Haves, 2007). This preference could be influenced by mothers' beliefs.

Acculturation level has been associated with the perception of being overweight among Hispanics. Mexican Americans less acculturated and with a BMI $\geq$ 25 "were less likely to perceive themselves as overweight and less likely to have tried to lose weight" (Ahluwalia, Ford, Link, & Bolen, 2007). Some authors have suggested that MA could have a conflict in their cultural idea that being overweight is healthy (Diaz, Mainous, & Pope, 2007).

Other factors at the family level that have been associated with a child's overweight or obesity are mothers' and children's acculturation level (Hernández-Valero et al., 2007; Van Hook, Balistreri, & Baker, 2009). Women (MA) born in the US were

two times more likely to have a child who was overweight or at-risk-for-overweight than women born in Mexico, but this relationship disappeared when they controlled by gender (Hernández-Valero et al., 2007). However, Van Hook and colleagues (Van Hook et al., 2009) found differences in terms of the child's generational status (1.0 generation were those children of parents who came to the US after 12 years old, and 1.5 whose parents were those who came before 12 years old), and parents' acculturation (measured by parents' proficiency of speaking, reading and writing English), and their association with child's weight. In terms of generational status, sons of natives were less likely to be overweight (defined as between 85th percentile and 95th percentile) or obese (defined as higher than 95th percentile). Children of immigrant parents with low and medium English proficiency had higher BMI than those of parents with high English proficiency; the difference was larger for boys. Their results supported the need to take into consideration the parents' acculturation level in study designs with immigrant children.

In summary, current evidence supports the influence of the family, of the mother's behaviors and beliefs, and the mother's acculturation level in the child' weight status. As mentioned previously, being overweight among children has been positively associated with PA and sedentary behavior (e.g., watching television) (Laurson et al., 2008; Patrick et al., 2004; Veugelers & Fitzgerald, 2005), behaviors that are different constructs (Lindquist, Reynolds, & Goran, 1999). A cross sectional study among adolescents (girls and boys, 11-15 years old) that examined the relationship of diet, PA, sedentary behaviors, and overweight status found that insufficiently vigorous PA was the only risk factor for higher BMI (Patrick et al., 2004). Eisenmann and colleagues (Eisenmann, Bartee, Smith, Welk, & Fu, 2008) suggested that besides PA, television

viewing also should be considered in the study of factors that affect overweight. In their study, they found that girls who watched moderate (2-3 hours per day) and high levels (≥ 4 hours per day) of TV had increased likelihood of being overweight at any level of moderate or vigorous PA (Eisenmann et al., 2008).

Before designing interventions to reduce or prevent obesity and to increase PA in Hispanic children and adolescents, it is necessary to study the patterns and determinants of PA. Although activity/inactivity patterns and determinant factors vary among ethnic groups, there is limited literature specific to Hispanic children and adolescents. In the absence of Hispanic specific research studies, findings of research among Whites and African Americans can provide some useful information.

## *Prevalence, Tracking, and Determinants of Physical Activity among Children and Adolescents*

### *PA Prevalence among Children and Adolescents*

In the period of 1988 to 1994, the prevalence of physical inactivity during leisure time was higher among women than men, regardless of age or social class (Crespo, Ainsworth, Keteyian, Heath, & Smit, 1999). Among adolescents (10-18 years old), age has been identified as the only factor that predicted changes in PA over time (Kahn et al., 2008). PA declines from early- to mid-adolescence and from mid to late-adolescence, particularly among females (Nelson, Neumark-Staziner, Hannan, Sirard, & Story, 2006).

A recent national study among adolescents (14-17 years old), including the 100 largest cities of the US, found that females have a higher prevalence of inactivity than males, and females' compliance declined significantly with age. Sixty percent (60 %) of girls and 43% of boys failed to comply with the national PA guidelines (defined as ≥ 5

days per week, at least 60 min a day) (Butcher et al., 2008). These trends of PA decreasing with age, and males being more active than females, are consistent with the findings reported in studies analyzing data from the 2007 Youth Risk Behavior Surveillance System (YRBSS) (Eaton et al., 2008) and the 2003-2004 National Health and Nutritional Examination Survey (Troiano et al., 2008).

The YRBSS national survey includes students in grades 9 through 12. This surveillance survey found that in 2007, 34.7% of students were physically active (physically active defined as "doing any kind of PA that increased their heart rate and made them breathe hard some of the time for a total of at least 60 min. per day on 5 or more days during the 7 days before the survey"). Also the 2007 YRBSS reported a prevalence of inactivity in 24.9% of students (inactivity defined as "did not participate in 60 or more min. of any kind of PA that increased their heart rate and made them breathe hard some of the time on at least 1 day during the 7 days before the survey") (Eaton et al., 2008 ). In terms of children, a recent study where PA was measured by accelerometers found that 42% of the children (6-11 years old) and 8% of the adolescents (12-19 years old) complied with the recommendation of 60 min of at least moderate-intensity PA per day (Troiano et al., 2008).

*PA and Physical Education Tracking*

Research findings about PA tracking are inconsistent. Studies have found a 'track' during early childhood (Pate, Baranowski, Dowda, & Trost, 1996; Sallis, Berry, Broyles, McKenzie, & Nader, 1995), including PA at home among MA and Anglo-American children (Sallis et al., 1995). Data for PA supported a 'track' from 6th to 12th grade; those identified high on PA initially remained high (Kelder, Perry, Klepp, & Lytle, 1994).

Kahn and colleagues examined the individual patterns of PA in a longitudinal study with children ten to 18 years old. They found a quadratic curve instead of a linear relationship between age and PA, and differences between boys and girls on the trend curves (Kahn et al., 2008). The quadratic curve suggested that among boys, "PA increased until approximately 11 years of age and reached a plateau, then decreased after about 13 years of age"; and for girls, "PA increased until 12 to 13 years of age, then began to decrease as in boys" (Kahn et al., 2008, p. 373).

As with PA, patterns of participation in physical education programs decreases with age (Gordon-Larsen, McMurray, & Popkin, 2000; Johnston, Delva, & O'Malley, 2007). Data from a replicated sample that was nationally representative from the Monitoring the Future (MTF) and from the Youth, Education and Society (YES) studies showed that physical education participation rates declined by age, declining substantially between eighth grade (91%) and twelve grade (34%) (Johnston et al., 2007).

*PA among Hispanics*

Beyond gender and age (or school grade), PA also varies by ethnic group. Adolescents from minority groups (non-Hispanic black and Hispanic) engage in less PA and more inactivity, and in less sport participation than Whites (Gordon-Larsen et al., 2000; Singh, Yu et al., 2008). Hispanics were the group with the highest rate of walking or biking to school across eighth grade, tenth grade and twelve grade combined; however, it was also the group with significantly lower rates of participation in intramural sports (after controlling for region and urban city), and attending schools where the smallest proportions of students are required to take physical education (PE) (Johnston et al.,

2007). This last fact should call researchers' and practitioners' attention, because PE can contribute to the total daily MVPA (Wickel & Eisenmann, 2007); and as Gordon-Larsen and colleagues suggested, "PE classes may represent the only opportunity for many adolescents to engage in weekly PA" (Gordon-Larsen et al., 2000, p.5).

Some research findings have suggested that Latina (female) adolescents have the lowest compliance rates with the national guidelines for PA (Butcher et al., 2008) and are less involved in sports (Brosnahan et al., 2004; Erkut & Tracy, 2002; Stovitz et al., 2008). Butcher and colleagues (Butcher et al., 2008) not only found that Hispanic-White girls had the lowest compliance, but also that there were gender differences among Hispanic-White adolescents: 61.4% of Hispanic-White boys complied versus only 34% of Hispanic-White girls. Data from the Study of Adolescent Health (Add Health) that included Latino adolescents (seventh grade to twelve grade) revealed that Latinas (Cuban, Puerto Rican and Mexican) were less involved in sports activities than Latino boys (except for Puerto Ricans) (Erkut & Tracy, 2002). Similarly, a cross sectional study in Nueces County, Texas, with 1,302 Hispanics and non-Hispanic Whites (14-17 years old), reported that 32% of Hispanic girls were at risk-of- overweight or were overweight; Hispanic girls (all weight categories) reported significantly fewer bouts of moderate activity, had less involvement in team sports, and spent more time watching television (Stovitz et al.).

A national study that examined PA and sedentary behaviors among immigrants and US-born children (68,288 children, 6-17 years old) found that Hispanic children (with one or both immigrant parents) had the highest percentage of physical inactivity in comparison with Whites, African Americans, and other ethnic group counterparts.

Among all the ethnic groups and immigrants statuses, foreign-born Hispanic immigrant children had the lowest likelihood of being physically active (Singh, Yu et al., 2008).

As evidenced in this section, there appears to be a high prevalence of overweight and inactivity among Hispanic children and adolescents. This prevalence is higher among girls, increases with age, and is highly associated with family factors (e.g., parents' weight status and parents' acculturation level). Before designing any intervention aimed at increasing PA among Hispanics, it is important to examine suspected determinant factors at the family level that might influence children's PA. Unfortunately, previously published research findings are based mostly on samples from White and African American populations; limited research has been published with Hispanics as the main study population.

*Suspected Determinants of PA for Children and Adolescents*

A systematic review of studies published between January 1999 and January 2005 examined the factors that correlate PA and sedentary behaviors among children (4-12 years old) and adolescents (13-18 years old). The review found that the associated factors vary by gender and age group. Male gender and self-efficacy were positively associated with PA in both age groups. Among children in the age range of 4-12 years old, PA was positively associated with parental PA (for boys) and parent support. For adolescents (13-18 years old), positive associations with PA were found for parental education, attitude, goal orientation/motivation, physical education/school sports, family influences, and friend support (van der Horst, Paw, Twisk, & Van Mechelen, 2007).

The review described above was an extension of a review by Sallis et al. (2000). The earlier review by Sallis and colleagues categorized factors influencing PA of children

and adolescents, respectively. They found an association between children's PA (3-12 years old) and sex (male), parental overweight status, PA preferences, intention to be active, perceived barriers, previous PA, healthy diet, program/facility access, and time spent outdoors. Among adolescents (13-18 years old), PA was associated with sex (male), ethnicity (White), age (inverse), perceived activity competence, intentions, depression (inverse), previous PA, community sports, sensation seeking, being sedentary after school and on weekends (inverse), parent support, support from others, sibling's PA, direct help from parents, and opportunities to exercise (Sallis et al., 2000).

As shown in the previous reviews, SES has not been consistently identified as a determinant of PA in children or adolescents. A possible explanation for the research findings, aside from PA and SES measurements, is that the type of activity and opportunities that parents provide to their children for PA involvement could vary by SES. For example, a study with children ages 7-8 years found that lack of structured sport opportunities or out of school activities for low SES did not translate into lower PA levels (Voss, Hosking, Metcalf, Jeffery, & Wilkin, 2008). However, in terms of sport involvement, those in the highest social status have a higher likelihood of current involvement in sports and continued training (Yang, Telama, & Laakso, 1996) than those in other groups. In terms of sedentary behavior, family SES and parents' educational level have been negatively associated with the amount of hours spent watching television and being in front of the computer of elementary school children (Merchant, Dehghan, Behnke-Cook, & Anand, 2007). Even when research findings about the association between family SES and PA are inconsistent, it is important to control for this factor in health related behavior studies. It has been identified as one of the factors that create the

gap between Whites' and Hispanics' health status (Kayitsinga & Martinez, 2008). However, among children and adolescents, parents' involvement might be a more influential factor than SES.

In summary, BMI and PA have been shown to be determined by multiple factors at the individual (demographical, psychological), social (family, peers), and environmental levels, and by the interaction among those factors. In this review, only those potential determinant factors that might help to examine how family social capital is associated with children's physical activity and weight status were reviewed. As demonstrated in previous sections and at the individual level, age, gender, and race are associated with PA and BMI.

At the social level, parents' beliefs and behaviors can influence children's PA and BMI. One possible mechanism by which families influence their children's PA behavior, and might prevent child's BMI, is through the benefits obtained from relationships and networks of social structures, such as family and community, referred to by some sociologists, economists, and politicians as "social capital" (e.g., Putnam, 2000; Coleman, 1987, 1988, 1990). Family and community networks can influence behavior "by shaping the flow of resources which determine access to opportunities and constraints of behavior" (Berkman & Glass, 2000, p. 140), one of such behaviors possibly being PA. As summarized by Berkman and Glass (2000), social networks influence a person's behavior through four pathways: provision of social support, social influence, social engagement and attachment, and access to resources and materials (Berkman & Glass, 2000, p. 144). In the context of PA, the flow of resources can be provided directly, indirectly, and bi-directionally. In PA, the direct flow of resources

could be, for example, attending sports events with children, enrolling children in a sports league, or buying sport equipments. The indirect flow of resources could be via parents' civic engagement, including involvement in sports events and activities and increasing the opportunities to have access to resources available in the community or among its members. Finally, the bi-directional influence could be in playing together (parent-child) and allowing the child to enjoy and value an active lifestyle.

In the next section, social capital and specifically FSC (i.e., family relationships, family-child direct time involvement, child-family-school involvement), is discussed in its capacity to be a potential determinant factor of a child's PA, a potential means to prevent obesity. Additionally, a review of several constructs and theories and their possible association with PA and BMI are presented, when possible these concepts will be discussed in the Hispanics context. There is a lack of research studying these phenomena; results of such examinations could help to design a research conceptual framework to examine the association of FSC on children's PA behavior and BMI.

### *Rationale and Theoretical Framework*

The theoretical frameworks and concepts that are suited to examine the associations of variables at family level with the child's PA and weight status are the social capital model, the ecology of human development model, social cognitive theory and self-efficacy, expectancy-value theory of achievement motivation, and acculturation (for Hispanics) . These frameworks and concepts are discussed as they relate to the research literature on children's PA and BMI.

#### *Social Capital*

Social capital does not have a standardized definition (please see Macinko and Starfield, [2001], for a review of this concept and its definitions). As pointed out by Robert Putnam, this term has "been independently invented at least six times", but all definitions have in common "the ways in which our lives are made more productive by social ties" (Putnam, 2000, p.19).

As defined by James Coleman, social capital is:

> ...social structures resources as a capital asset for the individual, that is, as social capital. Social capital is defined by its functions. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist on some aspect of social structure and they facilitate certain actions of individuals who are within the structure. ...Social capital is productive, making possible the achievement of certain ends that would not be attainable in its absence.... social capital inheres in the structured relations between persons and among persons. (Coleman, 1990, p. 302)

To facilitate the study of possible mechanisms by which the child's social structures can facilitate an active life and a healthy weight, the following section is divided into two areas: the child's personal social network— the family, and the child's public social network (Croninger & Lee, 1996).

*The child's personal social network— the family.* Coleman and Putman agree on the importance of social capital for the benefits of child development (e.g., Coleman, 1987, 1990; Putnam 2000). Coleman (1990) suggested that social capital is present in three aspects of the child's social structure: the intensity of the relationship between the adult and the child (parent-child tie [for purpose of this study, the mother-child relationship]); the relation between two adults who have relations of some intensity with the child (a triad); and the continuity of structure over time (p.590). In the family context, the first aspect refers to the intensity of the mother/father relationship with the child;

however, for the child to have benefits from this aspect of the social structure, the adult does not have to be a parent but can be any adult. In this dyad "social capital lies in the capability of the relation between the two nodes" (Coleman, 1990, p.592). Parents can have education and resources but these do not benefit the child if they do not have a strong relationship with the child (Coleman, 1988, 1990). Applying Coleman's conceptualization (1988, 1990) to the PA context, what might be important for child development is not SES , or the educational level of the mother or father , but their time, effort, commitment, encouragement (e.g., promoting PA), and support (e.g., transportation, economic) in the activities associated with PA and sports. Several research studies have noted the influence of parent/family support and a child's PA (DiLorenzo et al., 1998; Gesell et al. 2008; Heitzler et al., 2006; Pugliese & Tinsley, 2007; Sallis et al., 1999; Trost et al., 2003; van der Horst, Paw et al., 2007).

A positive association has been found between parents paying the fees for activities or sports, providing transportation to the activities, playing with children, and children's PA (Sallis et al., 1999). In a longitudinal study, Sallis and colleagues found that a parents playing with their (male) child was the only significant variable associated in the current period and over time with the child's PA (Sallis et al., 1999). A meta analysis of articles from 1960 to 2004 found a moderate positive association between parental support, model behavior, and PA among children and adolescents (Pugliese & Tinsley, 2007). Not only does actual social support influence the child, but also the child's perception of social support increases the likelihood of his/her participation in organized physical activities (Heitzler et al., 2006). Parents' encouragement and support for PA could be a more influential factor for a child's PA than seeing their parents

exercising or practicing a sport (modeling) (McGuire et al., 2002; Pugliese & Tinsley, 2007; Trost et al., 2003). In a longitudinal study, Anderssen, Wold and Torsheim (2006) did not find an association between parents' PA (modeling) and adolescents' PA. Some researchers have suggested that parent modeling is not as influential as social support because modeling does not remove barriers (Trost et al., 2003). Parental support also has a strong association with parental perceived importance of PA (Trost et al., 2003); parental support could be a proxy for how parents value PA for their children.

As presented in this section, parents' support for children's PA involvement can lead to the child's actual PA, thus making it a form of social capital. However, parents' support for the child's PA should not be confused with FSC. Family social support has been measured with indicators such as "(a) How often has a member of your family encouraged you to do physical activity or sports? (b) How often has a member of your family done a physical activity or played sports with you? (c) How often has a member of your family provided transportation to a place where you can do physical activities or play sports? (d) How often has a member of your family watched you participate in physical activities or sports?, and (e) How often has a member of your family told you that physical activity is good for your health?" (Saunders, Motl, Dowda, Dishman, & Pate, 2004, p.429; Dowda, Dishman, Pfeiffer, & Pate, 2007). In contrast, FSC is a broader concept, as previously presented.

The second form of social capital as defined by Coleman (1990) derives from the "existence of closure of a social network involving a child and two (or more) adults" (p. 593). That closure will depend on the strength of the relationship between the two adults. A positive home environment, such as family cohesion and parent-child communication,

has been shown to predict children's moderate to vigorous physical activity (MVPA) per week (Ornelas et al., 2007). However, there is a lack of literature to explain how a child's PA or weight status will benefit from the strength of the adults' (parents') relationship. A possible mechanism by which the child can obtain benefits from the two adults' relationship is when parents or parents/friends, behave "consistently and as a unit toward the child" (Coleman, 1990, p.593) to provide the child with an active lifestyle and healthy eating habits. Other possible examples could be agreement and coordination between adults (e.g., mother/father; parent/friend; parent/relative) with respect to time for family playing outside; transportation for the child's structured PA inside or outside the school; enrollment in a sports team or in a specific sports club; allocation of financial resources for exercise equipment; and family nutritional behaviors. The coordination and agreement could benefit the child's PA opportunities and eating behaviors.

In addition to the relationship between the child and the adult, and between adults, the third form of social capital as explained by Coleman (1990) is time-closure; defined as "the adult in a given type of relation with a child at one time is the same adult that was in this relation with the child at an earlier time" (Coleman, 1990, p.595). In terms of PA, if a child has interest in being on a sports team or in practicing a sport for several years, it could be beneficial for that child to continue the relation with the adult who has been a facilitator or a model in his/her sport involvement. That person might share interest in the same sport and enjoy the involvement, and could provide stable support to the child. Because published research was not found to show the last two aspects of the child's social structure (the relation between two adults who have relations on some intensity with the child, and continuity of structure over time) in the PA context, or related with the

child's BMI, studies in this area are needed. However, in the sport context, parents' support (e.g., economical, time, and emotional) and their relation with the child and the coaches through time are factors for the child to develop as an elite athlete (Baker, Horton, Robertson-Wilson, & Wall, 2003; Bloom, 1985; Côté, 1999).

Coleman (1990, p. 595) suggested various indicators of social capital in the family can benefit the child's high school achievement: (a) the presence of both parents in the household; (b) the number of siblings, with the greater number of children associated with lower the social capital for each child; (c) talking about personal matters; (d) mother working outside the home before the child is in school; and (e) parents' interest in the child's attending college. Some of these measures of relationship intensity between the parent and child can be extrapolated and tested within the PA or BMI context.

In terms of family structure that could indirectly measure the concept of time-closure, the limited research in this area suggests that this factor might not be related in the same direction in the PA or BMI context as it is with school achievement. For example, an association has been found between children from single-parent homes and higher levels of vigorous PA and watching television (Lindquist et al., 1999). No differences were found for children ages 9-13 years in receiving high parental support for PA in a two-parent household, compared with a single-parent family (Hohepa et al., 2007). As discussed earlier, the findings of family structure and BMI suggested that this association depends on the child's age group (Chen & Escarce, 2010).

Another measure of family structure is the number of siblings. Research findings suggest that the association between number of siblings is positive with PA (Bagley et al.,

2006); and negative with BMI (Chen & Escarce, 2010; Kayitsinga et al., 2009). Besides the dynamics of the relationship and the quality of the relationship of the child with the family explained in this section (child's personal social network— the family), the child can also benefit from the involvement of him/her with the family in the community and in the school, what some authors have named the "child public social network" (Croninger & Lee, 1996).

*Child's public social network.* Similar to Coleman (1987, 1988, 1990), who focused social capital on the relationship between persons in social structures (e.g., the family); Putnam (2000) defined social capital as "connections among individuals" (p.19). These connections can be with the members of the groups (formally organized or informal) to which the parents belong, or can be with outsiders. Putman (2000) defined two types of social capital, *bridging* (also called inclusive or localized), and *bonding* (or exclusive). *Bonding social capital* can get stronger from communication between members of the society ("ties") in activities such as civil engagement, religious participation, and voluntarisms. These activities can provide several opportunities for members of the groups, such as sharing information about resources in the community to engage in PA; providing social support for transportation to structured or unstructured physical activities; parents helping each other with time, transportation, and child care to support the child's PA involvement; and neighbors maintaining the safety and attractiveness of their physical environment for physical activities for children and adults.

Civic engagement (in school, community, church) can also help to create new social "weak" ties with outsiders that might facilitate access to "external assets and information diffusion" (Putnam, 2000, p.22). This is what Putnam (2000) called bridging

social capital. For Hispanic children, bridging capital might be more beneficial than bonding capital. As stated by Putnam (2004), "migration itself tends to be a socially isolating experience, as family and community ties are left behind in the place of origin, and new ties take time (for all of us) to construct in a new place" (p.5). As shown in the obesity and PA epidemiology section, parents with lower acculturation levels have a higher likelihood of having overweight or obese children than those with higher acculturation levels; however the possible mechanisms are unknown. A possible explanation is that language barriers and lack of bridging social capital negatively influence their ability to provide opportunities to the child for an active lifestyle. Searching the published literature, no evidence was found to support this hypothesis. However, research findings support that, for Hispanics, language is a barrier for access, use, and receipt of health care services as well as for health status (DuBard & Gizlice, 2008; Pearson et al., 2008). Parents might value the health and social benefits of PA/sports, and can have a high educational level and high SES , but the lack of language self-efficacy could be a barrier for their creation of ties (weak or strong). Low language self-efficacy might lead them to restrain the opportunities for the child's PA involvement, possibly decreasing the child's previous PA behavior and encouraging sedentary behaviors. Wu and Qi (2004) found a lower proportion of Hispanics and Asian-Americans participating in sports with their Kindergarten age children (3 to 6 times a week) than Whites and African Americans. Language and acculturation level could be possible explanations for this finding (acculturation and its association with PA are discussed later in this chapter).

Sedentary behavior in our society decreases social capital and the positive consequences that can be obtained from it (Putnam, 2000). In his book, *Bowling Alone* (2000), Putnam described a negative association between watching television and civic engagement or social communication (written, oral or electronic), and consequently a negative effect on social capital. "Television privatizes leisure time" (Putnam, 2000, p.236), which can affect the possibilities of the child's involvement in recreational and physical activities in the community. Various studies have found a negative association between television watching and PA among children and adolescents (Beets & Foley, 2008; Sallis et al., 1993). In summary, the association between social capital and sedentary behaviors seems bidirectional, with sedentary behaviors affecting social capital, and social capital affecting sedentary behavior.

As presented in this section, the child might obtain benefits from his/her relationship with his/her parents, as well as with the relationship between other adults inside the family context and outside the family context (the child's public social network). Following Coleman's (1987, 1988, 1990) and Putnam's (2000, 2004) operationalization of social capital, I suggest the formulation of a FSC latent construct that will include (a) family structure (number of siblings), (b) family dynamics with the child in the home, and (c) family dynamics with the child in the school and community (please see Figure 1). Family social capital, then, should be studied from an ecological perspective.

*The Ecology of Human Development*

The ecology of human development model proposed by Urie Bronfenbrenner (1979) has a contextual approach. Bronfenbrenner (1979) proposed that to understand human development it is necessary to:

> study the progressive, mutual accommodation between an active, growing human being and the changing properties of the immediate setting in which the developing person lives, as this process is affected by relations between these settings, and by the larger contexts in which the settings are embedded. (p.21)

The ecological environment is conceived as nested structures. These structures are the microsystem, mesosystem, exosystem, and macrosystem. " A microsystem is a pattern of activities, roles, and interpersonal relations experienced by the developing person in a giving setting [home, playground, school] with particular physical and material characteristics" (Bronfenbrenner, 1979, p.22), where he/she can engage in face-to-face interactions. In previous sections of this chapter, several examples of how the family (microsystem) can influence the child's PA and BMI were presented.

In addition to the family, another possible factor at the microsystem level that could influence children's and adolescents' PA is the relationship with, and support from, their friends. Having friends who encourage children to be physically active and do PA with other children provides support and has been associated with child PA (Hohepa et al., 2007; Springer, Kelder, & Hoelscher, 2006). Playing outside in the neighborhood (part of the child's microsystem) can be an opportunity for the child to be active. A sedentary lifestyle among children and adolescents is influenced by perceptions or experiences with neighborhood safety (Carver et al., 2005; Hume, Salmon, & Ball, 2007; Richmond, Field, & Rich, 2007).

The next level of the ecosystem is the mesosystem, "the interrelations among two or more settings" in which the child participates. For example, home with school, home with the neighborhood, home with the sport team involve interrelations between two settings. In terms of the interrelation of parents with the neighborhood, parents' perception of neighborhood safety can influence the opportunities to play outside, increasing the time of television watching and the likelihood of higher BMIs (Cecil-Karb & Grogan-Kaylor, 2009). Safety has been identified as an important factor in deciding where the child can play; for example, in a study with White and MA children (mean 4.9 years old), safety was the most important factor determining where the child could play (Sallis et al., 1997). A study of Hispanics in New York City found that for parents, the house is the safest place for children to play (Blakely, 1994). Also crimes (an objective measure of neighborhood safety) in the neighborhood have been positively associated with adolescent-female inactivity (Richmond et al., 2007).

The next level is the exosystems, which includes settings that do not involve the child as an "active participant" but that does affect the child. For example modeling by friends of parents has been associated with higher levels of PA (DiLorenzo et al., 1998). Another component of the exosystems is the parents' job. For labor-immigrant parents (e.g., MA) the time available out of work can be a barrier for their involvement with their children in PA or sports. Although studies have found that MA adults can be physically active (Crespo, Smit, Carter-Pokras, & Andersen, 2001 ), this can be a consequence of their occupational activities and their walking as a means of transportation during their leisure time, not as a consequence of exercising or playing with their children. As noted by Portes (2002), immigrants are a "low cost labor" that is attractive for employers, but

low wages translate to poverty and inferior schools, tough neighborhoods and the lack of role models (Portes, 2002). All of these are factors that influence negatively PA among children and adolescents.

The final level is the macrosystem, for example, the culture. Culture role stereotypes can influence the opportunities that parents provide to daughters for sport involvement (Sabo & Veliz, 2008).

In summary, an ecological perspective helps to examine how the interaction between the child and the family with the environment can directly or indirectly influence the child's PA and sedentary behaviors. Parents' perception of neighborhood safety, parents' number of jobs, and their stereotyped cultural roles are important ecological factors to control for when studying the association of FSC and the child's PA and sedentary behaviors.

*Social Cognitive Theory – Self Efficacy*

Similar to Bronfenbrenner, Albert Bandura (1977, 1997) proposes a theory which examines the child's behavior as a product of the interaction of child and environment—social cognitive theory. The "reciprocal causation" of the social cognitive theory (Bandura, 1977, 1989) proposes that "behavior, cognition and other personal factors, and environmental influences all operate as interacting determinants that influence each other bidirectionally" (Bandura, 1989, p.2). PA behavior, as with child's behaviors, is determined by multiple factors that influence each other at the individual and environmental levels. A child can have FSC but he/she might not use it to be physically active. Social capital implies that the child has the potential to obtain benefits from it, not the actual utilization of that support (Stanton-Salazar, 1997). It could be that even in the

presence of social capital, the motivation and participation in PA can be predicted by other cognitive factors, such as the child's self-efficacy (e.g., Dishman et al., 2004); and the parents' perception of the child's PA or sport competence (e.g., Fredericks & Eccles, 2002).

Self-efficacy has been shown to be a partial mediator between perceived family support and PA level among school age children and adolescents (Shields et al., 2008). A possible mechanism by which parents' perception of the child's PA affects the child's actual PA is by influencing the child's self-efficacy or the child's judgment of his/her capabilities to execute physical activities or sports (Bois et al., 2002; Dempsey et al., 1993). The self-efficacy component of social cognitive theory (Bandura, 1977, 1997) proposes that one of the sources of information that influence a child's self-efficacy is social persuasion. It is possible that realistic verbal feedback provided to the children during physical activities (playing, exercising or during sports) transmits mastering and competence information to the child and affects, positively or negatively, their self-efficacy. Unfortunately, ECLS-K data did not include self-efficacy; however, it did include parents' perception of their child's PA which is another possible cognitive process that influences children's PA. The parents' *expectancy effect* of the expectancy-value theory by Eccles, Wigfield and colleagues (Eccles (Parsons) et al., 1983; Wigfield & Eccles, 2000) has shown that parents' perception of their children's ability predicts children's beliefs and participation over time in the sport domain (Fredericks & Eccles, 2005).

*Expectancy-Value Theory of Achievement Motivation and Gender Differences*

Expectancy-value theory of achievement motivation, by Eccles, Wigfield, and colleagues, is a theoretical framework that takes into account how social agents' behavior (e.g., mother's behavior) and beliefs influence the child's expectations of success, subjective task value, and the choices that the child makes in a specific domain (e.g., sports). This theory argues that the choices, persistence, and performance of a child can be explained by his/her beliefs about how well he/she will do in a specific domain and the extent to which he/she values the activity (Eccles (Parsons) et al., 1983; Wigfield & Eccles, 2000).

It is important to understand the relationship of the components of this model. Briefly, choices are influenced by negative and positive task characteristics and the costs associated with them. Costs happen when the child chooses one alternative and eliminates other options. In this choice process there are two determinants: the relative value and the probability of success of the option. Both determinants influence performance, persistence, and task choices, and are domain specific. The child's perception of other people's attitudes and expectations (including his/her parents), affective memories, and the interpretation of his/her own previous achievement outcomes will influence some social cognitive variables (perceptions of competence, perception of the tasks difficulty, the goals of the individual, and the self scheme) that then will influence the expectancies and values. The authors distinguished the terms, 'ability' beliefs and 'expectancy' beliefs. The perception of current competence in a given domain defines ability beliefs which are focused on the present, while the expectancy beliefs are focused on the future in a given domain. Achievement values had

different components: attainment value (importance of doing well on a given task); intrinsic value (enjoyment one gains from doing the task); utility value or usefulness (refers to how a task fits into an individual's future plans); and cost.

As described above, one of the components of this theory proposes that the child's perception of others' attitudes and expectations will influence some social cognitive variables, including perceptions of competence, which will in turn influence the expectancies and values of the activity. Parents' perceptions of the child's ability in sports have been identified as the "strongest unique relationship with children's beliefs and participation both currently and over time" (Fredericks & Eccles, 2005, p.3). Parents' perceptions influence boys and girls. In a longitudinal study in France with third grade to fifth grade children (boys and girls), mother's perception of the child's physical competence was significantly related to the child's physical performance (Bois et al., 2002).

Most of the available literature in this area is about sports participation, which is a good way for children to be physically active. However, sports participation it encompasses competitive aspects and social comparisons that are not necessarily present in other types of PA (e.g., exercising or playing outside). Eccles and colleagues did a series of studies with the purpose of examining the influence of parents' belief in their children's ability in various domains, including academics and sports participation. For example, Fredericks and Eccles (2002) tested the hypothesis that motivational trajectories in math and sports are set by early experiences in the family that continue over time. Their sample consisted of 514 children from first grade to twelve grade; mothers and fathers were part of the study as well. Findings suggested that sports competence beliefs

decline over the course of schooling, with an accelerated decline beginning during middle school years. The authors suggested that possible reasons for the decline could be increases in the competitiveness context as children progress through school, school grading, and social comparison. In relation to sports and parents' beliefs, parents who rated their children's sports competence high initially had less dramatic declines over time. Parents' beliefs were associated strongly with children's beliefs. However, they also found differences between the associations of fathers' and mothers' beliefs and children's beliefs, suggesting that mothers and fathers play different socialization roles.

Parents' perceptions of the child's PA level and ability can be influenced by the child's gender and by parents' gender stereotypes (Fredericks & Eccles, 2005; Jacobs & Eccles, 1992; Mota & Queiros, 1996). Jacobs and Eccles (1992) studied the influence of gender role stereotypes on mothers' perceptions of their own children and on their children's self perception. Data were collected from children, parents, and teachers in two waves, during sixth grade and seventh grade. Sport gender stereotypes were assessed at the first wave of data collection in the children's and mothers' questionnaires. A scale was created parallel to math scales. Results revealed that mothers' gender stereotypic beliefs interacted with the child's sex and influenced their perception of their child's ability. There was a "biasing effect of mothers' gender role stereotypic beliefs on their perception of their own children's ability" (Jacobs & Eccles, 1992, p. 940). Lower ability beliefs for daughters and higher ability beliefs for sons were related to greater gender role stereotyping in sports. After controlling for other predictors, at mean levels of stereotyping, boys had higher self-perception in sports than girls.

Subsequent studies confirmed these findings and extended them to younger children. Fredericks and Eccles (2005) conducted a longitudinal study with children in second grade, third grade and fifth grade and their parents; they examined parents' socialization and two components of the task value (interest and importance). Parent socialization had three components: parent as a role model (being physically active or being involved in sports); as interpreter (with their beliefs in the value of sports, in the creation of gender differences); and as provider of emotional support (reinforces and encouragements). They found that boys have higher participation, perceived competence, and values than girls. Parents perceived that their sons had more ability than their daughters, and that sports were more important for sons than for daughters. Parents gave more opportunities and encouragements to support their sons than their daughters in sports. Additionally parents' perception of their children's ability was the strongest predictor of children's participation in sports.

As discussed in this section, parents' perceptions of the child's PA competence can influence the child's actual PA. FSC can be an asset for the child's PA behavior; however, such capital can be moderated or mediated by the child's PA self-efficacy, and by the parents' perceptions of the child's PA. Parents' perception of the child's ability can influence the social support provided to the child for PA involvement. Research findings support that there are gender role stereotypes in parents' perception of the child's PA ability which might turn into opportunities provided to the boys rather than to the girls. Therefore, parents' perception is another important factor when studying FSC as a predictor of child's physical activity. An additional factor that could influence the

availability of FSC, and the actual use of its benefits among immigrant children, is acculturation level.

*Acculturation Level*

> The long-term psychological consequences of this process of acculturation are highly variable, depending on social and personal variables that reside in the society of origin, the society of settlement, and phenomena that both exist prior to, and arise during, the course of acculturation. (Berry, 1997, p. 5)

Acculturation has been defined at the individual and group levels. In 1936, Redfield, Linton, and Herskovits defined acculturation as "Acculturation comprehends those phenomena which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original culture patterns of either or both groups" (Redfield, Linton, & Herskovits, 1936, p.149). Berry (2005) defined it as "the dual process of cultural and psychological change that takes place as the result of contacts between two or more cultural groups and their individual members" .... "At the individual level it involves changes in person's behavior repertoire..." (Berry, 2005, pp. 698-699). Acculturation has been operationalized in many different ways, including simple questions such as language of preference, or with scales (e.g., Brief Acculturation Rating Scale for Mexican Americans–II (ARSMA-II)). Acculturation definitions and measurements are beyond the scope of this review; please see Cabassa (2003) for a review of the theoretical models and assumptions that drive acculturation measurements.

Acculturation level has been significantly correlated with Hispanic immigrants' health related behaviors such as smoking, alcoholism, PA, dietary habits, BMI, weight-related behavior, and self-perceptions about weight (Ahluwalia et al., 2007; Berrigan,

Dodd, Troiano, Reeve, & Ballard-Barbash, 2006; Crespo et al., 2001; Detjen, Nieto, Trentham-Dietz, Fleming, & Chasan-Taber, 2007; Gordon-Larsen, Harris, Ward, & Popkin, 2003; Zemore, 2007).

The relationship between acculturation levels and PA behavior is not constant among age groups. To understand how acculturation level could be a determinant factor on immigrant-child's PA behavior, it is necessary to review findings from studies on adults and children.

PA behavior varies by acculturation level among Hispanic adults (Berrigan et al., 2006; Crespo et al., 2001; Evenson, Sarmiento, & Ayala, 2004) and adolescents (Gordon-Larsen et al., 2003). Among adults, inactivity during leisure time was found to be higher for MA with Spanish rather than English as their main language in a study of Crespo and colleagues (Crespo et al., 2001). Similarly, in terms of adherence to recommendations on leisure time PA, Berrigan and colleagues found that it was higher among the most acculturated participants (Berrigan et al, 2006). A study in North Carolina with 671 first generation Latina immigrants (20-50 years old) found that those with higher English language proficiency, greater acculturation level, and who arrived in the US at young ages had a higher likelihood of being physically active (Evenson et al., 2004).

While study findings show a positive association between MA adults' acculturation level and PA, findings from studies of adolescents and children seem to be in the opposite direction. A research study with a nationally representative sample of adolescents, including Hispanic immigrants (seventh grade to twelve grade), found that among Mexicans the "inactivity and low intensity PA increased with generation of US residence" (Gordon-Larsen et al., 2003). Similarly, a study with sixth graders in Southern

California (Asian Americans and Hispanics) found a positive association between acculturation level and a lower frequency of PA participation (Unger et al., 2004). These inconsistencies in findings and differences among age groups suggest an important area for future research. It is possible that acculturation and PA measurements, as well as other non studied antecedents, are responsible for these differences.

Immigration status (classified as legal or illegal) may or may not be associated with acculturation level. But it is a socio-cultural factor that can influence PA among Hispanics. For example, illegal immigrants may fear arrest by US Immigration and Naturalization Service while they are in public neighborhood parks (Martinez, Arredondo, Perez, & Baquero, 2009). The association of acculturation and BMI was discussed previously in this chapter.

*Summary*

In summary, increasing children's PA can provide health benefits to the child, including being an effective means of decreasing the high prevalence of obesity among children and adolescents. Parents can influence their children's PA and sports involvement. The child can benefit from his/her relationship with his/her parents and by the opportunities provided to him/her to be involved in physical activities or sports. Family structure, family involvement with the child and family social support together become a type of social capital, FSC. This social capital in early childhood can be potential determinant factor of the child's PA and weight status during adolescence. However, there are family constraints (e.g., neighborhood safety), as well as other parent (e.g., parent's perception of child's PA ability) and child (e.g., gender, age, race) characteristics that can influence the availability and use of this type of social capital.

Among Hispanics and other immigrants, acculturation level and language can be additional factors influencing FSC for the child's involvement in PA.

There has been limited research that examines which child, mother, and family factors influence children's PA participation and BMI from a life-course perspective, and how these associations vary by ethnic group. Examining which Hispanic family-related factors in early childhood are associated with child PA behavior and BMI, in late childhood or adolescence could be helpful in the design of effective ecological and culturally-sensitive intervention programs to increase children's PA, as well as decreasing or preventing obesity and overweight prevalence in the United States.

# Chapter 3

# Methods

## *ECLS-K Data and Research Design*

To test the research hypotheses (presented in Chapter 1) I conducted a secondary data analysis using data from the Kindergarten-Eighth Grade Full Sample Public-Use Data File of the ECLS-K Class of 1998–99. These data are released by the U.S. National Center for Education Statistics (NCES); which makes publicly available the data from the ECLS-K, a longitudinal study that has individual, school, and community level variables. ECLS-K involves a nationally representative cohort of 21,260 children enrolled in Kindergarten programs (public and private schools; full day or part-day) during the 1998–99 school year. The K-8 full sample public-use data file has a record for 21,409 cases that participated in any wave from fall-Kindergarten to spring of eighth grade.

Data were collected from parents, principals, teachers, and students. The data collection waves of the ECLS-K were conducted during the fall and spring of Kindergarten (1998-99), the fall and spring of first grade (1999-2000), the spring of third grade (2002), the spring of fifth grade (2004), and the spring of eighth grade (2007). I limited the data analysis to the data from parents' questionnaires of fall and spring of Kindergarten (1998-99), the spring of third grade (2002), and the spring of fifth grade (2004); and to the students' questionnaires of spring of eighth grade (2007). Surveys of those waves contain the variables that were useful to test this study's hypotheses.

The ECLS-K study used a multistage probability sample design. The primary sampling units (PSUs) were the counties and groups of counties (100 PSUs); second

stage units were schools within the sampled PSUs (1,277 schools: 914 publics and 363 privates); the third stage unit was the students within the selected schools (approximately 23 kindergartners per sampled school).

*Data collection procedures*

"The ECLS-K sample represents nearly four million children who attended Kindergarten in the United States in the 1998-99 school year, or attended first grade in the United States in the 1999-2000 school year" (Walston, Rathbun, & Germino-Hausken, 2008, p.1). Data were collected by one-on-one assessments, computer-assisted telephone interviews (CATI), and self-administered paper and pencil questionnaires. Even when the data collection included direct assessment of the children (e.g., mathematics, reading, and science) this secondary data analysis did not use that section of the data. Among the waves, ECLS- K survey questions were reviewed by content area specialists to assure that content and difficulties were appropriate to a child's age. Anthropometric measures included height, weight, and children's psychomotor skills (fall Kindergarten only, [e.g., hopping, skipping, jumping, manipulating blocks, drawing figures]). Translators were utilized, when available, for parents who preferred to answer the questionnaire in Spanish. Quality control procedures were employed during all stages of the study. For example, in eighth grade, parents' interviews were validated in 10% of the respondent cases.

*Study Sample*

The data analysis sample was limited to those cases where the resident biological mothers provided responses to the questions during the waves of Kindergarten, third grade, fifth grade, and eighth grade. In general more than 80% of the respondents of

ECLS-K study were mothers. The Kindergarten-Eighth Grade Full Sample Public-Use Data File contains a total of 21,409 cases that encompass all of the seven waves, from fall Kindergarten to spring eighth grade. This study sample consisted of 14,832 cases: children living with the mother during the fall of Kindergarten and whom the mothers were the survey respondents.

To test hypotheses 1, 2, 5, 6, and 9 the study sample at Kindergarten comprised all races (n=14,832). From this sample, a total of 6,137 cases were used for analyses, cases that had data from eighth grade and from at least one of the other three previous waves. To test hypotheses 3, 4, 7, and 8, the study sample consisted of only White (n=4,190) and Hispanic (n=970) cases, those cases had data from eighth grade and from at least one of the other three previous waves. For comparison purposes, Whites were selected as the reference group because they were the group with the larger sample which helps to obtain more precise statistical estimates (i.e., smaller standard errors). To test hypotheses 10 and 11 only Hispanic cases were used for analyses (n=970 cases).

For more details on study design and procedures from Kindergarten through the eighth grade, please refer to *Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Combined User's Manual for the ECLS-K Eighth-Grade and K–8 Full Sample Data Files and Electronic Codebooks* (NCES 2009–004) (Tourangeau, Nord, Lê, Sorongon, & Najarian, 2009).

*Measurements*

ECLS-K measurement instruments for Kindergarten, third grade, fifth grade, and eighth grade were reviewed. I prepared a matrix of variables to help in answering this

study's research questions. The measurement instruments are available on the ECLS-K website http://nces.ed.gov/ecls/kinderinstruments.asp.

Independent variables included in this study were assessed during the Kindergarten, third grade, and fifth grade waves. Most of the questions were in multiple choice format comprised of mutually exclusive categories; they were included in the analysis in their original format except where otherwise specified. "Refused" and "don't know" responses were treated as missing values during the analysis.

Several variables were latent constructs (i.e., FSC, PA-score, MP, and MACC). The questions that were used to formulate these constructs were included in an Exploratory Factor Analysis (EFA) individually, not as a score or a sum, but as individual indicators. Exploratory Factor Analysis is "used as a means of exploring the underlying factor structure without prior specifications of number of factors or components" (Kim & Mueller, 1978, p.77); it was used to examine the internal reliability of these constructs and their factors' structure. For the EFA formulation, the individual questions for observed variables were included in the model as they were assessed originally in the ECLS-K study, except as otherwise specified in the next section. Those indicators resulting in a factor weight $\geq 0.40$, which explained approximately 16% of the variance (Guadagnoli & Velicer 1988; Stevens, 1992), were selected to formulate the final latent construct.

*Dependent Variables*

The main dependent variables were adolescent's physical activity score and weight status (BMI) at eighth grade.

*Adolescent's physical activity score (PA-score).* Adolescents reported their physical activity level (1 question), and their involvement with sports (2 questions). With these three questions, I created a latent construct *physical activity score* (PA-score). EFA was used to examine this construct. Below I present how these three questions were assessed.

*Self reported PA level, eighth grade.* Adolescents answered a self-administered questionnaire at eighth grade. They reported "on how many of the past 7 days did you exercise or participate in PA for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic exercise?" Responses ranged from 0 to 7 days. This variable was a continuous variable for hypothesis testing, from 0 days to 7 days. This question does not provide information required to calculate energy expenditure of the performed activities. However, it has been used in previous studies to classify students as active or low active (Trost, Pate, Ward, Saunders, & Riner, 1999); as meeting or not meeting "physical activity requirements" (Liu et al., 2009); and as a measure of vigorous PA (VPA) (Eisenmann et al., 2008). This classification (active/low active) was based on the guidelines issued by The International Consensus Conference on PA Guidelines for Adolescents in 1994: "adolescents should engage in three or more sessions per week of activities that last 20 min or more at a time and that require moderate to vigorous levels of exertion" (Sallis & Patrick, 1994, p.302).

*Self reported sport involvement, eighth grade.* Students reported if they had participated in the following school-sponsored activities during the school year. For school sports, response alternatives were (a) did not participate, (b) participated, and (c)

participated as an officer, leader, or captain. Those who responded "Participated" were classified as Athlete (1); otherwise they were classified as Non Athlete (0). *Self reported sport involvement, eighth grade* was a dichotomized variable: Athlete (1) or Non-Athlete (0).

*Self reported non-school based sport involvement, eighth grade.* This variable was assessed by the question: How often do you spend time...playing non school sports? Alternatives were: rarely or never; less than once a week; once or twice a week; every day or almost every day. Those who responded "rarely or never" were classified as Non-Athlete (0), otherwise they were classified as Athlete (1). *Self reported non-school based sport involvement* was a dichotomized variable: Athlete (1) or Non-Athlete (0).

*Weight status.* The variable was measured using a composite variable Body Mass Index (BMI). This variable was calculated for each wave "by multiplying the child's composite weight in pounds by 703.0696261393 and dividing it by the square of the child's composite height in inches". (http://www.nber.org/~kling/surveys/Userguide.pdf) In each wave the study trained staff measured the child's height and child's weight. For height, the Shorr Board vertical stadiometer (accuracy = 0.01 cm) was used, and a Seca digital scale (accuracy = 0.1 kg) was used to assess the weight. Both measures were collected twice for each child.

*Independent Variables*

The three main predictor variables were FSC, MP, and MACC (only for Hispanics). These three variables were not directly measured in the ECLS-K, however several questions were used as indicators to formulate latent variable for each concept (FSC, MP, and MACC). All of the FSC, MP, and MACC indicators were reported by the

mother during the first (Kindergarten fall) and second (Kindergarten spring) waves of the ECLS-K; except for one indicator of mother's acculturation (age when moved to the US) that was reported in the fifth wave.

*Social Capital embedded in the family*: *Family Social Capital (FSC)*. There is not a standard measure for social capital or for FSC. After reviewing the literature in the domains of social capital, FSC and children's outcomes, and previous research studies with the ECLS-K data, the operationalization of social capital by Coleman's (1987, 1988, 1990) and Putnam's (2000, 2004) were applied to help in the testing of this study's hypotheses. I formulated a FSC latent construct that included the factors: (a) family structure - number of siblings (Coleman, 1988, 1990); (b) family relationships; (c) family involvement with the child (Coleman, 1988, 1990); (d) family-school involvement (Coleman, 1988, 1990; Putnam, 2000); and (e) family social support (Coleman, 1988, 1990; Putnam, 2000) (please refer to Figure 1). The formulation of the FSC included the following indicators: number of siblings, intensity of relationships, child-family activities in the home, child-family activities outside the home, child-family-school involvement, social support for involvement in school activities, intergenerational closure, and residence mobility. Below there is a description of how these indicators were assessed.

*Number of siblings.* It was a composite variable from the data set that included full, step, adoptive, or foster kids with whom the child lived in the household. "Siblings were identified through the respondents' stated relationship of the sibling to the focal child. In addition, any child that was reported to be a child of the focal child's parent/guardian was considered a sibling of the focal child" (Tourangeau, Nord, Pollack, & Atkins-Burnett, 2006, p. 7-21)

*Intensity of relationships.* The aspects of the social structure that denotes intensity of the relationships in the family include: *mother-child relationship* —the intensity of the relation between an adult (i.e., mother) and child; and *mother-partner relationship* —the intensity of the relation between two adults (i.e., mother-partner). *Mother-child relationship* is a variable that denotes connection between the mother and the child. It was measured using responses to the statements about the mother's relationship with the child. The statements included: (a) I often have warm, close times together; (b) Most of the time I feel that {CHILD} likes me and wants to be near me; (c) Even when I'm in a bad mood, I show {CHILD}; a lot of love; (d) I express affection by hugging, kissing, and praising {CHILD}; (e) {CHILD} does things that really bother me; (f) I find myself giving up more of my life to meet {CHILD}'s needs than I ever expected; (g) I often feel angry with {CHILD}; and (h) {CHILD} seems harder to care for than most. Possible answers to the statements were completely true (1), mostly true (2), somewhat true (3), or not at all true (4). It was recoded as: completely true (4); mostly true (3), somewhat true (2), or not at all true (1). Answers to alternatives *e*, *f*, *g*, and *h*, were reversed. Alpha reliability for the combined questions (8 items) is 0.55. *Mother-partner relationship.* The relation between the mother and her partner was assessed with the questions: Would you say that your relationship is...very happy (1), fairly happy (2), or not too happy (3). It was recoded to create the following categories: very happy (3), fairly happy (2), or not too happy (1).

*Child-family activities.* This variable was assessed in Kindergarten by asking: In a typical week, how often do you or any other family members do the following things with {CHILD}? Alternative answers were: not at all (1), once or twice (2), 3-6 times (3),

or every day (4). The activities with the child included: (a) tell stories to the child; (b) sing songs; (c) help the child to do arts and crafts; (d) involve the child in household chores, like cooking, cleaning, setting the table, or caring for pets; (e) play games or do puzzles with the child; (f) talk about nature or do science projects with the child; (g) build something or play with construction toys with the child; (h) play a sport or exercise together; and (i) read books to the child. In this study sample the Alpha reliability of the combined questions (9 items) is 0.72. Alternatives were recoded as: not at all (0), once or twice (1), 3-6 times (2), or every day (3). Using data from the first and third grade of the ECLS-K, Tanner-Smith (2006) reported a reliability Alpha of 0.71 for a "within-family social capital" scale that was created using eight items of this question (i.e., "tell child stories, sing songs with child, help child do art, play games with child, teach child about nature, build things with child, play sports with child, read to child." p.7).

*Child-family activities outside the home.* Mothers responded with Yes (1)/No (2) to questions about activities outside the home during the last month (i.e., gone to a play, concert, or other live show; visited an art gallery, museum, or historical site; visited a zoo, aquarium, or petting farm; and attended an athletic or sporting event in which {CHILD} was not a player). Answers to these questions were recoded and dichotomized as Yes (1), and No (0). Alpha reliability of the combined questions (four items) is 0.39. The items from these questions have been used previously as indicators of "parent-home involvement" (Carpenter, 2005).

*Child-family-school involvement.* Mothers responded with a Yes (1) or No (2) to the questions: "Since the beginning of this school year, have you or the other adults in your household...": (a) attended an open house or back-to-school night; (b) attended a

meeting of a PTA, PTO, or Parent-Teacher Organization; (c) gone to a regularly-scheduled parent-teacher conference with {CHILD}'s teacher; (d) attended a school or class event, such as a play, sports event, or science fair; (e) volunteered at the school or served on a committee; and (f) participated in fundraising for {CHILD}'s school. Answers to these questions were recoded as Yes (1), and No (0). Alpha reliability for this set of questions for Kindergarten was 0.58 which is similar to the alpha reported by Hamilton, Cheng and Powell (2007) in their study which analyzed data from the Kindergarten and first grade of ECLS-K ($\alpha = .60$). Hamilton and colleagues (2007) used this variable as an indicator of "social capital resources." Similarly other authors have used some of the activities assessed in this question as indicators of "parental social capital" (i.e., parent attend open house; parent attend teacher conferences; parent attend school event; and parent was a school volunteer) (Schlee, 2007), and "social capital" (i.e., parent attended the school's open house; parent attended a parent-teacher conference; parent acted as a school volunteer) (Schlee, Mullis, & Shriner, 2009). Additionally the items from this question have been used previously as an indicator of "parent-school involvement" (Carpenter, 2005). The previous four indicators of FSC can be described as measures of the intensity of the parent-child relation (Coleman, 1987, 1988, 1990): (a) family structure-number of siblings (Coleman, 1988, 1990); (b) child-mother relationship; (c) family interaction with the child (Coleman, 1988, 1990); (d) family-school involvement (Coleman, 1988, 1990).

*Social support for involvement in school activities. The* ECLS-K does not have direct questions about social support for the wave of Kindergarten; neither does it have a direct assessment of social support for PA. Family social support was used as a proxy of

social capital because, as noted by Portes (1988), social capital is "the ability of the actors to secure benefits by virtue of membership in social networks or other social structures" (Portes, 1998, p.6). The relationships in the family social networks facilitate the involvement of the family with the school, providing support for them to participate in school activities, such as transportation and child care. In Kindergarten the mother answered Yes (1) or No (2) to several reasons that made it harder for her to participate in activities at her child's school during the current year. I chose some of the reasons that can be proxies of social support: no child care keeps your family from going to school meetings or events; and problems with transportation to the school. Answers to these questions were recoded as Yes (1), and No (0).

*Social ties - intergenerational closure.* Mothers reported how many parents of children in their child's class they talk with regularly, either in person or on the phone. Social ties is a continuous variable from 0 to 40. This ECLS-K question has been used by other researchers as an indicator of social capital (Hamilton et al., 2007; Schlee et al., 2009).

*Residence mobility.* During the fall of Kindergarten the mothers reported on how many different places the child has lived, for four months or more, since the child was born. It was a continuous variable from 1 to 20. Residence mobility was used as an indicator of the stability of social ties and networks.

The second main predictor was the mother's perception of child's physical activity level in comparison with his/her peers at Kindergarten (MP-K). It was a latent construct formulated with questions that assessed MP in three settings: (a) structured activities, (b) free time, and (c) aerobic exercise.

*MP-K.* Mothers rated their children in each of these settings on a scale of 1 (*less active*) to 3 (*more active*). They answered the question: "Thinking about {CHILD}'s overall activity level, would you say {he/she} is ..." (a) less active than their (boy/girl) peers, (b) as active as peers, or (c) more active than peers. These three indicators have a Cronbach's alpha of 0.74, which is the same as reported by Beets and Foley (2008). Gannotti and colleagues combined the three questions as one measure of perceived activity level by parents, with a possible minimum score of 3 and a maximum of 9 (Gannotti, Venerie, & Robert, 2007). However to examine my hypotheses these three questions was used to formulate a latent variable.

The third main predictor was *mother's acculturation level (MACC) at baseline.* It was used to test only the hypotheses in the Hispanic model. Acculturation level was not assessed in ECLS-K; however several questions can be used to create a latent variable as a proxy of acculturation level. These are (a) country of birth, (b) age when moved to the US, and (c) language (primary language and English proficiency). Escobar and Vega (2000) recommended these objective measures in assessing level of acculturation instead of more complex. The variables place of birth, age when moved to US, language at home, and English proficiency have been used previously to measure acculturation (e.g., Liu et al., 2009; Sussner et al., 2009).

*Mother's country of birth* was assessed in the fifth wave (spring - third grade); it was recoded as a dichotomous variable: US born (0) and Non US born (1). *Age when first moved to the United States* was assessed in the fifth wave (spring - third grade). It was a continuous variable. I created a categorical (ordinal variable) with 7 categories of age groups (Rumbaut, 2004). These categories represent stages of life: 0-5; 6-12; 13-17;

18-24; 24-34; 35-54; and, 55 or more (Rumbaut, 2004). In the study sample, only six categories resulted with cases; these categories were recoded as: 0-5 (5); 6-12 (4); 13-17 (3); 18-24 (2); 24-34 (1); and, 35-54(0).

*Language.* Several questions assessed language spoken at home, and the mother's English proficiency. *Primary language spoken at home.* In Kindergarten the mothers answered to the question: What is the primary language spoken in your home? This variable was recoded as English (1), and Non-English (0).

*English proficiency.* In fall of Kindergarten the mothers responded to: How well do you: (a) Speak English, (b) Read English, (c) Write English, and (d) Understand someone speaking English?: very well (1), pretty well (2), not very well (3), or not well at all (4). Answers were reversed to: very well (4), pretty well (3), not very well (2), and not well at all (1).

*Control variables*

Based on theoretical and empirical evidence discussed in the literature review presented in Chapter 2, several factors were identified as possible mediators or moderators in the association between FSC and the child's PA and BMI. At the child's level, several variables that could influence the association between social capital and his/her future physical activity level and BMI were assessed at the baseline (fall or spring of Kindergarten). These variables were race, gender, child's place of birth, child's disability, child's weight status, child's PA level, child's involvement in sports, and hours of television watched per week. At the family level, some of the variables that were identified with the child's physical activity and/or weight status were family structure, mother's perception of the neighborhood's attributes and safety, mother's employment

status, family's rules of hours of television viewing, family SES, parent's place of birth, and place of residence (urbanicity and region).

*Child's race.* Mother's reported race at the first wave of the study, the categories of this variable included: White-Hispanic, or Latino Group; American Indian or Alaska Native; Asian; Black or African American; Native Hawaiian or Other Pacific Islander; White; and another races. I collapsed these categories into four groups: Whites (0-reference group), African Americans (1), Hispanics (2), and Others (3).

*Gender.* The child's gender was assessed in the first wave: Male (1) and Female (2). This categorical variable was recoded as Male (0) and Female (1).

*Child's disability.* This is an ECLS-K composite variable that indicates whether a child had a disability that was diagnosed by a professional. The composite variable is different depending on the conditions that were assessed in each wave. Example of the conditions are overall activity level, overall behavior and relations to adults, ability to communicate, difficulty hearing and understanding speech, and eyesight. Child's disability is a dichotomous variable Yes (1), and No (0).

*Child's PA level-parents reported.* Child's PA level was assessed by the question: "In a typical week, on how many days does (CHILD) get exercise that causes rapid breathing, perspiration, and a rapid heartbeat for 20 continuous minutes or more?". Responses ranged from 0 to 7 days. This variable was a continuous variable for hypothesis testing, from 0 days to 7 days. This is the same question that children answered themselves at eighth grade.

*Organized athletic activities.* This variable was assessed with the question: Outside of school hours in the past year, has {CHILD} participated in organized athletic

activities, like basketball, soccer, baseball, or gymnastics. Alternatives were Yes (1) or No (2). This variable was recoded as Yes (1) and No (0).

*Child's place of birth.* This variable indicates if the child was born in the US, Yes (1) or No (2). It was recoded as Yes (1) and No (0).

*Child's sedentary behavior.* The mother reported how many hours the child watched television during school days and during weekends. With this information a variable was created by multiplying the total number of hours reported for a weekday times five, plus the total number of hours during the weekends; it was a continuous variable. After the total number of hours per week was obtained, those children that watched 14 hours or less of TV per week (2 hours or less of per day) were categorized as (0), and those with more than 14 hours (more than 2 hours per day) were categorized as (1). This classification was based on the recommendations of the American Academy of Pediatrics (2001). Hours of television viewing reported by parents has previously been used as one measure of sedentary behavior among elementary school children (Drenowatz et al., 2010).

*Family Structure.* The population sample for this study included only biological mothers. *Family structure* was recoded as follows: two biological parents or biological mother and a partner (0); and biological mother only (1). All other categories were dropped from the database, leaving only those families where the biological mother lived with the child.

*Parent's place of birth.* Mothers reported the country of birth of both parents. A dichotomous variable was created, none US-born parent (0), and one or both parents US-born (1).

*Mother's employment status.* The mothers reported number of jobs hold. Those that did not report to be working were recoded as (1), and those that reported one or more jobs were recoded as (0).

*Neighborhood safety to play.* This variable was assessed with the question: How safe is it for children to play outside during the day in your neighborhood? Alternatives were recoded as: not at all safe (0); somewhat safe (1); and very safe (2).

*Neighborhood Attributes.* This variable was assessed with the questions: How much of a problem are the following in the block or area around your house or apartment? Would you say they are a big problem (1), somewhat of a problem (2), or no problem at all (3): (a) garbage, litter or broken glass in the street or road, on the sidewalks, or in yards; (b) selling or using drugs or excessive drinking in public; (c) burglary or robbery; (d) violent crimes like drive-by shootings; and (e) vacant houses and buildings. Answers to these questions were recoded as: big problem (0), somewhat of a problem (1), and no problem at all (2). A composite score was created with a range from 0 to 10. The higher the score the safer the neighborhood. In the present sample these five indicators have an Alpha reliability of .75, the same as reported by Beets and Foley (2008).

*Parental rules for hours of television watching.* During the spring of Kindergarten the mothers reported if there were family rules about how many hours the child may watch television. It was recoded as No (0), and Yes (1).

*SES.* Family SES was a composite variable in the ECLS-K data set. The components used to create the SES were as follows: (a) father/male guardian's education; (b) mother/female guardian's education; (c) father/male guardian's occupation; (d)

mother/female guardian's occupation; and (e) household income. Occupation was recoded to reflect the average of the 1989 General Social Survey (GSS) prestige score. This was computed as the average of the corresponding prestige scores for the 1980 Census occupational categories covered by the ECLS-K occupation variable (Tourangeau, Nord, Lê, Pollack, & Atkins-Burnett, 2006, p. 7-25).

*Urbanicity.* ECLS-K has a composite variable that denotes location type for school. For Kindergarten it included three main categories, central city (0), urban fringe and large town (1), and small town and rural (2).

*Region.* ECLS-K has a composite variable that denotes the geographic region of the school. For Kindergarten it included four regions, Northeast (0), Midwest (1), South (2), and West (3).

### *Statistical Treatment*

Different statistical techniques were used for analysis: exploratory data analysis; descriptive data analysis; multilevel modeling (HLM); Structural Equation Modeling (SEM); and EFA. The statistical significance level was set at the conventional value of $p < .05$ for all the statistical tests.

#### *Exploratory Data Analyses*

*Exploratory data analyses* (e.g., frequencies, percentages, histograms) was used, as appropriate, in order to identify possible outliers, out of range values, and be able to complete the data cleaning process to enhance data quality prior to statistical analysis.

#### *Descriptive statistics*

A description of the sample included the distribution (means, frequencies, percentages) of child, family, and community level variables. *Bivariate analysis* was

conducted to test differences and to assess relationships among variables and between groups (e.g., boys and girls; Hispanics and Whites) using the *t*-test, Chi-square, and Pearson correlation as appropriate.

*HLM*

Hierachical Linear Modeling was used for two main purposes. First, the data come from a multistage clustering design where at Kindergarten the children are nested within schools. The nesting structure of children in schools might imply a violation to the assumption of lack of independence of the individual scores on the dependent variables PA-score and BMI; therefore the independence assumption of classical regression method does not apply. HLM seems appropriate for this data because it is a statistical technique that handles this lack of independence. Second, the repeated measurements from each subject in the ECLS- K create the possibility of correlation among observations. The repeated measurements (e.g., physical activity level, BMI) are nested within subjects. Again the independence assumption is violated. Intra-class correlation coefficients (ICC) were examined to determine possible cluster effect at school level with the main outcomes PA-score and BMI. As explained by Muthén (1996) the ICC is "the amount of between-group variation divided by the total amount of variation (between plus within)" (Muthén, 1996, p. 4). Additionally, the size of the design effect was examined to determine possible cluster effect at school level.

*EFA*

To formulate FSC and other latent constructs (PA-score, MP and MACC) I used EFA. It was explained previously in the measurement section of this chapter.

*SEM*

To test the hypotheses I used SEM. SEM is used to test the fit of the model when dealing with latent variables. Three model fit indices were used: the Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) where values of 0.95 or greater suggest adequate fit (Hu & Bentler, 1999); and the Root Mean Square Error of Approximation (RMSEA), where values of less than 0.08 indicate adequate fit, and values under 0.05 which suggest excellent fit (Browne & Cudeck, 1992).

MPlus statistical software was used to conduct hierarchical lineal modeling to account for the possible clustering effect at the school level and for SEM.

*Complex Sample Design (weights)*

Because ECLS-K is not a simple random sample, the use of weights allowed producing estimates that are representative of the cohort of children of Kindergarten in 1998-99 (Tourangeau et al., 2009). The ECLS-K public data set contains un-weighted frequencies for all variables. ECLS-K data are weighted to compensate for unequal probabilities of selection at each sampling stage and to adjust for the effects of school, child, teacher, and parent non response; after Kindergarten only child-level weights were computed (Tourangeau et al., 2009). For longitudinal analysis I used C1_7FP0; this weight is to be used for analysis of parent interview data from six rounds of data collection, alone or in combination with child assessment (Tourangeau et al., 2009).

# Chapter 4

## Results

This dissertation had six aims that were tested within three models: Model 1) Family Social Capital; Model 2) Mother's perception of child's PA relative to child's peers and FSC; and Model 3) Hispanic' model, mother's acculturation level, FSC and MP. Model 1 examined the association between FSC at Kindergarten and child's PA and BMI at eighth grade, and possible race differences in these associations (Aims 1 and 3). Model 2 examined the association between MP of child's PA, relative to child's peers, at Kindergarten, and child's PA and BMI at eighth grade; and possible race differences in these associations (Aims 2 and 3). Also Model 2 examined if the association between FSC at Kindergarten and child's PA and BMI at eighth grade was attenuated by MP of child relative to peers' PA at Kindergarten (Aim 4). Model 3 examined the association of mother's acculturation level at Kindergarten with child's PA and BMI at eighth grade, after controlling for FSC, MP and other covariates (Aim 5). Additionally Model 3 examined potential determinant factors at Kindergarten of child's PA and BMI on third grade, fifth grade, and eighth grade, among Hispanic children (Aim 6).

Guided by these purposes, this Results chapter is organized into the following sections: (a) descriptive statistics of the sample, (b) bivariate associations, (c) differences between groups (males and females; Whites and Hispanics), and (d) hypothesis tests based on FSC and PA and BMI; MP and FSC; and the Hispanic model (MACC, FSC, and MP). The hypotheses section is organized by the three models.

*Description of Study Sample*

Prior to running descriptive statistics, the study variables were recoded as explained in Chapter 3. Table 1 (categorical variables) and Table 2 (continuous variables) present the description of the study sample (Whites, African Americans, Hispanics, and other races), as well as the differences between groups (Whites and Hispanics) for selected demographics, and other child and family characteristics. To test differences between groups (Whites and Hispanics; males and females), the *t*-test and Chi-square were used.

In terms of demographic characteristics, the study sample had 14,832 cases of children who were living with their mothers and whose mothers were the respondents in Kindergarten. Whites (n=8,838) represented 60% of the study sample, and Hispanics (n=2,619) represented 18%.

For the whole study sample, at Kindergarten, the mean number of days with 20 min or more of children's MVPA, as reported by the mother, was 3.64 days/wk; and 43% of the children were involved in sports out of school hours during the previous year. The study sample spent approximately 14 hours per week watching television, DVD, or video. Fifty three percent (53%) of the parents reported having rules for the number of hours of television watching. The average BMI in the total study sample was 16.4 $kg/m^2$.

Table 1

*Selected child and family characteristics at baseline, overall and for Whites and Hispanics*

| Characteristic | Total n= 14,832 | Whites n=8,838 | Hispanics n=2,619 |
|---|---|---|---|
| Gender | | | |
| Male | 51% | 51% | 49% |
| Female | 49% | 49% | 51% |
| Child's disability* | | | |
| Yes | 14% | 16% | 11% |
| Child's country of birth* | | | |
| US Born | 98% | 99% | 93% |
| Non-US Born | 2% | 1% | 7% |
| Past year organized athletic activities, outside of school* | | | |
| Yes | 53% | 59% | 26% |
| Average hours of television watching per day* | | | |
| ≤2 hr | 60% | 65% | 56% |
| > 2 hr | 40% | 35% | 44% |
| Family structure* | | | |
| Both biological (nucleus family) or Mother-partner | 79% | 87% | 77% |
| Mother-only | 21% | 13% | 23% |
| Number of siblings | | | |
| None | 15% | 11% | 19% |
| One | 27% | 28% | 28% |
| Two | 43% | 47% | 38% |
| Three or more | 15% | 14% | 15% |
| Parents' country of birth* | | | |
| At least one parent born in US | 88% | 99% | 56% |
| Both parents non-US-born | 12% | 1% | 44% |
| Mother's employment status | | | |
| Working | 68% | 69% | 59% |
| Not Working | 32% | 31% | 41% |
| Mother's perception of neighborhood safe to play* | | | |
| Not at all safe | 4% | 2% | 10% |
| Somewhat safe | 26% | 18% | 39% |
| Very safe | 70% | 80% | 51% |
| Home rules for hours of television watching* | | | |
| No | 47% | 50% | 40% |
| Yes | 53% | 50% | 60% |
| Urbanity | | | |
| Central City | 42% | 31% | 61% |
| Urban fringe and large town | 38% | 43% | 32% |
| Small town and rural | 20% | 26% | 7% |
| Region | | | |
| Northeast | 19% | 23% | 13% |
| Midwest | 26% | 32% | 11% |
| South | 32% | 29% | 27% |
| West | 23% | 16% | 49% |

*Significant race differences (Whites and Hispanics) using the Chi-Square Test, $p \leq .05$.

Table 2

*Selected child and family characteristics at baseline, overall and for Whites and Hispanics**

| Variable | Total n=14,832 | | Whites n=8,838 | | Hispanics n=2,619 | |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD |
| Days/wk ≥20 min MVPA | 3.92 | 2.30 | 4.05 | 2.23 | 3.64 | 2.37 |
| Total hours week television watching | 14.11 | 8.11 | 12.98 | 6.98 | 15.02 | 9.21 |
| BMI | 16.40 | 2.30 | 16.26 | 2.10 | 16.81 | 2.60 |
| Siblings | 1.50 | 1.15 | 1.42 | 1.01 | 1.61 | 1.20 |
| SES | 0.05 | 0.79 | 0.25 | 0.73 | -0.40 | 0.69 |
| Mother's perception of neighborhood attributes (0-10) | 9.48 | 1.26 | 9.70 | 0.83 | 9.15 | 1.71 |
| Residence mobility | 2.13 | 1.33 | 2.09 | 1.35 | 2.22 | 1.41 |

* Significant race differences using *t*-test, $p \leq .05$.

*PA and BMI Changes Over Time*

To examine the possible individual change (increase or decrease) of PA level and BMI, as a function of time, *intercept (i) and slope (s) models* (IS) were examined (one for PA level and one for BMI). The IS model (not shown in a table) allows to the factors to be fixed at the times when the assessment occurs; and assumes a linear change. For PA level (score 0 to 7 days; reported by the mother), three waves were used to examine repeated measures (spring of Kindergarten, third grade, and fifth grade); for BMI the four waves (spring of Kindergarten, third grade, fifth grade, and eighth grade) were used. In both models (PA level and BMI) the estimator was maximum likelihood (ML).

For the PA level model, the variances of the slopes were fixed at zero. In this model the initial value of PA level (intercept) for the study sample was 3.95 days ($p \leq .001$) and the slope was -0.026 day ($p \leq .001$) indicating that PA level decreased over

time. The model fit the data adequately (CFI .978, TLI .978, RMSEA .028). To examine possible differences among gender and race, the initial model was conditioned to these two variables. The variance of the slope was fixed at zero. In this model the initial value of PA level for girls (intercept) was -0.452 day ($p \leq .001$) less than boys; and the slope was -0.027 day ($p \leq .01$), indicating that in addition to starting at a lower PA level, over time there was a trend that signals a decrease of PA among girls when compared to boys. In terms of differences among Whites and Hispanics, the initial value of PA level for Hispanics (intercept) was -0.441 day ($p \leq .001$) when compared to Whites; however the slope suggested that Hispanics increased their PA level from Kindergarten to fifth grade by 0.047 day ($p \leq .001$) when compared to Whites. This model fit the study data adequately (CFI .979, TLI .956, RMSEA .02).

When examining the IS model for BMI, neither the residual variance nor the variance of the slope were fixed, because when restricted the model did not adequately fit the data. In this model, the initial value of BMI (intercept) was 15.60 $kg/m^2$ ($p \leq .001$) and the slope was 0.786 $kg/m^2$ ($p \leq .001$), indicating that BMI increased over time. The model fit indices (CFI .959, TLI .951) suggested that the model fit the data adequately. The model resulted with no negative residual variances; however, the RMSEA was over .08 (.13). To examine possible differences among gender and race (Whites vs. Hispanics), the BMI initial model was conditioned to these two variables. After adding gender and race to the model, the RMSEA improved (RMSEA .08, CFI .958, TLI .929). In this model, the initial value of BMI level for females (intercept) was -0.106 $kg/m^2$ ($p \leq .001$) when compared to males; and the slope was 0.018 $kg/m^2$ ($p > .05$), indicating

that in this study sample there was not a significant gender difference in the change of BMI over time (from Kindergarten to eighth grade). In terms of differences among Whites and Hispanics, the initial value of BMI (at Kindergarten) among Hispanics (intercept) was 0.419 kg/m$^2$ higher ($p \leq .001$) when compared to Whites; and the slope suggested that Hispanics had a higher increase on their BMI from Kindergarten to eighth grade (0.144 kg/m$^2$, $p \leq .001$) when compared to Whites.

*Bivariate associations*

*Correlation Between PA and BMI*

Pairwise correlations were used to examine the correlation between PA level and BMI during the first three waves (Kindergarten, third grade and fifth grade). As presented in Table 3, the repeated assessments of BMI over time were highly correlated among one another. In contrast, the repeated assessments of PA level, reported by the mother, were significant, but not highly correlated. The correlations between child's PA level and child's BMI in each year and among years were weak but significant; however, these significant associations could have been a result of the large sample size of the present study. In additional to these correlations, other correlations between PA and BMI, adjusting for other covariates, will be presented as part of the hypothesis testing section.

*Associations between Latent Constructs and other Control Variables*

After confirming the latent variables' factor structures (refer to Appendix A), bivariate associations of each latent construct with gender and race were examined. Additionally, the association between FSC-K and other variables at baseline were examined. As presented in Table 4, the bivariate associations of FSC-K and gender suggested no gender differences ($\beta$=-.005, $p > .05$).

Table 3

*Bivariates correlations (unweighted) between PA level and BMI during the first three waves: Kindergarten (K), third grade (3), and fifth grade (5)*

| Variables | PA-K | PA-3 | PA-5 | BMI-K | BMI-3 | BMI-5 |
|---|---|---|---|---|---|---|
| PA-K | 1.00 | | | | | |
| PA-3 | .24*** | 1.00 | | | | |
| PA-5 | .23*** | .31*** | 1.00 | | | |
| BMI-K | <- .01 | -.03*** | -.03** | 1.00 | | |
| BMI-3 | <- .01 | -.06*** | -.06*** | .82*** | 1.00 | |
| BMI-5 | -.01 | -.06*** | -.08*** | .77*** | .92*** | 1.00 |

*$p \leq .05$. ** $p \leq .01$. ***$p \leq .001$.

Table 4

*Association of FSC-K with selected variables at baseline(n=14,832)*

| Variable | Standardized estimates | SE |
|---|---|---|
| MP-K | .174*** | 0.014 |
| Gender | | |
| Males (ref.) | | |
| Females | -.005 | 0.015 |
| Race | | |
| Whites (ref.) | -.291*** | 0.017 |
| African American | -.347*** | 0.017 |
| Hispanics | -.117*** | 0.020 |
| Others | | |
| Child disability | .008 | 0.018 |
| Days/wk ≥20 min MVPA | .172*** | 0.012 |
| BMI | -.063*** | 0.012 |
| Past year organized athletic activities, outside of school | .557*** | 0.012 |
| Home rules for hours of television watching | .243*** | 0.014 |
| Mother's perception of neighborhood attributes (0-10) | .194*** | 0.011 |

***$p \leq .001$.

Hispanics had significantly lower FSC-K than Whites ($\beta$=-0.347, $p \leq .001$). FSC-K was positively associated with several baseline variables, such as PA level ($\beta$=0.172, $p \leq .001$), last year participation in athletic activities outside the school ($\beta$=0.557, $p \leq .001$), rules at home for number of hours of television watching ($\beta$=0.243, $p \leq .001$), and

Table 5

*Association of latent constructs (MP-K and PA-score) with gender and race (Whites and Hispanics) (n=14,832)*

| Latent constructs | Standardized Estimates | SE |
|---|---|---|
| MP-K (Kindergarten) | | |
| Gender | | |
| Males (ref.) | .010 | 0.013 |
| Females | | |
| Race | | |
| Whites (ref.) | | |
| African American | .019 | 0.016 |
| Hispanics | -.033* | 0.015 |
| Others | .012 | 0.018 |
| PA-score (eight grade) | | |
| Males (ref.) | | |
| Females | -.276*** | 0.020 |
| Race | | |
| Whites (ref.) | | |
| African American | -.115*** | 0.029 |
| Hispanics | -.228*** | 0.024 |
| Others | -.090** | 0.031 |

*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

mother's perception of neighborhood attributes (β=0.194, $p \leq .001$). Additionally FSC-K was inversely related with child's BMI at baseline (β=-0.063, $p \leq .001$). Child's disability at baseline was not associated with FSC-K (β=-0.008, $p > .05$). Table 5 presents the associations of the other two latent variables (MP and PA-score) with gender and race. There were no gender differences (β=-0.01, $p > 0.05$) in mother's perception of child's PA level in comparison with the child's peers; however, bivariate analysis suggests that the Hispanic mothers perceived their children to be less active than mothers of White children (β=-.033, $p \leq 0.05$). In terms of PA-score at eighth grade, females (β=-.276, $p \leq 0.001$), and Hispanics (β=-.228, $p \leq 0.001$) had a significant lower PA-score at eighth grade than their counterparts.

## *Differences Between Groups*

### *Differences Between Races*

The distribution was almost 50/50 between boys and girls among the study sample of Whites, and of Hispanics as well (Table 1 and Table 2). Ninety-nine percent (99%) of the White children and 93% of the Hispanic children were US-born. In terms of parent's country of birth, 44% of the Hispanic children had both parents who were non-US-born. Among Hispanics, the higher representation was from Mexico (4%, n=659, of the mothers of the study sample were born in Mexico). A significantly higher proportion of White children had a disability at Kindergarten than Hispanics (16% vs.11%).

There were significant differences ($p < .05$) between races (Whites vs. Hispanics) in terms of children's PA level, sport participation, sedentary behavior, and weight status. At Kindergarten, Whites were significantly more active ($\bar{X}$=4.05 days vs. $\bar{X}$=3.64 days); had a higher proportion of children involved in sports during out of school hours (59% vs. 26%); spent fewer hours watching television, DVD, or video ($\bar{X}$=12.98 hrs. vs. $\bar{X}$=15.02 hrs.); and had a lower BMI mean ($\bar{X}$=16.26 vs. $\bar{X}$=16.81) than Hispanics. However, a higher proportion of Hispanic parents had rules about number of hours of television watching (60% vs. 50%).

At the family level, there were statistically significant differences in family structure; the mean number of siblings; the mean of SES index; the proportion of mothers working; and the mean number of times of residency mobility. In terms of family structure, a higher proportion of White children were living in the nucleus family (biological parents) than were Hispanics children (78% vs. 68%; not shown in the tables); a significantly lower proportion of White mothers reported being single than Hispanic

mothers (13% vs. 22%); and White children had fewer siblings than Hispanic children ($\bar{X}$=1.42 vs. $\bar{X}$=1.61). White families had a significantly higher mean SES index ($\bar{X}$=0.25 vs. $\bar{X}$=-.40) and a higher proportion of mothers reported working (69% vs. 59%) than Hispanic families. Hispanics reported a higher mean of times of residence mobility than Whites ($\bar{X}$= 2.09 vs. times vs. $\bar{X}$=2.22 times).

Other social variables at the family level, such as mother's perception of the neighborhood as a safe place to play and the mean of the mother's perception of neighborhood problems (e.g., garbage; use or selling of drugs; robbery; violent crimes; vacant houses) were significantly different between Whites and Hispanics. Eighty percent (80%) of White mothers reported the neighborhood to be very safe to play in, versus only 51% of the Hispanic mothers. In terms of neighborhood problems, White mothers had a significantly higher mean score (meaning fewer problems) than Hispanic mothers ($\bar{X}$= 9.70 vs. $\bar{X}$= 9.15).

Selected mother's characteristics (refer to Table 6) were examined uniquely for Hispanic mothers. For example, 49% of families the primary language spoken at home was Spanish; eleven percent (11%) of the mothers reported language as a barrier to be involved in the child's school activities; and more than half of the mothers (56%) were non-US-born, and moved to the US after they were 18 years old (63%).

*Differences Between Genders*

Several associations between gender and selected variables at baseline were examined for the study sample with *t*-test and Chi-Square tests (Table 7 and Table 8).

Table 6

*Selected Hispanic mothers' characteristics at baseline*

| Characteristic | % |
|---|---|
| Primary language at home (n=1,555) | |
| Spanish | 49% |
| Language as a barrier for school involvement (n=2,617) | 11% |
| Mother's country of birth (n=1,943) | |
| Non-US | 56% |
| US | 44% |
| Age when first moved to US (n=1,021) | |
| 0-5 | 9% |
| 6-12 | 10% |
| 13-17 | 18% |
| 18-24 | 37% |
| 25-34 | 22% |
| 35-54 | 4% |

Table 7

*Selected child and family characteristics at baseline, by gender*

| Characteristic | Males | Females |
|---|---|---|
| Child's disability* | | |
| No | 83% | 89% |
| Yes | 17% | 11% |
| Past year organized athletic activities – outside of school * | | |
| No | 46% | 60% |
| Yes | 54% | 40% |
| Average hours of television watching per day* | | |
| ≤2 hours | 58% | 62% |
| > 2 hours | 42% | 38% |
| Mother's perception of neighborhood as safe place to play | | |
| Not at all safe | 3% | 4% |
| Somewhat safe | 27% | 27% |
| Very safe | 70% | 69% |
| Home rules for hours of television watching* | | |
| No | 45% | 48% |
| Yes | 55% | 52% |

*Significant differences based on Chi-square, $p \leq .05$.

There were statistically significant ($p \leq .05$) gender differences at baseline in terms of children's PA, sport participation, sedentary behavior, and weight status. At Kindergarten, males were significantly more active ($\overline{X}$=4.15 days vs. $\overline{X}$=3.69 days); and were more involved in sports during out of school hours (54% vs. 40%) than females.

However, males spent more hours watching television, DVD, or video ($\bar{X}$=14.51hrs. vs. $\bar{X}$=13.69 hrs.); had a higher BMI mean (16.44 kg/m$^2$ vs. 16.36 kg/m$^2$); and a higher proportion of parents with rules about number of hours of television watching per week (55% vs. 52%) than females.

Table 8

*Selected child and family characteristics at baseline, by gender*

| | Males | | Females | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| Days/wk ≥20 min MVPA* | 4.15 | 2.29 | 3.69 | 2.29 |
| Total TV hours/wk* | 14.51 | 8.39 | 13.69 | 7.81 |
| BMI (kg/m$^2$) * | 16.44 | 2.23 | 16.36 | 2.37 |
| Mother's perception neighborhood attributes (0-10) | 9.49 | 1.21 | 9.47 | 1.30 |

*Significant gender differences, $p \leq .05$.

### *Hypotheses Testing*

Before performing statistical analyses a number of steps were taken to prepare the data for hypothesis testing. These included a test for normality, an evaluation of the ICC, EFA and CFA. I examined the magnitude of the ICC between the main outcomes and clustering at the school level. The results did not support the need for multilevel modeling (please refer to Appendix A). Additionally, the results of the analyses on the formulation of latent constructs suggested that PA-score, MP, and MACC can be assessed as latent constructs (please refer to Appendix A for details). In the next section, the results of the study's hypotheses testing are presented. Structural equation modeling was used to test all the study's hypotheses.

*Model 1. Social Capital and Physical Activity/Sedentary Behavior – Hypotheses*

> H1. There is a positive association between FSC at Kindergarten (FSC-K) and adolescents' PA-score at eighth grade (latent construct), after controlling for previous PA and BMI, and other potential confounders (e.g., race, gender, family socioeconomic index). (Aim 1a)
>
> H2. There is a negative association between FSC-K and adolescents' BMI at eighth grade, after controlling for previous PA and BMI, and other potential confounders (e.g., race, gender, family socioeconomic index). (Aim 1b)

To test H1 and H2, two steps were taken. First, eight structural equations were evaluated in one model (see Figure 1 for the conceptual model); and second, other control variables were added to the model. During the first step the eight regressions in the model (described below) included FSC-K as the main predictor, while controlling for the previous PA level or BMI:

1. PA level at *Kindergarten* on FSC-K.
2. PA level at *third grade* on FSC-K, controlling for PA level at *Kindergarten.*
3. PA level at *fifth grade on* FSC-K controlling for PA level at *third grade.*
4. PA-score at *eighth grade* on FSC-K controlling for PA level at *fifth grade.*
5. BMI at *Kindergarten* on FSC-K.
6. BMI at *third grade* on FSC-K controlling for BMI at *Kindergarten.*
7. BMI at *fifth grade on* FSC-K controlling for BMI at *third grade.*
8. BMI at *eighth grade* on FSC-K controlling for BMI at *fifth grade.*

In addition to the previous regression equations, the correlation between concurrent PA level with BMI for each year (e.g., PA level of third grade with BMI of third grade) were included in the model. The study sample included 6,137 cases (all races were included in the analyses). Table 9 presents the unstandardized (UPE) and the

standardized parameter estimates (SPE) for the model of the first step of the test hypotheses (H1 and H2), controlling for previous PA levels and BMIs (without other control variables). The model fit the study sample data adequately. The results of this model suggest that FSC at Kindergarten predicts directly the child's PA-score (SPE, $\beta$ =.229, $p \leq .001$) at eighth grade, after controlling for PA level at Kindergarten, and the child's BMI at eighth grade (SPE, $\beta$ = -.053, $p \leq .001$), after controlling for BMI at Kindergarten. During the second step, other potential confounders were added to the

Table 9

*Structural Equation Modeling for Family Social Capital at Kindergarten (FSC-K) as a predictor of Adolescent's PA-score, and Body Mass Index (BMI) at eighth grade (n= 6,137)*

| Predictor | PA-score 8th UPE | SE | PA-score 8th SPE | SE | BMI 8th UPE | SE | BMI 8th SPE | SE |
|---|---|---|---|---|---|---|---|---|
| FSC-K | 0.421*** | 0.06 | .229*** | 0.03 | -0.543*** | 0.11 | -.053*** | 0.01 |
| MVPA ≥20min/day/ wk (Fifth Grade-Spring) | 0.135*** | 0.01 | | | N/A | N/A | N/A | N/A |
| BMI (Fifth Grade-Spring) | N/A | N/A | N/A | N/A | 1.002*** | 0.01 | .816*** | 0.01 |

*Note.* Model fit indices: CFI .979, TLI .977, RMSEA .009. Model ends with no negative residual variances. Model estimator: WLSMV.UPE = Unstandardized parameter estimates; SPE = Standardized parameter estimates. Correlations (SPE): PA level-K with BMI-K =.009 (p ≥.05); PA level-3 with BMI-3 = -.086**; PA level-5 with BMI-5 = -.12***; PA-score with BMI-8 = -.182***.
* $p \leq .05$. ** $p \leq .01$. ***$p \leq .001$.

model (Table 10). In addition to the regression equations and the correlations mentioned previously, in the model of the second step possible mediators (indirect effect) between FSC-K and PA-score and BMI were included (i.e., PA level and BMI of third and fifth grade). Several other control variables that have been previously associated with a child's PA or BMI were included in this model. At the child level the model controlled

for gender, race, disability status, and total of weekly hours of television watching. At the family level the variables SES, type of family, number of siblings, rules at home for amount of hours of television watching, mother's employment status, mother's perception of neighborhood attributes, mother's perception of neighborhood as a safe place to play, and region and urbanicity were included in the model. The study sample included 6,003 cases (all races were included in the analyses). The model fit the data appropriately (CFI .917, TLI .900, RMSEA .032); however, some control variables at baseline were not significant predictors of PA-score nor of BMI at eighth grade (i.e., mother's perception of neighborhood attributes, mother's perception of neighborhood as a safe place to play, number of siblings). To have a more parsimonious model, those control variables were removed from the model. The new model ended with better model fit indices (CFI .930, TLI .916, RMSEA .034). Table 10 presents the unstandardized parameter estimates for the model on the second step for testing hypotheses (H1 and H2), controlling for previous PA levels, BMIs, and other control variables. The results of all other parameter estimates of the model are available by contacting the author. This model suggests that even after controlling for other covariates at baseline, FSC-K predicted directly and indirectly the child's PA-score (total effect, UPE, $\beta$=0.402, $p \leq 0.001$; indirect effect, UPE, $\beta$=0.156, $p \leq 0.001$); but did not predict child's BMI at eighth grade.

Even in the presence of weak parameter estimates, the results of these analyses (Step 1 and Step 2) supported H1; therefore it was not rejected. There was a positive association between FSC at Kindergarten and adolescent's physical activity score (PA-score) at eighth grade (latent construct), after controlling for potential confounders. The model identified other significant predictors of PA-score at eighth grade. For example, as

Table 10

*Structural Equation Modeling for Family Social Capital at Kindergarten (FSC-K) as a predictor of Adolescent's PA-score, and Body Mass Index (BMI) at eighth grade; adjusted model (n= 6,003)*

| | H1. PA-score | | H2. BMI | |
|---|---|---|---|---|
| Predictor Variable | UPE | SE | UPE | SE |
| FSC-K | 0.246*** | 0.067 | 0.079 | 0.291 |
| Previous BMI (5th Spring) | 0.002 | 0.004 | 1.019*** | 0.009 |
| Previous MVPA ≥20min/day/wk (5th -Spring) | 0.137*** | 0.014 | 0.132 | 0.075 |
| Gender : Male (ref.) | | | | |
| Female | -0.226*** | 0.035 | 0.557*** | 0.000 |
| Race: Whites (ref.) | | | | |
| African Americans | 0.071 | 0.087 | -0.428** | 0.134 |
| Hispanics | -0.137* | 0.066 | -0.682*** | 0.177 |
| Others | -0.231* | 0.101 | -0.298 | 0.162 |
| Variables at baseline | | | | |
| Children disability (K-Fall) | | | | |
| Yes | -0.223*** | 0.051 | 0.221 | 0.299 |
| Average hours of television watching per day (K-Spring): ≤2 hr (ref.) | | | | |
| > 2 hr | -0.071** | 0.027 | -0.084 | 0.169 |
| Family structure: Two parents (ref.) | | | | |
| Single mother | -0.254*** | 0.044 | 0.368 | 0.309 |
| Family SES score at Kindergarten | 0.294*** | 0.028 | -0.288 | 0.217 |
| Mother employed (ref.) | | | | |
| No employed | -0.025 | 0.049 | 0.376* | 0.168 |
| Home rules of hours for TV watching: No (ref.) | | | | |
| Yes | 0.016 | 0.042 | 0.165 | 0.243 |
| Urbanity: Central city (ref.) | | | | |
| Urban fringe and large town | 0.028 | 0.068 | 0.023 | 0.169 |
| Small town and Rural | 0.270*** | 0.058 | -0.590*** | 0.150 |
| Region: Northeast (ref.) | | | | |
| Midwest | 0.332*** | 0.077 | 0.429* | 0.205 |
| South | -0.096 | 0.098 | 0.071 | 0.153 |
| West | 0.079 | 0.073 | 0.571 | 0.294 |
| Total effect | 0.402*** | 0.057 | 0.221 | 0.372 |
| Total indirect | 0.156*** | 0.019 | 0.142 | 0.265 |

*Note.* Model fit indices: CFI .930, TLI .916, and RMSEA .034.Model ends with no negative residual variances. Model estimator: WLSMV. Correlations (SPE): PA level-K with BMI-K =.018 ($p \geq .05$); PA level-3 with BMI-3 = -.101***; PA level-5 with BMI-5 = -.146***; PA-score with BMI-8 = -.168***.

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

presented in Table 10, the PA-score was predicted by several baseline variables: child's disability status; number of hours of television; family structure; family SES; living in rural areas ("central city" reference group); and living in the Midwest (Northeast reference group). Previous PA level (at fifth grade) also predicted PA-score at eighth grade. At eighth grade females had a lower PA-score than males; and Hispanics and those in the "others" ethnic category were less active than Whites.

In terms of H2 (BMI), even when the unconditioned model resulted in significant but weak parameter estimates, after controlling for other variables the direct effect disappeared. The results from these analyses led to a rejection of H2. That is there was *not* a significant negative association between FSC at Kindergarten and adolescent's BMI at eighth grade, after controlling for other potential confounders.

The parameter estimates suggested that other factors were strongly associated with the PA-score and the BMI at eighth grade than FSC-K. BMI at eighth grade was associated with gender, females having a significantly higher BMI than males. The previous BMI (fifth grade) and other baseline variables predicted BMI at eighth grade (i.e., the mother not working; living in the Midwest (Northeast reference group); living in rural areas ("central city" reference group).

H3. The relationship between FSC-K and adolescent's PA-score at eighth grade (latent construct) is stronger for Whites than for Hispanics. (Aim 3)

H4. The relationship between FSC-K and adolescent's BMI at eighth grade is stronger for Whites than for Hispanics. (Aim 3)

To test H3 and H4, I evaluated two nested models. The first step was to specify and examine a restricted model that included eight regression equations (same used in the unconditioned model of H1 and H2), with FSC-K as the main predictor. All the

parameters (means, variances, covariances, regressions) were set to be equal across the two groups (Whites and Hispanics), indicating that the models were identical for both groups. The study sample included only White (n=4,190) and Hispanic (n=970) cases.

The second step involved the specification of a less restricted model, where the eight regressions modeled the effect of FSC-K on PA-score and BMI was allowed to differ across the two groups (Whites and Hispanics). Table 11 presents the results of these two models. Relaxing the restriction of equal regressions coefficients across the two groups did not improve the model fit ($\Delta X^2/\Delta df = 6/8, p > .05$). In other words, based on a model with equal parameters across both groups, it is reasonable to assume that the effect of FSC-K on PA-score at eighth grade, were similar across both groups. The results from this analysis led to a rejection of H3. There *was not* a strong correlation (as measured by standardized estimates) between FSC and adolescent's physical activity score (PA-score, latent construct) at eighth grade neither for Whites nor Hispanics.

In terms of BMI at eighth grade (H4), FSC-K predicted the child's BMI (UPE, $\beta = -0.788, p \leq .05$) for Whites, but not for Hispanics (UPE, $\beta = 0.263, p > .05$). Therefore H4 was supported: There was a stronger negative correlation (measured by standardized estimates) between FSC and adolescent's BMI at eighth grade for Whites than for Hispanics, after controlling for possible confounders. In summary there was no race difference in the magnitude of the direct effect of FSC-K on adolescents' PA-score in eighth grade; however, FSC-K had a significant direct effect only on White adolescents' BMI at eighth grade.

Table 11

*Nested models for Family Social Capital at Kindergarten (FSC-K) as a predictor of Adolescent's PA-score, and Body Mass Index (BMI) at eighth grade; by race (Whites and Hispanics)*

| | Restricted model | | | | Unrestricted model | | | |
|---|---|---|---|---|---|---|---|---|
| | Whites n=4,190 | | Hispanics n=970 | | Whites n=4,190 | | Hispanics n=970 | |
| | Parameter | SE | Parameter | SE | Parameter | SE | Parameter | SE |
| H3. PA-score 8th | | | | | | | | |
| FSC-K UPE | 0.468*** | 0.059 | 0.468*** | 0.059 | 0.470*** | 0.074 | 0.489*** | 0.094 |
| FSC-K SPE | .230*** | 0.028 | .230*** | 0.028 | .229*** | 0.036 | .239*** | 0.041 |
| H4. BMI 8th | | | | | | | | |
| FSC-K UPE | -0.620*** | 0.123 | -0.620*** | 0.123 | -0.788*** | 0.145 | 0.263 | 0.197 |
| FSC-K SPE | -.059*** | 0.011 | -.059*** | 0.011 | -.075*** | 0.012 | .025 | 0.019 |
| CFI | .948 | | | | .947 | | | |
| TLI | .948 | | | | .947 | | | |
| RMSEA | .011 | | | | .011 | | | |
| Free parameters | 106 | | | | 114 | | | |
| Chi-Square | 1166.61 *** | | | | 1161.19*** | | | |
| *df* | 878 | | | | 870 | | | |
| Contribution Chi-Square | | | | | | | | |
| Whites | 617.01 | | | | 620.95 | | | |
| Hispanics | 549.60 | | | | 540.23 | | | |

*Note.* Model ends with no negative residual variances. Model estimator: WLSMV.

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

*Model 2. Family Social Capital and Mother's perception (MP)*

H5. There is a positive association between m*other's perception of her child's PA level in comparison with the child's peers* at Kindergarten and *child's PA-scores* at eighth grade, after controlling for previous PA levels and BMIs (at Kindergarten, third and fifth grade), and other possible confounders (e.g., gender, family SES ). (Aim 2)

H6. There is a negative association between m*other's perception of her child's PA level in comparison with the child's peers* at Kindergarten and *child's BMI* at eighth grade, after controlling for previous PA levels and BMIs (at Kindergarten, third and fifth grade), and other possible confounders (e.g., gender, family SES ). (Aim 2)

To test H5 and H6, two steps were followed. First, eight structural regressions equations were performed in one model (see below); and second, other control variables were added to the model. In the first step, PA-score and BMI at eighth grade were the main outcomes, and MP-K was the main predictor. The regressions were:

1. PA level at *Kindergarten* on MP-K.
2. PA level at *third grade* on MP-K, controlling for PA level at *Kindergarten.*
3. PA level at *fifth grade* on MP-K, controlling for PA level at *third grade.*
4. PA-score at *eighth grade* on MP-K, controlling for PA level at *fifth grade.*
5. BMI at *Kindergarten* on MP-K.
6. BMI at *third grade* on MP-K, controlling for BMI at *Kindergarten.*
7. BMI at *fifth grade* on MP-K, controlling for BMI at *third grade.*
8. BMI at *eighth grade* on MP-K, controlling for BMI at *fifth grade.*

In addition to these regression equations, the correlation between concurrent PA level with BMI for each year (e.g., PA level of third grade with BMI of third grade) were included in the model. The study sample included 6,137 cases for analyses (all races). Table 12 presents the parameter estimates for the model of the first step to test hypotheses H5 and H6, controlling for the previous PA levels and BMIs (without other control variables). The model fit the study sample data adequately (CFI .996, TLI .996, RMSEA .027). The results of this model suggested that MP at Kindergarten predicts directly the child's PA-score (SPE, $\beta = .232$, $p \leq .001$), after controlling for PA level at Kindergarten, third grade and fifth grade; however, it did not predict directly child's BMI at eighth grade (SPE, $\beta = .001$, $p > .05$) after controlling for BMI at Kindergarten, third grade and fifth grade. In addition to the regression equations and the correlations

explained previously, in the second step of the model mediators (indirect effect) between MP and PA-score, as well as between MP and BMI were examined (i.e., PA level and BMI of third and fifth grade). Additionally, several control variables that have been previously associated with child's PA and BMI were included in this model. At the child level the model controlled for gender, race, disability status, and total number of hours of television watched per week. At the family level the variables SES, type of family, number of siblings, rules at home for number of hours of television watching, mother's employment status, mother's perception of neighborhood attributes, mother's perception of neighborhood as a safe place to play, region, and urbanicity were included in the model.

Table 12

*Structural Equation Modeling for Mother's Perception at Kindergarten (MP-K) as a predictor of Adolescent's PA-score, and Body Mass Index (BMI) at eighth grade (n= 6,137)*

| Predictor | H5. PA-score UPE | SE | H5. PA-score SPE | SE | H6. BMI UPE | SE | H6. BMI SPE | SE |
|---|---|---|---|---|---|---|---|---|
| MP-K | 0.302*** | 0.024 | .232*** | 0.024 | 0.009 | 0.097 | .001 | 0.014 |
| MVPA ≥20 min/day/wk (Fifth Grade-Spring) | 0.135*** | 0.015 | .229*** | 0.018 | N/A | N/A | N/A | N/A |
| BMI (Fifth Grade-Spring) | N/A | N/A | N/A | N/A | 1.01*** | 0.008 | .822*** | 0.002 |

Note. Model fit indices: CFI .996, TLI .996, RMSEA .027. Model ends with no negative residual variances. Model estimator: WLSMV. Correlations (SPE): PA level-K with BMI-K = .02 ($p > .05$); PA level-3 with BMI-3 =-.079**; PA level-5 with BMI-5 =-.140***; PA-score with BMI-8 =-.228 ***. * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

The model fit the data adequately (CFI .986, TLI .984, RMSEA .023) (not shown in a table); however some control variables at baseline were not associated with PA-score, nor with BMI at eighth grade (i.e., mother's employment status; mother's

perception of neighborhood attributes; mother's perception of neighborhood as a safe place to play; number of siblings; and home rules about hours of watching television). To have a more parsimonious model, those control variables were removed from the model, resulting in better model fit indices (CFI .990, TLI .988, RMSEA .025) (Table 13).

Table 13 presents the unstandardized parameter estimates for the final model of the second step for the tested hypotheses H5 and H6, controlling for the previous PA levels, BMIs, and other covariates. The study sample included 6,046 cases for analyses (all races). This model suggests that even after controlling for other covariates at baseline, MP at Kindergarten had both a direct and indirect effect on adolescents' PA-score (total effect, UPE, $\beta$=0.324 kg/m$^2$, $p \leq 0.001$; indirect effect, UPE, $\beta$=0.065 kg/m$^2$, $p \leq 0.001$). The results from these analyses (Step 1 and Step 2) support H5. There was a positive association between m*other's perception of her child's PA level in comparison with the child's peers* at Kindergarten and the *child's PA-scores* at eighth grade, after controlling for suspected confounders.

In terms of BMI (H6), after controlling for other covariates at baseline, MP did not have a direct effect on adolescents' BMI, however, it indirectly predicted eighth grade BMI (total effect, UPE, $\beta$=-0.472, $p \leq 0.001$; indirect effect, UPE, $\beta$=-0.471, $p \leq 0.001$), through previous BMIs (Kindergarten, third grade, and fifth grade). The results from these analyses supported H6. There was a positive association between *mother's perception of her child's PA level in comparison with the child's peers* at Kindergarten, and the *child's BMI* at eighth grade, after controlling for suspected confounders. The results of all other parameter estimates of the model are available by contacting the

Table 13

*Structural Equation Modeling for Mother's Perception at Kindergarten (MP-K) as a predictor of Adolescent's PA-score, and Body Mass Index (BMI) at eighth grade (n= 6, 046)*

| | H5. PA-score | | H6. BMI | |
|---|---|---|---|---|
| Predictor Variable | UPE | SE | UPE | SE |
| MP-K | 0.259*** | 0.023 | -0.001 | 0.094 |
| Previous BMI (5th-Spring) | N/A | | 1.014*** | 0.010 |
| Previous MVPA ≥20min/day/wk (5th-Spring) | 0.119*** | 0.013 | N/A | |
| Gender | | | | |
| Male (ref.) | | | | |
| Female | -0.264*** | 0.042 | 0.449*** | 0.130 |
| Race | | | | |
| Whites (ref.) | | | | |
| African Americans | 0.070 | 0.102 | -0.396* | 0.164 |
| Hispanics | -0.128* | 0.065 | -0.585** | 0.170 |
| Others | -0.229*** | 0.100 | -0.224 | 0.157 |
| Variables at baseline | | | | |
| Children disability (K-Fall) | -0.222*** | 0.054 | 0.182 | 0.339 |
| Average hours of television watching per day*(K-Spring): ≤2 hr (ref.) | | | | |
| > 2 hr | -0.070** | 0.026 | -0.099 | 0.163 |
| Family structure: Two parents (ref.) | | | | |
| Single mother | -0.224*** | 0.040 | 0.319 | 0.280 |
| Family SES score at Kindergarten | 0.318*** | 0.029 | -0.272 | 0.213 |
| Urbanity: Central city (ref.) | | | | |
| Urban fringe and large town | 0.032 | 0.077 | 0.003 | 0.189 |
| Small town and Rural | 0.301*** | 0.060 | -0.563*** | 0.120 |
| Region: Northeast (ref.) | | | | |
| Midwest | 0.346*** | 0.079 | 0.396* | 0.172 |
| South | -0.086 | 0.103 | 0.138 | 0.153 |
| West | 0.077 | 0.072 | 0.612 | 0.318 |
| Total effect | 0.324*** | 0.020 | -0.472*** | 0.074 |
| Total indirect | 0.065*** | 0.010 | -0.471*** | 0.083 |
| Specific indirect | | | | |
| MP-PAK-PA3-PA5-PA8 | 0.004*** | 0.001 | | |
| MP-PA3-PA5-PA8 | 0.008*** | 0.001 | | |
| MP-PA5- PA8 | 0.053*** | 0.009 | | |
| MP-BMIK-BMI3-BMI5-BMI8 | | | -0.365*** | 0.053 |

*Note.* Model fit indices: CFI .990, TLI .988, and RMSEA .025. Model ends with no negative residual variances. Model estimator: WLSMV. Correlations (SPE): PA level-K with BMI-K =.04*; PA level-3 with BMI-3= -.05* ;PA level -5 with BMI-5 = -.11***; PA-score with BMI-8 = -.12***

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

author. In summary, MP at Kindergarten had an effect on adolescents' PA-score (direct and indirect effect), and on adolescents' BMI (indirect effect only) at eighth grade.

> H7. The relationship between *mother's perception of her child's PA level in comparison with the child's peers* (at Kindergarten) and the *child's PA-scores* at eighth grade will be stronger for Whites than for Hispanics. (Aim 3)
>
> H8. The relationship between *mother's perception of her child's PA level in comparison with the child's peers* (at Kindergarten) and the *child's BMI* at eighth grade will be stronger for Whites than for Hispanics. (Aim 3)

To test H7 and H8, I evaluated two nested models. The first step was to specify and examine a restricted model that included eight regression equations (same ones used in the first step of hypotheses testing of H5 and H6), with MP-K as the main predictor. In addition to the regression equations, the correlations between concurrent PA level with BMI for each year (e.g., PA level of third grade with BMI of third grade) were included in the model. Additionally, autocorrelations among PA levels and BMIs in the four waves were included (e.g., BMI-eighth grade on BMI-fifth grade). In the restricted model all the parameters (means, variances, covariances, and regressions) were set to be equal across the two groups (Whites and Hispanics), indicating that the models were identical for both groups. The study sample included only White (n=4,190) and Hispanic (n=970) cases for analyses. The second step involved the specification of a less restricted model, where the eight regressions modeling the effects of MP-K on PA and BMI were allowed to be different across the two groups (Whites and Hispanics).

Table 14 presents the results of these two models. Relaxing the restriction of equal regression coefficients across the two groups did not improve the model fit ($\Delta X^2/\Delta df = .53/8, p > .05$). In other words, based on a model with equal parameters across both groups, it is reasonable to assume that the effects of MP-K on PA and BMI

were also similar across both groups. The results of these analyses led to the rejection of H7. The relationship between *mother's perception of her child's PA level in comparison with the child's peers* (at Kindergarten) and the *child's PA-scores* at eighth grade *was not* stronger for Whites than for Hispanics. However, it is important to observe that for Hispanics, MP-K had a higher direct effect of PA-score than for Whites (Whites, SPE, $\beta$=.178, $p \leq .001$; Hispanics, SPE, $\beta$=.254, $p \leq .001$).

In terms of BMI at eighth grade (H8), MP-K did not have a direct effect on BMI at eighth grade (UPE, $\beta$= -0.059, $p > .05$) for Whites, nor for Hispanics (UPE, $\beta$= 0.232, $p > .05$). Therefore H8 was rejected: The relationship between *mother's perception of her child's PA level in comparison with the child's peers* (at Kindergarten) and the *child's BMI* at eighth grade was *not* stronger for Whites than for Hispanics.

In summary, MP at Kindergarten had a direct and indirect effect on adolescents' PA-score, and an indirect effect on adolescents' BMI, even after controlling for other variables. There were no race differences in the effect of MP-K on PA-score or BMI at eighth grade; however, MP-K of Hispanics had a higher direct effect on adolescents' PA-score at eighth grade than on Whites.

Table 14

*Nested models for Mother's Perception at Kindergarten (MP-K) as a predictor of Adolescent's PA-score, and Body Mass Index (BMI) at eighth grade; by race (Whites and Hispanics)*

| | Restricted model | | | | Unrestricted model | | | |
|---|---|---|---|---|---|---|---|---|
| | White n=4,190 | | Hispanics n=970 | | White n=4,190 | | Hispanics n=970 | |
| | Parameter | SE | Parameter | SE | Parameter | SE | Parameter | SE |
| H7. PA-score | | | | | | | | |
| MP-K UPE | 0.262*** | 0.038 | 0.262*** | 0.038 | 0.224*** | 0.042 | 0.326*** | 0.075 |
| MP-K SPE | .207*** | 0.031 | .207*** | 0.031 | .178*** | 0.035 | .254*** | 0.052 |
| H8. BMI 8th | | | | | | | | |
| MP-K UPE $Kg/m^2$ | 0.020 | 0.078 | 0.020 | 0.078 | -.059 | 0.085 | 0.232 | 0.151 |
| MP- K SPE | .003 | 0.012 | .003 | 0.012 | -.009 | 0.013 | .036 | 0.024 |
| Model fit indices | | | | | | | | |
| CFI | .990 | | | | .990 | | | |
| TLI | .989 | | | | .989 | | | |
| RMSEA | .034 | | | | .034 | | | |
| Free parameters | 53 | | | | 61 | | | |
| Chi-Square | 36.56*** | | | | 36.03*** | | | |
| *df* | 9 | | | | 9 | | | |
| Contribution for each group: | | | | | | | | |
| Chi-Square Whites | 11.51 | | | | 12.46 | | | |
| Chi-Square Hispanics | 25.05 | | | | 23.58 | | | |

*Note.* Model ends with no negative residual variances. Model estimator: WLSMV.

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

H9. *Mother's perception of her child's PA level in comparison with the child's peers* at Kindergarten (MP-K) attenuates the association between *FSC* at Kindergarten and *the child's PA-score and BMI* at eighth grade. (Aim 4)

To test H9, two steps were followed. First eight regressions equations modeling the effect of FSC-K and MP-K on adolescents' PA-score and BMI were examined. Second, the results were compared with the results for H1, H5, and H6. In the first step, the eight regressions in the model included:

1. PA level at Kindergarten on FSC-K and MP-K.

2. PA level at *third grade* on FSC-K and MP-K, controlling for PA level at *Kindergarten.*
3. PA level at *fifth grade on* FSC-K and MP-K, controlling for PA level at *third grade.*
4. PA-score at *eighth grade* on FSC-K and MP-K, controlling for PA level at *fifth grade.*
5. BMI at *Kindergarten* on FSC-K and MP-K.
6. BMI at *third grade* on FSC-K and MP-K, controlling for BMI at *Kindergarten.*
7. BMI at *fifth grade on* FSC-K and MP-K, controlling for BMI at *third grade.*
8. BMI at *eighth grade* on FSC-K and MP-K, controlling for BMI at *fifth grade.*

In addition to these regression equations, the correlations between concurrent PA level with BMI for each year (e.g., PA level of third grade with BMI of third grade) were included in the model. The study sample included 6,137 cases (all races). The second step was to compare the results of this model (parameter estimates and model fit indices) with those of H1, H5, and H6, which included FSC-K as a predictor of PA-score and BMI at eighth grade (H1, Table 9), and MP-K as a predictor of PA-score and BMI at eighth grade (H5 and H6, Table 12). Table 15 presents the model of the first step of the test hypothesis (H9), controlling for previous PA levels and BMIs. The model fit the study data adequately (CFI .975, TLI .975, RMSEA .029). To facilitate testing of these hypotheses, some information from Table 9 (H1) and the Table 12 (H5 and H6) were included in Table 15.

The three models had similar model fit indices. When the model included both predictors (H9), the standardized parameter estimates suggest that both (FSC-K and MP-K) had the same magnitude in predicting adolescents' PA-score (direct effect, SPE, $\beta$=.21, $p \leq 0.001$), but were different in terms of the direct effect on adolescents' BMI.

Table 15

*Structural Equation Modeling for Family Social Capital (FSC-K) and Mother's Perception at Kindergarten (MP-K) as predictors of Adolescent's PA-score, and Body Mass Index (BMI) at eighth grade (n= 6,137)*

| | PA-score UPE | SE | PA-score SPE | SE | BMI 8th UPE | SE | BMI 8th SPE | SE |
|---|---|---|---|---|---|---|---|---|
| H1 results FSC-K Only | 0.421*** | 0.061 | .229*** | 0.030 | -0.543*** | 0.110 | -.053*** | 0.011 |
| H5 and H6 results MP-K Only | 0.302*** | 0.024 | .232*** | 0.024 | 0.009 | 0.097 | .001 | 0.014 |
| H9 results FSC-K | 0.407*** | 0.062 | .207*** | 0.031 | -0.596*** | 0.109 | -.057*** | 0.010 |
| MP-K | 0.265*** | 0.028 | .210*** | 0.024 | 0.053 | 0.094 | .008 | 0.014 |
| MVPA (Spring) ≥20min/day/wk Fifth Grade | 0.109*** | 0.012 | .190*** | 0.018 | N/A | N/A | N/A | N/A |
| BMI (Spring) Fifth Grade | N/A | N/A | N/A | N/A | 1.003*** | 0.008 | .817*** | 0.003 |

*Note.* H1: CFI .979, TLI .977, RMSEA .009; H1 $R^2$: PA-score .134, BMI .680. H5-H6: CFI .996,TLI .996,RMSEA .027; H5-6 $R^2$: PA-score .134, BMI .676. H9: CFI .975, TLI .975. RMSEA .029; H9 $R^2$: PA-score .169, BMI .681. Models ends with no negative residual variances. Model estimator: WLSMV. ***$p \leq .001$.

Family Social Capital-K (FSC-K) predicted BMI at eighth grade (direct effect, SPE, $\beta$=-.057, $p \leq 0.001$), but MP-K did not have any direct effect on adolescents' BMI at eighth grade. Because of the results of these two steps, there was no need to add further statistical analysis to test this hypothesis. The results from these analyses led to rejecting H9. *Mother's perception of her child's PA level in comparison with the child's peers* at

Kindergarten *did not* attenuate the association between *family social capital* at Kindergarten and *the child's PA-score and BMI* at eighth grade in this study's sample.

*Model 3: Hispanic Model— FSC, MP and Mother's Acculturation*

> H10. Hispanic m*other's acculturation level* (MACC) at Kindergarten is positively associated with the *child's PA- score* at eighth grade, after controlling for previous PA levels, and BMIs (at Kindergarten, third and fifth grade), and other possible confounders (e.g., gender, family SES ). (Aim 5)
>
> H11. Hispanic m*other's acculturation level* (MACC) at Kindergarten is negatively associated with *child's BMI* at eighth grade, after controlling for previous PA levels, and BMIs (at Kindergarten, third grade, and fifth grade), and other possible confounders (e.g., gender, family SES ). (Aim 5)

To test H10 and H11, only the Hispanic cases were used for the analyses (n=970). First, eight regressions equations were performed in one model, and second, other control variables were added to the second model. In the first step, PA-score and BMI at eighth grade were the main outcomes, and MACC was the main predictor. The regressions were:

1. PA level *at Kindergarten* on MACC.
2. PA level at *third grade* on MACC, controlling for PA level at *Kindergarten.*
3. PA level at *fifth grade on* MACC, controlling for PA level at *third grade.*
4. PA-score at *eighth grade* on MACC, controlling for PA level at *fifth grade.*
5. BMI at *Kindergarten* on MACC.
6. BMI at *third grade* on MACC, controlling for BMI at *Kindergarten.*
7. BMI at *fifth grade* on MACC, controlling for BMI at *third grade.*
8. BMI at *eighth grade* on MACC, controlling for BMI at *fifth grade.*

In addition to the regression equations, the correlation between concurrent PA level with BMI for each year (e.g., PA level of third grade with BMI of third grade) were

included in the model. The second step of the hypotheses involved adding several control variables that have been previously associated with children's PA or BMI. At the child level the model controlled for gender, disability status, and total of hours of television watched per week. At the family level the model controlled for FSC-K , MP-K, SES, family structure, number of siblings, parents' place of birth, rules at home for number of hours of television watching, mother's employment status, mother's perception of neighborhood attributes, mother's perception of neighborhood as a safe place to play, residence mobility, region, and urbanicity. Besides adding control variables, the second step examined possible indirect effects (mediators) of FSC-K and MP-K on all the eight outcomes:

1. PA level and BMI of third grade (outcomes at third grade);
2. PA level and BMI on fifth grade (outcomes at fifth grade);
3. PA-score and BMI at eighth grade (outcomes at eighth grade).

Table 16 presents the Hispanic structural equation model (parameter estimates) examining MACC as a predictor of child's PA-score and BMI at eighth grade, after controlling for the previous PA levels and BMIs. Table 17 presents the final models after controlling for suspected confounders. Beginning with the first step model, the model fit the study data adequately (CFI 1.00, TLI .999, RMSEA .016). This model suggested that MACC at Kindergarten had a direct effect on adolescents' PA-score at eighth grade (SPS, $\beta$=.148, $p \leq .05$), but not on adolescents' BMI at eighth grade (SPS, $\beta$=-.009, $p > .05$).

After controlling for other covariates in the second step of the first model, the fit indices decreased, but remained high enough for an appropriate fit of the data (CFI .916, TLI .902, RMSEA .025) (not shown in the table). After controlling for FSC-K, MP-K,

Table 16

*Structural Equation Modeling for Mother's Acculturation level at Kindergarten (MACC) as a predictor of Adolescent's PA-score, and Body Mass Index (BMI) at eighth grade (n= 970)*

| | PA-score | | PA-score | | BMI 8 | | BMI 8 | |
|---|---|---|---|---|---|---|---|---|
| Predictor | UPE | SE | SPE | SE | UPE | SE | SPE | SE |
| MACC | 0.135* | 0.058 | .148** | 0.050 | -0.052 | 0.141 | -.009 | 0.025 |
| MVPA (Spring) ≥20min/day/wk Fifth Grade | 0.135*** | 0.026 | .270*** | 0.029 | N/A | N/A | N/A | N/A |
| BMI (Spring) Fifth Grade | N/A | N/A | N/A | N/A | 1.005*** | 0.030 | .846*** | 0.010 |

Model fit indices: CFI 1.00, TLI .999, RMSEA .016. Model ends with no negative residual variances. Model estimator: WLSMV. UPE = Unstandardized parameter estimates. SPE =Standardized parameter estimates.

* $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$.

and other covariates, the association of MACC with child's PA-score (SPE, $\beta$=.033, $p >$ .05) was not significant anymore (Table 17). The results of these analyses led to rejection of hypotheses 10 and 11. *Mother's acculturation level* at Kindergarten was *not* associated with adolescents PA-score or BMI at eighth grade, after controlling for the previous PA levels and BMIs (at Kindergarten, third and fifth grade), FSC-K, MP-K, and other possible confounders.

Besides testing hypotheses 10 and 11, the final model allowed examination of baseline variables (e.g., FSC-K, MP-K, and MACC) that had an effect on the child's PA on third grade, fifth grade, and eighth grade (Aim 6). Even when these examinations were not part of the hypotheses tested, they helped to identify PA's and BMI's potential determinant factors and the direct and indirect effects of FSC-K and MP on the Hispanic child's PA and BMI through different developmental stages. The results of the final model (Table 17) suggested that the effects of baseline variables on the child's PA and BMI in later school years were different. Based on the standardized parameter estimates

Table 17

*Determinant Factors of Hispanic Children's Physical Activity and BMI, Standardized Estimates (n=970)* *

| Main predictors | PA level K | PA level 3rd grade | PA level 5th grade | PA-score 8th grade (H10) | BMI K | BMI 3rd grade | BMI 5th grade | BMI 8th grade (H11) |
|---|---|---|---|---|---|---|---|---|
| FSC-K direct effect | .169 | | .102 | | | | | |
| MP-K direct effect | .259 | | .153 | .266 | -.160 | | | |
| MP-K total effect | | .085 | .178 | .285 | | -.133 | -.127 | -.109 |
| MACC direct effect | | .076 | | | | | | |
| PA level K | N/A | .257 | | | | | | |
| PA level 3rd grade | | N/A | .251 | | | | .099 | |
| PA level 5rd grade | | | N/A | .105 | | | | |
| BMI K | | | | | N/A | .816 | | |
| BMI 3rd grade | | | | | | N/A | .943 | |
| BMI 5th grade | | | | | | | N/A | .861 |

*Note.* SES, family structure, and mother's perception neighborhood as a safe to play were added to the model, but resulted in no significant association in any grade.

* $p \leq .05$.

Table 17 (cont'd)

| Baseline covariates (Kindergarten) | PA level K | PA level 3rd grade | PA level 5th grade | PA-score 8th grade | BMI K | BMI 3rd grade | BMI 5th grade | BMI 8th grade |
|---|---|---|---|---|---|---|---|---|
| Child's level factors | | | | | | | | |
| Gender | | | | | | | | |
| Male (ref.) | | | | | | | | |
| Female | | -.134 | -.114 | -.299 | | | | |
| Children with disability: No (ref.) | | | | | | | | |
| Yes | | -.051 | | -.188 | | | | |
| Total hr/week television watching | | | | | | | | |
| < 2 hr | | | | | | | | |
| ≥ 2 hr | | | | -.075 | | | | |
| Family level factors | | | | | | | | |
| Number of siblings | | | | | .111 | | | -.037 |
| Mother employment status | | | | | | | | |
| Working | | | | | | | | |
| Not working | | | -.073 | | | | | |
| Parents' country of birth | | | | | | | | |
| At least one parent US-born | | | | | | | | |
| Both parents non-US-born | -.135 | -.155 | -.085 | -.182 | | | .034 | |
| Home rules for hours of TV watching | | | | | | | | |
| Yes | | | | | | | | |
| No | | | | | -.077 | | | |
| Neighborhood attributes (0-10) | | | | | | | | -.044 |
| Urbanicity | | | | | | | | |
| Central city (ref.) | | | | | | | | |
| Urban fringe and large rural town | | -.066 | | | | | | |
| Small town and rural | .061 | | | | | | | .014 |
| Region | | | | | | | | |
| Northeast (ref.) | | | | | | | | |
| Midwest | | | -.075 | | | .086 | | |
| South | .167 | .148 | | | | .119 | | |
| West | | | | | | .085 | | |
| Residence Mobility | .076 | | | | | | | |

in the final model, the variables associated ($p \leq .05$) with Hispanic child's PA level and BMI vary by grade.

The magnitude (parameter estimates) of the determinant factors of child's PA and BMI are similar parameters of those reported previously in the literature of determinant factors of children's PA (e.g., Loprinzi & Trost, 2010). In summary, the results of these analyses suggested that several child and family level variables at early school ages (Kindergarten) did have a direct effect on the Hispanic children's PA and BMI in the elementary and middle school years. Except for gender, and MP, all other variables were not consistent in their association with the Hispanic child's PA or BMI.

In general, Hispanic females were less active than males in third grade, fifth grade and eighth grade. No significant gender differences were found in terms of children's BMI in any grade (Kindergarten, third grade, fifth grade, and eighth grade). After adjusting for child and family level variables, FSC-K and MP-K were determinant factors of Hispanic children's PA and BMI, but the associations were not consistent in all grades. FSC at Kindergarten was associated with the child's PA at Kindergarten and fifth grade. MP at Kindergarten was associated consistently with the child's PA level and the child's BMI (Kindergarten, third grade, fifth grade, and eighth grade). Beside from FSC-K and MP, another variable at the family level that influenced the child's PA was the parents' place of birth. Those children with both parents non-US born were less active than those with at least one US-born parent. Please refer to Appendix B for a detailed discussion of the magnitude and direction of the association between the determinant factors and the Hispanic children's PA and BMI, by grade.

# Chapter 5

## Discussion

The current high prevalence of overweight and sedentary lifestyle among children and adolescents in the US makes it necessary to look for strategies at the family level, the main social environment of the child; in order to increase children's PA and prevent child's obesity. One of the initial steps in the design of a behavior change or preventive intervention in public health is to identify the factors that are associated or predict the target behavior. This study accomplished this by beginning to explore theoretically and empirically FSC, and examining MP, during the early school years and their association with child's PA and BMI. This study found that FSC is associated with child's PA and BMI. Interventions designed toward FSC, specifically toward parents and their involvement with the children in their leisure time, should be explore in future research as possible means to increase child's PA and to prevent his/her obesity.

As recommended by Dishman and colleagues (1985), when studying PA determinant factors, is important to include other health behaviors and outcomes, and how these factors differ by personal characteristics such as race (Dishman, Sallis & Orenstein, 1985). This study has accomplished this recommendation when including several family level factors, such as FSC, MP and MACC, and their association with two main outcomes, children's PA and BMI. To the best of my knowledge this is the first study that examines FSC and MP as latent constructs and their association with child's PA and BMI concurrently and over time using a nationally representative sample of children.

Guided by this study conceptual model, and by the main aims of this study, the discussion chapter is organized in three major sections, Model 1 FSC, Model 2 MP, Model 3 Hispanics model. In each section the results, potential contribution and limitations of the measurements, and future research opportunities are discussed. The chapter ends with a section where general limitations and practical implications are discussed.

*Model 1: FSC, PA, and BMI*

This study was designed as an examination of FSC-K as a latent construct, formulated with several indicators of social capital, and its' association of child's PA and BMI. FSC-K resulted in a three factors construct that represented different aspects of the child's social network, such as the involvement of the family with the child in the house (family context), outside the house, and with the child's school (school context). These factors complemented each other for child's positive outcomes, in this case PA level and weight.

FSC-K had a direct and indirect effect on children's PA-score 8 years later in this study sample (study sample including all races). Additionally, it had a direct effect on children's PA level at Kindergarten, third grade and fifth grade (not shown in the Results chapter, it was not part of the hypotheses; results are available contacting the author). In this study FSC-K did not have a measure of the quality of that involvement; however the measure on the types and frequency of activity of child-parent; the type of child-parent-school involvement; the existence of "intergenerational closure" (Coleman, 1988, 1990); and the social support for school involvement, together as a latent construct, had an effect on children's PA level 3 (third grade), 5 (fifth grade), and 8 years later (eighth grade).

The results of this study suggest that FSC-K has a long term effect on child's PA. FSC-K has a direct effect on adolescent's PA-score even after controlling for other factors at baseline and for PA and BMI during intermediary years (third grade and fifth grade). Additionally, when comparing Whites versus Hispanics, its effect was similar for both groups. The implications of these findings are that to design population-based interventions at family level during early school years, focusing on the time parents invest with the child (FSC) might be effective in increasing child's PA, independently of child gender, race, family structure, or place of residence. Kindergarten is a good starting point, as at this age the parents are still selecting the activities in which the child will be involved, influenced among other factors, by their own values of that activity, by their perceived benefits and barriers, by their gender role stereotypes; in later years parent roles change from "providing exposure, opportunities and role modeling...to providing encouragement and guidance for activities that the children choose at later points in development." (Jacobs, Vernon, & Eccles, 2005, p.252; Jacobs & Eccles, 2000).

The time invested with the child in the family context depends mainly on parent decisions. However, the time invested in the school context is affected by the parents' motivation, financial and other resources, time constraints, and by the school (Muller & Kerbow, 1993), an institution with its own policies, practices, and heterogeneous staff's beliefs and behaviors. As noted by Muller and Kerbow (1993), "when context involves other actors, as involvement in school or community does, then it is subject of constraints in that context" (p 39). Kindergarten is, for some students, the first contact with an extended network. It is also the first experience for parents to be involved with schools. The involvement of the parents with the child on school related aspects at home, and with

the child's school decreases as the child ages (Paulson & Sputa, 1996; U S Department of Education, 1997); if practitioners can engage parents to be involved with schools from the beginning (at Kindergarten or earlier) of their school years, it will bring benefits to the child's academic performance (e.g., Hoffer & Shagle, 2004), and this study's results suggest that it also might influence in the child's PA behavior . Early school years are a good starting point for family interventions targeting child's PA behaviors and BMI. The analyses of this study did not include the type of school that the children were attending, or school system administrative policies, which are factors that might influence the parents' involvement in the school network (Epstein, 1987); and therefore might influence the child's FSC. Future research can examine if FSC as formulated in this study is affected by the type of school, or by school administrative policies; and their effect on child's PA and weight status.

The findings of this study have policy implications for the educational and health systems; the results can provide support for policy makers in education. FSC benefits child's academic achievement (e.g., Hoffer & Shagle, 2004), and can also benefits the child's healthy behaviors (e.g., PA) and physical health (preventing overweight/obesity). Public health interventions might be more effective with the complement of school and home based programs. Parents recognize the importance of the home and school working together for an active lifestyle and a healthy weight (Eckstein et al., 2006; Hesketh, Waters, Green, Salmon, & Williams, 2005). Interventions toward increasing PA level and/or healthy nutrition of the children and the family can be effective, including on minority groups (e.g., Story et al., 2003). Those interventions can benefit the child and other members of the family, such as the parents (e.g., Epstein et al., 1985; Epstein,

Valoski, Wing, & McCurley, 1994), the siblings, and the extended families. Parents can be active instead of passive participants of the interventions; for example, parents can be taught behavioral changes techniques for weight loss (please refer to Epstein et al., 1985; Epstein et al., 1994; McLean, Griffin, Toney, & Hardeman, 2003) and active lifestyles to be implemented for them and for the children.

FSC-K was associated with child's PA level at third grade and fifth grade, and with PA-score at eighth grade, even after controlling for baseline variables. However, it did not have the same effect on BMI. FSC-K was negatively associated with child's BMI (i.e., the greater the FSC-K, the lower the BMI) at Kindergarten, at third grade, and eight grade when controlling for previous PA and BMI; however when other variables at baseline were added to the model the associations were no longer significant. Only the concurrent association of FSC-K and BMI (at Kindergarten) was positive and significant ($p < .05$). The stronger predictor of BMI in each grade (third, fifth and eighth) was the previous BMI. Possible explanation for the lack of association between FSC and child's BMI is that other weight determinant factors were not assessed, such as parents' weight and stigmatization of obesity. Previous research findings support the positive association between parents' and child's weight (please refer to Chapter 2). FSC-K was a latent construct that included activities inside and outside the house, including the school. Overweight/obese children have a higher likelihood to suffer from social isolation (Strauss & Pollack, 2003), stigma (please refer to a review by Puhl & Latner, 2007), and to be bullied (Lumeng et al., 2010) than non-overweight/obese children. The stigma of obesity is not a phenomenon of just current times (e.g., Cahnman, 1968; Richardson, Goodman, Hastor, & Dornbusch, 1961). And this stigmatization seems to have increased

during the last 40 years (Latner & Stunkard, 2003). It could be that even when obese children at Kindergarten are involved with their parents at home, they are not involved in activities outside the house or at school because their obese parents reframe themselves to participate in those activities to avoid other's stigma about their obesity or their child's obesity; affecting the child's FSC-K score. Future studies could examine the association between parental weight, FSC, and child's PA and/or BMI.

When examining race difference (between Whites and Hispanics) with respect to the effect of FSC-K on child's BMI, controlling for previous PA and BMI, the study results showed that FSC-K is negatively associated with children's BMI for Whites, but not for Hispanics. The effect of FSC-K on the White study sample outcomes were not one of the aims of this study, therefore additional analyses were not performed to examine if the association between FSC-K and BMI at eighth grade remains after controlling for other potential factors. However, this finding calls for future research. In terms of the non-significant association between FSC-K and child's BMI among Hispanics, a possible explanation can be that MP is a stronger with Hispanic children's BMI than FSC-K. This topic is further addressed in the Hispanic model section of this chapter.

*FSC as a Latent Construct*

The association of FSC's indicators with child's PA and/or BMI have been studied previously, but this study is the first (to the best of my knowledge) that formulated a latent construct to study FSC and its association with child's PA and BMI, concurrently (Kindergarten) and over time (third, fifth and eighth grade), with a nationally representative sample of children. Several studies on social capital and its

association with child's outcomes have been included as indicators of social capital, or as part of the formulation of social capital latent constructs, the family structure (e.g., both-parents family vs. single-parent family) (e.g., Coleman, 1988; Israel et al., 2001; Kim & Schneider, 2005; Runyan et al., 1998). In this study, this variables was a control variable, because it has been associated with child's PA and BMI (Chen & Escarce, 2010; Johnson et al., 2009; Lindquist et al., 1999); however, it was not included in the formulation of the FSC-K latent construct. The reason behind this decision was to create a latent construct that can be used in future intervention and experimental research studies; independently of family background (family structure, race, or SES). As stated by Lin and Erickson (2008), these indicators of family background are statuses that make the access to social capital unequal since the child's born; driving to "advantage reproduction" (Lin & Erickson, 2008). In contrast to formulating a FSC that mirrors the "advantage reproduction" (Lin & Erickson, 2008), this study's FSC latent construct ended with five factors that can be manageable, that can be nurtured and included in future interventions, independently of family structure, parent's educational level, or SES. Based on the results of the EFA and the factor loading, I have labeled these five factors as: (1) child-mother relationship, positive experiences; (2) child-family-school network; (3) child-mother relationship, negative experiences; (4) child-family involvement in the house; (5) child-family involvement outside the house. All of these factors are congruent with Coleman operationalization of social capital. The factors 1, 3, 4, and 5 are evidence of the "closure' (intensity and time investment) between the child and the parents. Factor 2 represents the "intergenerational closure" between the family and the school-network (Coleman, 1988, 1990).

When the final FSC-K construct was incorporated in the models of this study sample, the contribution of the factors that measured the relationship of the mother with the child were minimal in the models; and were removed from further analyses. However, future studies can examine their contribution in different outcomes such as academic achievement, or other health behaviors (e.g., eating habits). A possible reason for the high residual variance of these factors was that they were measuring only mother's perception but not the child's, or the partner's perceptions of the intensity, or the quality of the family relationships. Future research can assess if adding these factors into the model will improve the contribution of the family-child relationships to the FSC latent construct, and if they affect the child's PA and/or BMI.

Welk (1999), classified several socialization variables at family level that are associated with child's PA behavior; those being parental encouragement (e.g., verbal and non verbal persuasion), parental involvement in child's physical activities, parental facilitation (e.g., access to facilities), and parental role modeling. FSC-K as measured in this study should not be confused with any of these variables or with social support for PA. Only one question in the FSC-K construct assessed family involvement with the child in PA: In a typical week, how often do you or any other family members do the following things with child: play a sport or exercise together? In this study Welk's (1999) socialization variables were not examined; however, the results of this study suggest that FSC can be an additional socialization variable to include in this list. Future research agendas can include the study of FSC and its association and/or interaction with these variables and how they individually, or together, influence PA behaviors and weight status in children.

This study has several limitations in term of the measure of FSC. First, the measures of FSC-K did not assessed the intensity (strong or weak ties), or the density of the child's networks. Second, this study helped to examine FSC as a factor associated with child's PA and BMI concurrently and over time; however, how FSC influenced PA or BMI were not examined. As discussed in previous chapters I argue that FSC could contribute to the child's PA and healthy weight status through different mechanisms in the child's social networks, such as through information channels, norms, obligations, and expectations (Coleman, 1987, 1988, 1990). Third, the individual contribution of the FSC's indicators, or factors, was out the scope of this study. Based on previous research in the concept of social capital and social networks, the FSC measurement can be extended in future research adding questions about: (a) the density(amount), centrality, and intensity (quality) of the child's social networks (e.g., parents-child and parents-classmate' parents); (b) the type of information share between parents (e.g., summer camps opportunities); (c) the child's and parent' beliefs and behaviors about PA and obesity, to determine the homogeneity of the social networks in these aspects (norms); (d) the type of social support (e.g., emotional, informational, instrumental) received from the members of the social network (i.e., child from parents, child from others classmate's parents, and parents from other classmate's parents); and (e) the expectations of future help as reciprocity of support received previously. Future research can analyze which factors, and how, influence children's PA and BMI.

*Model 2: MP, PA and BMI*

Consistent with the expectancy-value theory of achievement motivation (Eccles (Parsons) et al., 1983; Wigfield & Eccles, 2000) and with previous study's findings, this

study results revealed that MP was associated with, and had an effect on child's PA (Bois et al., 2002; Fredericks & Eccles, 2005; Pfeiffer, Dowda, McIver, & Pate, 2009); and with BMI (Eckstein et al., 2006; Rose & Bodor, 2006). MP at Kindergarten had a positive effect on child's PA level at third grade, fifth grade, and PA-score at eight grade, even after controlling for variables such as race, gender, and other variables at baseline (e.g., disability status, family structure, urbanicity and region).

The effect of MP-K on current and posterior PA levels calls for more research. The facts that the measure of MP was at Kindergarten when parents (e.g., parents' feedback) are one of the main sources of judging physical ability (Horn & Weiss, 1991; Weiss, 2000), and when children's perceived physical competence does not correlate with actual physical competence (Horn & Weiss, 1991), support the importance of MP on child's PA level. It has an effect on posterior years (i.e., fifth grade and eighth grade) when this effect might compete with the effect of other sources of perceived competence such as actual ability, comparison with the peers, and other adults' feedback (e.g., coaches) (Horn & Weiss, 1991; Weiss, Ebbeck & Horn, 1997). This study has the limitation of not including these variables (e.g., perceived competence). Future research can examine if these associations (MP with PA level; MP with PA-score) have the same effect if instead of measuring MP in the three settings (structured, free time and aerobics), it is measured only on structured sport settings; or if the measures complement each other, resulting in a more comprehensive measure of parents' perception of child's PA abilities at Kindergarten. Additionally, further research can examine if MP still has the same effect on child's PA, after adjusting for perceived ability, comparison with the peers, or adults' perception in elementary school or middle school.

In this study sample, MP significantly predicted child's PA for all grades, but only had a concurrent association with BMI at Kindergarten. A study with the ECLS-K data found similar inverse associations between MP, (measured with the same three questions that were used to construct MP latent construct, but individually), and child's BMI at Kindergarten (Rose & Bodor, 2006). Previous studies have reported similar findings regarding the no effect of MP. Eckstein and colleagues (Eckstein et al., 2006), performed a study with children (2-17 years old) in Chicago where 87% of the reporters were mothers (n=223; 44% Whites, 35% Hispanics, 17% Blacks, and 7% others). They measured parents' perception of the child's PA in comparison with children's peers with the questions: (1) "In summer weather, my child participates in active physical exercise... More h/wk than other children, About the same h/wk as other children, Fewer h/wk than other children", and (2) "When my child runs, he/she is usually...Faster than other children, About as fast as other children, Slower than other children (Eckstein et al., 2006, p. 686). Their study did not show an association between parents' perception and child's BMI. The discrepancy in the study findings might be because the difference in the measures for MP and the participants' age groups.

Possible mechanisms in which MP predicts BMI at Kindergarten can be the same that have been identified in the association of MP and child's PA: by providing higher instrumental and emotional support to those perceived as having more ability (Loprinzi & Trost, 2010); and by influencing the child's self perception of PA ability (Bois et al., 2005). Previous studies with children (fifth grade and sixth grade) have shown that children that are overweight can have a lower perceived physical competence (Southall, Okely, & Steele, 2004).

The nested models demonstrated the need to stratify by race when studying MP on child's BMI. The analysis of this study found race differences (Whites and Hispanics) in the association of MP and child's BMI. While MP predicted child's PA-score at eighth grade for Whites and for Hispanics, it predicted child's BMI at eighth grade for Whites, but not for Hispanics. In summary, the nested models suggested that FSC-K and MP-K had an effect on White children's BMI at eighth grade; but neither FSC-K, nor MP-K, had an effect on Hispanic children's BMI at eighth grade. This topic will be discussed more broadly in the Hispanic model section.

*MP as a Latent Construct*

The measure of MP in this study included a comparison with the peers in different settings of physical activity: (a) during structured activities like sports or activities at day care or school, (b) during free time, and (c) how much aerobic exercise does the child get on a consistent basis. These questions are different from the measures used by Eccles and colleagues. For example, Eccles and colleagues (Jacobs, Vernon, & Eccles, 2005) have assessed parent's perception with the question "How good is your child in sport" (p. 248) and "How well is your child doing in sports this year?" (Jacobs & Eccles, 1992, p. 936). The MP latent construct used in this study was formulated with questions that are appropriate for the age group. Assessing physical activity in structure, free, and aerobic settings might be more appropriate than asking only about sports ability among Kindergarteners for several reasons. First, less than half of the children of the study sample were involved in sports out of school hours at Kindergarten (structured activities). Second, the focus of this study is on child's PA, where sports participation is one component of the main outcome PA-score at eighth grade. Third, children can be active

in other unstructured activities like playing with other children; this type of activity also can contribute to compliance with PA guidelines and to obtain the health benefits of PA. Even when the measurements of MP are different from previous studies (which can be a limitation at the moment of comparing other studies' findings), the results of this study are consistent in identifying MP at early school years with future PA involvement (e.g., sports involvement) (Jacobs, Vernon, & Eccles, 2005).

Previous studies have used the indicators of MP as a proxy of Kindergarten child's PA level. For example, Rose and Bodor (2006) dichotomized these measures with "less active than their (boy/girl) peers" versus "as active as peers or more active than peers" to measure PA level. Using this measure they found that the three settings (i.e., structured activities, free time, and aerobic exercise) were significant negatively associated with child's BMI (Rose & Bodor, 2006). Contrary to Rose and Bodor (2006), in the present study these questions were used within the three settings and with the three alternatives to formulate MP (please refer to Method Chapter for details). I argue that they should not be a proxy of PA, as they are assessing different concepts. I based my argument on the results of several analyses. First, the alpha correlation of the four questions (three items of MP-K, and one item of PA level at Kindergarten) resulted in $\alpha$=.34; and when the PA-level at Kindergarten was removed the alpha increase to $\alpha$=.74. Second, the four questions were examined in an EFA, resulting in a poor RMSEA (.11), and PA level at Kindergarten had a very high residual variance (.931). When PA level at Kindergarten was removed from the EFA, the RMSEA improved (.001).

*Model 3 (Hispanic model): FSC-K, MP-K, and MACC*

The analysis of the Hispanic model demonstrates the importance of studying the PA and BMI determinant factors by race/ethnic group. After analyzing the final Hispanic model, which includes FSC-K, MP, MACC and other control variables, FSC-K was associated only with child's PA level on Kindergarten and fifth grade, not with PA-score of eighth grade; this is different from the results in the model with the whole study sample. These results could be explained by several reasons, including that Hispanic model had additional control variables related with minorities (e.g., parent's place of birth, residence mobility, and mother's perception of neighborhood safety) and did not include race. Another reason could be that FSC is a dynamic concept, and its effect on the outcomes (PA level and BMI) will depend on the measure used, and the proximity between the time when it was measured and when the outcome occurs. The activities at Kindergarten were used to create FSC-K. However, the type of activities in which the parents are involved with the children changes through time. A recent study using the data from National Longitudinal Study of Adolescent Health, examined the association of family influence on adolescent' (sixth to twelve grade) MVPA, including several age-appropriate questions including family cohesion, parent monitoring, parent-child communication and parents engagement (number of activities of parents and child in the past four weeks: church events, shopping, playing sports, going to movies, plays, museums, concerts or sport events, working on school projects and eating evening meals together) (Ornelas et al., 2007). Their measure of parent engagement is similar to questions included in the formulation of the FSC-K construct in this study; they are indicators of FSC. Parents' engagement predicted adolescent MVPA one year later, after

controlling for child's self esteem and depression; it was a stronger predictor than parent monitoring, family cohesion, and parent-child communication. The ECLS-K takes that into consideration and the questions are appropriate for the child developmental stage and age. Future research can examine how the formulation of FSC can be different by children's age group; and if its association with children's outcomes vary as a function of the time (wave) of the independent variable (FSC) and of the outcomes (PA level and BMI).

While FSC-K among Hispanics had an effect only on PA level on Kindergarten and on fifth grade, MP at Kindergarten was associated with child's PA and BMI in all grades (Kindergarten, third grade, fifth grade, and eighth grade). MP standardized values were higher than those of FSC-K, in all grades (refer to Table 18). When analyzing if MP attenuates the effect of FSC on child's PA and/or BMI, in the whole study sample, by examining both variables (FSC-K and MP) together, neither the significance, magnitude, nor direction changed as consequence of having the two variables in the model. However, in the Hispanic model, MP is a stronger predictor than FSC-K. Hispanic mothers perceived their children less active than White mothers in Kindergarten, and this perception has a direct and indirect effect on Hispanic children's PA and BMI in posterior years.

In this study, PA was associated with BMI consistently in most of the models; additionally Hispanics had higher BMI and were less active than Whites. This is evidence in favor of the possibility that those with higher BMI are perceived less active and might also be provided with fewer opportunities to become involved in PA. Previous research studies have shown that obese children have a lower PA self-efficacy, lower self-

confidence in overcoming barriers, less likelihood to ask parents to provide opportunities for PA, and less perceived adult support for physical activity than non-obese children (Trost, Kerr, Ward, & Pate, 2001; Zabinski, Saelens, Stein, Hayden-Wade, & Wilfley, 2003).

However, this possible explanation should not be extrapolated to the conclusion that parents of overweight/obese children spent less time or are less involved with their children's activities inside or outside the house, or at school. Among Hispanics, FSC was not associated with child's BMI. A possible explanation is that even when the parents are involved with the children at home and at school, if the child perceives that their parents don't consider he/she as active, or having physical abilities (e.g., in any sport), their self-esteem or self-efficacy is negatively affected (Bois et al., 2005).

The challenge and question is: how do we improve the Hispanic mother's perception of child's ability? Mother's perception is not easy to change. When parents create their beliefs and expectations about their children, it may be too late. First of all, parents need to value the benefits of physical activity and healthy nutrition in their lives and in their children's lives in order to provide opportunities to the children. Parents should be oriented as soon as the child is born regarding the influence that they have over their children's behavior; on the benefits that an active lifestyle has over their children social, mental and physical health; on how to overcome barriers for physical activity with simple age-appropriate activities at home; how to manage time for children physical activities indoors and outdoors; on how communication, verbal persuasion and modeling affect their children behaviors; and how they can be agents of change in their lives and in their children lives. The high prevalence of inactivity and obesity among Hispanic

children is a public health priority. Parents need to be taught in their language and on how to act with their limited resources; with Hispanics role models, with people like them; in places where they attend, church, public health clinics, and work places (e.g., farms, factories). In order to positively impact the obesity epidemic, the government needs to go where minorities are, and empower them with the knowledge of how to help their children.

*MACC*

In addition to FSC-K and MP, the final Hispanic model included mother's acculturation at Kindergarten. Similar to previous studies with Hispanic children in Kindergarten, MACC was not related with children's BMI after controlling for possible confounders (Ariza et al., 2004). These findings have several explanations. First, in the Hispanic model FSC, MP and previous BMI were stronger predictors of child's BMI, and MP was a stronger prediction of PA than MACC. Second, this study has the limitation that it did not include other determinant factors of BMI that have been associated with children's BMI (e.g., calorie intake, parental weight, food security, eating habits such as having breakfast, family supper). Third, MACC resulted in a measure of mother's linguistic acculturation at child's Kindergarten; and the outcomes (BMI and PA) were measured eight years later, a period when the mother and the child could have improved their English proficiency. Fourth, other acculturation indicators might be more influential on children's BMI than linguistic acculturation, such as dietary acculturation. Changes in the diet, such as higher intake of sodas, high sugar content foods, and change in meal patterns can be indicators of dietary acculturation (refer for example to Romero-Gwynn & Gwynn, 1997); and they have been associated with higher BMI among children. Future

research can examine how indicators of mother's acculturation measured individually or as a group (latent construct) (e.g., linguistic acculturation, dietary acculturation) can influence child's BMI and PA concurrently and over time.

One of the measures of acculturation is place of birth. It was not part of the final MACC latent construct; however, it was included in the final Hispanic model as a control variable. Specifically, a variable was created with the information from both parents' place of birth; a new variable indicated if both parents were non-US-born, or if at least one parent was US-born. This dichotomous variable predicted child's PA level in Kindergarten, third grade, fifth grade, and eighth grade; those children with both non-US-born parents had less PA level than those with at least one US-born parent. Future studies can examine if the association or effect of FSC or MP on Hispanic children's PA and BMI vary by parents' place of birth; this was out of the scope of this study. Recent findings suggested that children of recent immigrants are at higher risk of obesity (Van Hook et al., 2009).

In summary FSC-K and MP as measured in this study evidenced that these factors had an effect on Hispanic children's PA and BMI.

*General Limitations*

In this study PA level was a subjective measure, reported by the mother (Kindergarten, third grade, and fifth grade), and PA-score was self-reported by the children. The association of PA with other factors (e.g., FSC, MP, and MACC) can be influenced by the measurements of PA (Epstein, Paluch, Coleman, Vito, & Anderson, 1996). However, the measures used in this study to assess PA level have been used recently in the literature (Eisenmann et al., 2008; Liu et al., 2009; Trost et al., 1999); and

the significant association of FSC with them suggest that parents that are involved in the children's activities at Kindergarten have more active children concurrently (Kindergarten), and in future developmental stages (third grade, fifth grade, and eighth grade).

For statistical analysis purposes BMI was a continuous variable instead of a categorical variable based on the CDC growth charts. The continuous measure of BMI facilitated the interpretation of the association of FSC, MP and MACC at baseline with BMI ($kg/m^2$). Future studies can examine if there are differences in the association between FSC and MP on child's BMI based on the CDC categories.

The sample used in this study was limited to children living with their biological mothers and for whom their mothers were the main respondent in all waves. Several measures were related with mother' characteristics, and perceptions: mother's acculturation, mother's perception of child's physical activity in comparison with the child's peers, mother job status, mother's perception of neighborhood safety for child's to play, and family social capital indicators as reported by the mother, including "mother-child relationship" but not father-child relationship. The findings of this study cannot be generalized to families with step-mothers or adopted-mothers; the quality of the relationship and the time invested in the child, both indicators of FSC, can be different for non-biological mothers (Clingempeel & Segal, 1986; Lansford, Ceballo, Abbey, & Stewart, 2001; Rueter, Keyes, Iacono, & McGue, 2009) and can be different by child's gender (Clingempeel & Segal, 1986). Are these differences related or affecting child's FSC score or MP among non-biological-mother families? This differences call for future research in this area.

*FSC - Practical Implications*

This study's findings suggest that social capital can be use as a framework in the study of determinant factors of child's PA. Researchers should explore social capital and its association with child's PA. Besides the psychosocial determinants presented in the literature (please see Chapter 2), the factors that comprise social capital, such as the time invested in the child (not including sports or physical activity), and the time invested in the child's social networks are modifiable factors that can contribute to a more active lifestyle for the children concurrently and in the long term. If this' study findings can be replicated or extended, and confirmed in future research, researchers and practitioners will have an additional tool for interventions at family and school level. For example, at the family level, parents should be counseled during prenatal care, by gynecologists, pediatricians, and hospitals, on the importance of their time involvement with the child in different activities inside and outside the house. Parents' involvement benefits the child's emotional, social, cognitive, and physical development; but it might also help to develop an active lifestyle, to prevent sedentary behaviors, and probably obesity. At the school level, the educational system should include in their operational plans orientation to parents on this topic at pre-school care centers up to elementary grades. Additionally, this study findings support the importance of developing strategies to increase parents' involvement with the school.

In terms of public health there are several public service announcements that encourage an active lifestyle for adults and children. Practitioners on this area should evaluate health communication strategies where family social capital indicators are the main components of their health message. The emphasis might not necessarily be on

achieving only an active lifestyle for children or adults, but also on promoting and encouraging quality time investments on fostering long lasting child-parent relationships.

*Conclusion*

Social capital embedded at the family level has been consistently identified as an important factor for children's cognitive and social development. The results of this study have provided evidence that it also is associated with child's PA behavior and BMI. This study calls for further studies to examine social capital embedded at the child's family (FSC) as a potential determinant factor of child's PA and weight status, concurrently and over time; and to study this phenomena from a socio-cultural context (i.e., race and acculturation level).

Among Hispanics, even when the parents can be involved with the child's development (FSC), mother's perception of children PA in comparison with her child's peers can be a stronger predictor of her child's PA and BMI. Hispanic mothers need to be oriented on the influence that their perception has on children's behaviors and health outcomes; mothers need to be educated about strategies to improve child's self-competence and self-efficacy such as verbal persuasion and role modeling. Future research is necessary to confirm this study's findings, and to examine possible mechanisms of how FSC and MP exert its influence on children's PA and weight status.

# APPENDIX A

## Preparation of Data for Hypothesis Testing

*Test for ICC*

To test for the possibility of multistage clustering (at Kindergarten the children are nested within schools) and the violation of the independence assumption of the classical regression method, ICC tests were performed for the main outcomes: PA-score and BMI at eighth grade. Table A1 presents the results of the ICC analyses for PA level and BMI, for each wave. "School identification" was used as the Level 2 variable. All the calculated ICCs in this study data were less than .10, (Raykov, 2009); and the design effect was less than 2.00 (Muthén & Satorra, 1995).Therefore, only SEM (e.g., EFA, CFA, and structure equations) was used to test the hypotheses; multi-level modeling was not justified and was not used.

*EFA and CFA for FSC at Kindergarten*

Factor loading FSC-K indicators was used to test if the correlation among the observed variables (social capital —factor indicators) could be explained by one continuous latent variable (social capital—factor). A latent variable is "any random variable that has an individual realization(s) in any sample/population, but this realization(s) is not observable" (Raykov, 2009, p.34). MPlus 5.21 statistical software was used to conduct the EFA. The estimator used was a robust weighted least squares estimator; it is the default estimator when the factor indicators are continuous and categorical (Muthén & Muthén, 2009). Categorical factor indicators were specified in the model. Using all the FSC-K factor indicators explained in the Methods chapter, an EFA analysis was run.

Table A1

*Intra-Class Correlation Coefficients, and Design Effect Size by Selected Observed Variables*

| Variable | ICC Cluster-School | Average cluster size | Size of design effect[+] |
|---|---|---|---|
| Days/ week ≥20 min MVPA | | | |
| Spring K (n=14,146) | .067*** | 11.408 | 1.70 |
| Spring 3rd grade (n=9,948) | .081*** | 4.485 | 1.29 |
| Spring 5th grade (n=8,150) | .063*** | 4.427 | 1.22 |
| Spring 8th grade (n=6,943) | .045*** | 3.176 | 1.10 |
| BMI $kg/m^2$ | | | |
| Spring K (n=14,300) | .039*** | 12.243 | 1.44 |
| Spring 3rd grade (n=10,227) | .047*** | 4.748 | 1.18 |
| Spring 5th grade (n=8,276) | .063*** | 4.537 | 1.23 |
| Spring 8th grade (n=6,729) | .091 | 3.182 | 1.20 |

[+]Size of design effect: 1 + (average cluster size - 1) x intra-class correlation.

*** $p < .001$

To assess model fit, three indices were used: the CFI; the TLI, where values of 0.90 suggest acceptable model and 0.95 or greater suggest adequate fit (Hu & Bentler, 1999); and the RMSEA, where values of less than 0.08 indicate adequate fit and values under 0.05 suggest excellent fit (Browne & Cudeck, 1992). A scree plot was used to graphically display the eigenvalues for EFA of FSC-K. In a first EFA, a five factors model was selected, however, the number of siblings variable resulted in a one factor with one factor indicator, it was removed for further analysis (results are available upon request to the author). The second EFA resulted with eigenvalues from 5.09 (for one factor) to 1.02 (for eighth factors) for the FSC-K sample correlation matrix. The scree plot showed a plateau after five factors, with an eigenvalue of 1.24, and the model with five factors fit the study data adequately (CFI .978, TLI .969, RMSEA .021). Based on this analysis, I selected the five-factors model. Five correlated factors resulted from the EFA, showing that social capital indicators did not load only in one factor (please refer to

Table A2). All the factor indicators with a factor loading less than .40 across all five factors were removed from the model (Stevens, 1992): relationship of mother-partner (.214), past month sport event (.363), no child care (.180), and residence mobility (-.202). Number of siblings and residence mobility were included as a control variable in the hypothesis testing. The indicator "warmth" that belongs to Factor 3 (a.a) had to be removed from the model because it had empty cells for the Hispanics study sample.

Table A2

*Factor Analysis Solution for Family Social Capital at Kindergarten ( n=14,832)*

| | Attribute | Factor weight | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| *(a)Mother -child relation* | Mother responded statements about the her relationship with the child : | | | | | |
| | (a) I often have warm, close times together; | | | .78 | | |
| | (b) Most of the time I feel that {CHILD} likes me and wants to be near me; | | | .75 | | |
| | (c)Even when I'm in a bad mood, I show {CHILD}; a lot of love; | | | .53 | | |
| | (d) I express affection by hugging, kissing and praising {CHILD}; | | | .62 | | |
| | (e) {CHILD} does things that really bother me; | .75 | | | | |
| | (f) I find myself giving up more of my life to meet {CHILD}'s needs than I ever expected ; | .47 | | | | |
| | (g) I often feel angry with {CHILD}; | .71 | | | | |
| | (h) {CHILD} seems harder to care for than most. | .66 | | | | |
| *(b) Mother-partner* | Would you say that your relationship is...Very happy = 1; Fairly happy = 2; or Not too happy= 3. | | | *.21* | | |

Table A2 (cont'd)

| | Family-child activities | Factor weight | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| *(c) Child-family involvement* | In a typical week, how often do you or any other family members do the following things with {CHILD}? | | | | | |
| | (a) tell stories to the child; | | | | .57 | |
| | (b) sing songs; | | | | .46 | |
| | (c) help the child to do arts and crafts; | | | | .50 | |
| | (d) involve the child in household chores; | | | | .42 | |
| | (e) play games or do puzzles with the child; | | | | .59 | |
| | (f) talk about nature or do science projects with the child; | | | | .55 | |
| | (g) build something or play with construction toys with the child; | | | | .55 | |
| | (h) read books to the child; | | | | .50 | |
| | (i) play a sport or exercise together? | | | | .50 | |
| *(d) Child-family activities outside the home* | Activities outside the home during the last month: | | | | | |
| | (a) gone to a play, concert, or other live show; | | | | | .46 |
| | (b) visited an art gallery, museum, or historical site; and | | | | | .57 |
| | (c) visited a zoo, aquarium, or petting farm. | | | | | .57 |
| | (d) attended an athletic or sporting event in which {CHILD} was not a player? | | *.36* | | | |

Table A2 (cont'd)

| | Proxy of family social networks | Factor weight | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| *(e) Child-family - school involvement* | Any household (adult) participation in: (a) attended an open house or back-to-school night; | | .61 | | | |
| | (b) attended a meeting of a PTA, PTO, or Parent-Teacher Organization; | | .44 | | | |
| | (c) gone to a regularly-scheduled parent-teacher conference with {CHILD}'s teacher; | | .42 | | | |
| | (d) attended a school or class event, such as a play, sports event, or science fair; | | .60 | | | |
| | (e)volunteered at the school or served on a committee; and | | .77 | | | |
| | (f) participated in fundraising for {CHILD}'s school. | | .52 | | | |
| *(f) Family social support* | Reasons that made it harder for the mother to participate in activities at her child's school during the current year, I chose some of the reasons that can be proxy of social support: | | | | | |
| | (a) no child care keeps your family from going to school meetings or events; | .18 | | | | |
| | (b) problems with transportation to the school. | | .44 | | | |
| *(e) Mother's social ties school related* | About how many parents of children in {CHILD}'s {or {TWIN}'s} class do you talk with regularly, either in person or on the phone? | | .53 | | | |
| *(f) Stability of social ties-residence mobility* | Since {CHILD} was born, how many different places has {he/she} lived for four months or more? | | -.20 | | | |

The EFA of FSC-K yielded five main factors. They can be labeled as (1) child-mother relationship, positive experiences; (2) child-family-school network; (3) child-mother relationship, negative experiences; (4) child-family involvement in the house; and (5) child-family involvement outside the house. Table A3 presents the factors' inter-

correlations, which suggests that these five factors were not independent. For example, the highest correlations were between the factor child-family involvement outside the house and two other factors: child-family-school network (.553), and child-family involvement in the house (.460).

Table A3

*Factor Inter-Correlations for Family Social Capital Construct*

| Factor | F1 | F2 | F3 | F4 | F5 |
|---|---|---|---|---|---|
| F1 | 1.000 | | | | |
| F2 | 0.112 | 1.000 | | | |
| F3 | 0.371 | 0.136 | 1.000 | | |
| F4 | 0.316 | 0.365 | 0.151 | 1.00 | |
| F5 | 0.198 | 0.553 | 0.104 | 0.460 | 1.00 |

*Note.* Factors' labels: (F1) child-mother relationship, positive experiences; (F2) child-family-school network ; (F3) child-mother relationship negative experiences; (F4) child-family involvement in the house; (F5) child-family involvement outside the house.

Because the indicators used to formulate FSC-K as a latent construct were drawn from previous social capital definitions and research, the data were examined with an EFA. However, a second order factor analysis was run without those factor-indicators with a factor loading less than .40, and without the factor-indicator "warmth", to test the reliability of the model. The final model of FSC-K as a latent variable with five factors had a CFI of .922, a TLI of .937, and a RMSEA of .033 (not shown in the tables). During hypothesis testing, Factor 1 and Factor 3 had a residual variance over 0.90, suggesting that they did not contribute in the models. I reexamined the second order factor analysis of FSC-K without factors Factor 1 and Factor 3 (child-mother relationship), and it resulted in better model fit indices (CFI .945, TLI .958, RMSEA .03). For hypothesis testing, FSC had three indicators, Factor 2, Factor 4, and Factor 5.

*Other Latent Variables*

Additionally, EFA and/or CFA were used to examine the latent constructs: mother's perception of her child's PA level in comparison with child's peers at Kindergarten (MP-K); physical activity score at eighth grade (PA-score); and Hispanic mother's acculturation (MACC). Table A4 presents the results of the EFA for MP-K. EFA was used because no previous study was found using these indicators to formulate a MP-K latent construct. The results suggest that MP-K can be used as a latent construct, with MP-K indicators loaded in one factor.

Table A4

*Exploratory Factor Analyses (EFA) for Mother's Perception Of Child's Physical Activity Level in Comparison With Child's Peers (MP-K) As One Single Factor Latent Construct, Spring-Kindergarten (n=15,715)*

| Observed variables | Possible answers | GRL | CFI<br>TLI<br>RMSEA | ESCM | FD |
|---|---|---|---|---|---|
| MP- indicators: | | | 1.000<br>1.000<br>0.000 | 2.267 | .932 |
| CHQ130. Compared to other (boys/girls) (his/her) age, how physically active is {CHILD} during structured activities like sports or activities at day care or school? Is (he/she)... | 1. More physically active than other (boys/girls); 2. Less physically active than other (boys/girls); or 3. About the same as other (boys/girls)? | .873 | | | |
| CHQ131. How about during free time? | 1. More physically active than other (boys/girls); 2. less physically active than other (boys/girls); 3. about the same as other (boys/girls) | .851 | | | |
| CHQ137. Aerobic exercise makes the heart work very hard and makes people break out in a sweat. Compared to other (boys/girls) (his/her) age, how much aerobic exercise does (CHILD) get on a consistent basis? Would you say ... | 1. More than other (boys/girls); 2. less than other (boys/girls); or 3. about the same as other (boys/girls)? | .668 | | | |

*Note.* GRL= Geomin Rotated Loading. ESCM = Eisenvalues for Sample Correlation Matrix. FD = Factor determinancies.

To examine the PA-score as a latent construct, responses to the three questions that assessed physical activity behaviors at eighth grade were entered into a CFA. The analysis type was complex; the weight variable was "c7pw0" ; the cluster variable was "s7_id" (school identification); and the default estimator was the WLSMV, which is the "weighted least square parameter estimates using a diagonal weight matrix with standard errors and mean- and variance- adjusted chi-square test statistic that use a full weight matrix" (Muthén & Muthén, 2009, p.484). The model fit the data adequately, suggesting that the PA-score can be used as a latent construct, with PA-score indicators loaded in one factor (Table A5).

Table A5

*Confirmatory Factor Analyses For Self-Reported Adolescent's Physical Activity as a Single Factor Latent Construct, Spring eighth grade (n=7,091)*

| Observed variables | Possible answers | Standardized Estimate |
|---|---|---|
| (Q.28.)On how many of the past 7 days did you exercise or participate in PA for at least 20 min that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic exercise? | 0-7 days | .576 |
| | | .574 |
| (Q.10) Have you participated in the following: school-sponsored activities this school year?<br>a. School sports | Did not participate (1)<br>Participated (2)<br>Participated as an officer, leader, or captain (3)<br>Recoded: 1=0; 2-3=1 | |
| (Q.12.g.) How often do you spend time...playing non school sports? | Rarely or never;<br>Less than once a week;<br>Once or twice a week;<br>Every day or almost every day.<br>Recoded: 1=0; 2-4=1. | .538 |

*Note.* CFI 1.00, TLI 1.00, RMSEA 0.000. Model ends with no negative residual variances. Estimator: WLSMV.

To examine MACC as one latent construct, some indicators that have been used previously as proxies of acculturation were entered in an EFA. Table A6 presents the results of the EFA for MACC among Hispanics. The results suggest that MACC can be used as a latent construct. The model fit with a CFI of 1.00, TLI of 1.00, and RMSEA of 0.016. Acculturation indicators loaded on one factor. Because the age when mothers first moved to the United States had a factor loading of -.015, it was removed from the model. All other factors were entered in a CFA. The analysis type was complex, the weight variable was "c1pw0"; the cluster was "s1_id" (school identification); and the default estimator was WLSMV. The CFA results confirmed MACC as a latent construct with a fitted model (CFI 1.00, TLI 1.00, and RMSEA 0.000). The final model of MACC is a proxy of acculturation; all the final indicators are related with mother's English proficiency.

Table A6

*Exploratory Factor Analyses for Hispanic-Mother's Acculturation level (MACC) as a Single Factor Latent Construct (n=1,620)*

| Observed variables | Possible answers | GRL |
|---|---|---|
| PLQ.070. In Fall-Kindergarten the mother reported: How well do you (continuous variables): | 1= Very well<br>2= Pretty well<br>3= Not very well<br>4=Not well at all<br>It was recoded inversely. | |
| a. Speak English | | .974 |
| b. Read English | | .984 |
| c. Write English | | .976 |
| d. Understand someone speaking English | | .962 |
| PLQ060. In Fall-Kindergarten mothers reported: What is the primary language spoken in your home? (Dichotomous variable) | English;<br>Spanish;<br>Other European Languages;<br>Asian, Pacific Island Or Native American Languages;<br>Other Languages Or Cannot Choose<br>It was dichotomized as: 0=Other language and 1=English | .816 |
| FSQ 250. In 3rd grade the mothers reported age when first moved to the United States. (Categorical ordinal variable) | It was recoded in seven categories+<br>0-5<br>6-12<br>13-17<br>18-24<br>25-34<br>35-54<br>55 or more | -.015 |

*Note.* GRL = Geomin Rotated Loading. Model ends with no negative residual variances.

+Following life stages by Rumbaut (2004). CFI 1.00, TLI 1.00, RMSEA 0.016.

## APPENDIX B

### Potential Determinant Factors of Hispanic Children's PA and BMI

### (Aim 6)

Based on the standardized parameter estimates in the Model 3 (please refere to Hispanic model, Table 17), the variables associated with the Hispanic child's PA at Kindergarten were FSC-K (β= .169); MP (β= .259); residence mobility (β= .076), having both parents non-US-born (β= -.135); living in the south (β= .167); living in "small town and rural" areas (β= 0.061) ("central city" reference group). The following baseline variables had a direct effect ($p \leq .05$) on the child's PA level at third grade: MACC (β= .076); MP (total effect β=.085); PA level at Kindergarten (β=.257); gender (females, β=-.134); having a disability at Kindergarten (β=-.101); having both parents non-US-born (β=-.155); living in the south (β=.148) ("North" reference group); and living in "urban fringe and large town" areas (β=-.066) ("central city" reference group). The significant baseline variables that had a direct effect ($p \leq .05$) on the child's PA level at fifth grade were FSC-K (β=.102); MP (direct effect β=.153; total effect β=.178); PA level at third grade (β=.251); gender (females, β=-.114); mother's not working (β=-.073); having both parents non-US-born (β=-.085); and, living in the Midwest (β=-.075) (North reference group). The predictors of child's PA-score were MP (direct effect β=.266; total effect β=.285); PA level at fifth grade (β=.105); gender (β=-.299); having both parents non-US-born (β=-.182); having a disability at Kindergarten (β=-.188); and more than two hours per day of television watching (β=-.075).

In terms of the variables significantly associated with child's BMI at Kindergarten, they were MP (β=-.160); number of siblings (β=.111); and having rules at

home for amount of hours of watching television (β=-.077). The significant predictor variables ($p \leq .05$) at baseline (Kindergarten) for child's BMI at third grade were: BMI at Kindergarten (β=.816); region: North (reference group), Midwest (β=.086), South (β=.119), West (β=.085); and MP (indirect effect β=-.106; total effect β=-.133). For child's BMI at fifth grade the predictors were: BMI at third grade (β=.943), and PA level at third grade (β=.099), MP (indirect effect β=-.092; total effect β=-.127) and having both parents non-US-born (β=-.034). The baseline predictors of the child's BMI at eighth grade were: MP (indirect effect β=-.109; total effect β=-.109); number of siblings at Kindergarten (β=-.037); mother's perception of neighborhood attributes (β=-.044); and living in "urban fringe and large town" areas (β=.014) ("central city" reference group). Additionally BMI at fifth grade (β=.861) predicted child's BMI at eighth grade.

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