

ABSTRACT

Title of Document: PARENTAL AND SCHOOL INFLUENCES
ASSOCIATED WITH FIFTH GRADERS'
HEALTHY EATING AND PHYSICAL
ACTIVITY BEHAVIORS

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Healthy eating and physical activity behaviors are decreasing among children in the United States. Despite growing evidence that parents and schools are important influences on the healthy development of children and adolescents, few studies have explored the relations between parental and school influences and children's positive health behaviors. This study, therefore, examined how the associations between parental and school health-related practices and children's healthy eating and physical activity behaviors differed according to varying levels of parental nurturance and school belongingness, and whether these associations were mediated by children's self-beliefs (i.e., physical appearance self-worth and physical self-efficacy). A parent, school, and combined model were tested.

Based on data from the Healthy Passages study measured-variable path models were used to evaluate the direct, moderating, and indirect effects of parental and school influences on children's positive health behaviors for 5,147 fifth graders

and their primary caregivers. Findings revealed that the three models for both healthy eating and physical activity had adequate model-data fit indices. Parenting practices, including regulating the watching of television and observing children being physically active, were related directly to children's healthy eating and physical activity, respectively. One moderating effect indicated that there was a positive association between eating meals together and children's healthy eating in homes with high and medium levels of father nurturance (see Darling & Steinberg, 1993). Both mother and father nurturance were indirectly related to children's healthy eating and physical activity via children's self-beliefs. In addition, children's physical self-efficacy partially mediated the relation between parents observing their children engage in physical activity and children's physical activity behaviors.

One school practice, minutes per week of physical education, was predictive of children's physical activity. Children's self-beliefs fully mediated the relation between school belongingness and children's healthy eating and physical activity. The combined parent and school model provided a more complete explanation of children's positive health behaviors than did either of the singular parent and school models. The results of this study constitute an initial step toward evaluating exploratory causal models of children's healthy eating and physical activity behaviors. Implications of the findings and directions for future research are discussed.

PARENTAL AND SCHOOL INFLUENCES ASSOCIATED WITH FIFTH
GRADERS' HEALTHY EATING AND PHYSICAL ACTIVITY BEHAVIORS

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Dedication

To Cal, for all your love and support.

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Chapter 1

Introduction

Healthy eating behaviors and regular physical activity promote optimal health in children and adolescents. Research has demonstrated that children who are physically active and eat healthy diets exhibit improved cardiorespiratory fitness, stronger bones and muscles, reduced likelihood of becoming overweight, reduced feelings of anxiety and depression, and increased optimal growth and intellectual development (Eisenmann, 2003; Strong, Malina, & Blimkie, 2005; U.S. Department of Health and Human Services, 1996). In contrast, physical inactivity and unhealthy dietary behaviors have been linked to chronic diseases such as obesity, heart disease, and cancer (U.S. Department of Health and Human Services, 2001, 2008).

Data from the National Health and Nutrition Examination Survey (NHANES, 1976–1980 and 2003–2006) have shown that childhood obesity has nearly tripled over the past three decades (Ogden, Flegal, Carroll, & Johnson, 2002). Research also has shown that overweight and obese children are more likely than normal weight children to exhibit certain risk factors for cardiovascular disease, including high blood pressure, high cholesterol, dyslipidemia, and Type 2 diabetes (Centers for Disease Control and Prevention, 2009a; U.S. Department of Health and Human Services, 2001). Additional associated health complications include sleep apnea, asthma, and liver damage (Centers for Disease Control and Prevention, 2009a; U.S. Department of Health and Human Services, 2001). Besides suffering from physical illnesses, it is common for overweight and obese children to experience social stigmatization and

discrimination, difficulties at school, and psychological problems (such as depression).

Children usually become overweight or obese when their dietary intake is greater than their energy expenditure (Isganaitis & Lustig, 2005). For example, if children eat out at restaurants more frequently, consume a greater quantity of unhealthy foods and larger portion sizes, and frequently drink sugar-sweetened beverages, they will most likely consume a greater number of calories than they are able to expend, especially if they regularly engage in sedentary behaviors, such as watching television and playing video games, rather than being physically active. However, childhood overweight and obesity can be prevented or slowed down if healthy eating and physical activity behaviors are adopted early in life and if messages regarding these behaviors remain consistent in the multiple contexts (such as home and school) in which children spend their time (U.S. Department of Health and Human Services, 2010a).

Several studies have demonstrated that both family and school practices shape and reinforce children's healthy eating and physical activity (e.g., Beets, Vogel, Chapman, Pitetti, & Cardinal, 2007a; Frenn et al., 2005; Larson, Story, Wall, & Neumark-Sztainer, 2006). In particular, these studies have revealed that parents play key roles in making decisions regarding food, activity, and television viewing in the home. For example, children are more likely to be physically active and eat a nutritious diet when parents exercise with them and encourage them to eat fruits and vegetables (e.g., Lee et al., 2010; Young, Fors, & Hayes, 2004). In addition, the atmosphere that parents cultivate in the home (a nurturing one, for example) has been

shown to affect the health behaviors of children (e.g., Lohaus, Vierhaus, & Ball, 2009).

Schools also play pivotal roles in influencing and shaping healthy eating and physical activity behaviors among children and adolescents. School practices such as providing nutritious and appealing foods and beverages in all venues accessible to students (including the cafeteria, vending machines, and school stores) can encourage and reinforce healthy eating behaviors (e.g., e.g., Story, Nannery, & Schwartz, 2009). Furthermore, schools that provide high-quality physical education, recess, and interscholastic sports provide students with the opportunities to engage in the recommended amounts of physical activity (Story et al., 2009; U.S. Department of Health and Human Services, 2010a). Positive school environments are also associated with decreased occurrences of risky health behaviors among children and adolescents (Catalano, Haggerty, Oesterie, Fleming, & Hawkins, 2004; Resnick, Bearman, & Blum, 1997).

Although researchers have demonstrated that healthy practices on the part of parents and schools can promote healthy eating and physical activity among children and adolescents, they have paid little attention to how the parent and school environments can enhance or hinder the effectiveness of these practices. In addition, few studies have examined the school environment as it relates to children's healthy eating and physical activity behaviors; no studies have, to my knowledge, examined the ways in which the school environment affects the relation between school practices and children's behaviors. Furthermore, researchers have not examined the joint effects of parental and school influences on children's healthy eating and

physical activity behaviors. Therefore, the proposed study investigated the ways in which parental and school influences affect children's healthy eating and physical activity behaviors. This was accomplished by examining the direct relations between parent and school practices and children's health behaviors, and how this relation varies according to the parent and school environments. In addition, this study explored whether children's self-beliefs serve as a relevant pathway between parent and school practices and children's health behaviors. Finally, this study examined the extent to which these two contexts (parent and school) jointly affect children's healthy eating and physical activity behaviors.

In the following sections, I provide support for the theoretical basis of this study. In addition, I describe and reference the most recent and relevant research available in order to document what is known about the ways in which parents, schools, and other possible influences affect children's healthy eating and physical activity behaviors. I also explain and elaborate upon the need for examining multiple contexts. In the final section, I discuss the purpose of the current study, including an explanation of the variables that were used, research questions, and definition of terms.

Theoretical Framework

Historically, researchers have used theoretical frameworks, such as the typologies of parenting styles (authoritative, authoritarian, permissive, and neglectful) presented by Baumrind (1967) and Maccoby and Martin (1983), to understand how the parenting context influences behaviors and outcomes among children and adolescents. These frameworks, however, lack the ability to explain why and how

particular parenting styles or individual parenting dimensions (such as responsiveness or demandingness) produce competent and successful children and adolescents. To address this limitation, Darling and Steinberg (1993) developed a contextual model that attempted to refine conceptually the previous frameworks so as to improve the possibilities for discovering mechanisms that better explain children's behaviors. More specifically, Darling and Steinberg (1993) introduced the notion that parenting styles and parenting practices should be viewed as separate concepts. In particular, parenting practices are the mechanisms through which parents directly help their children attain their socialization goals (for example, parents preparing healthy meals with their children, so that the children develop healthier eating behaviors), whereas parenting style is the emotional environment that parents set in the home that indirectly influences children's behaviors and outcomes (Darling & Steinberg, 1993). They also argued that, depending on the type of environment established in the home (nurturing vs. controlling), the strength of the association between practices and outcomes will differ.

The current study is based on the contextual model of parenting proposed by Darling and Steinberg (1993) (Figure 1). They posited that parenting style and parenting practices are directly influenced by the overarching goals and values that parents hold. In addition, parenting practices are shown to be directly related to children's outcomes. Darling and Steinberg further suggested that the parenting style affects the association between specific parenting practices and children's outcomes. For example, nurturing parents might be more effective in implementing specific parenting practices than disengaged parents. Darling and Steinberg also posited that

parenting style directly influences a child's personality, which, in turn, moderates the relationship between parenting practices and children's outcomes.

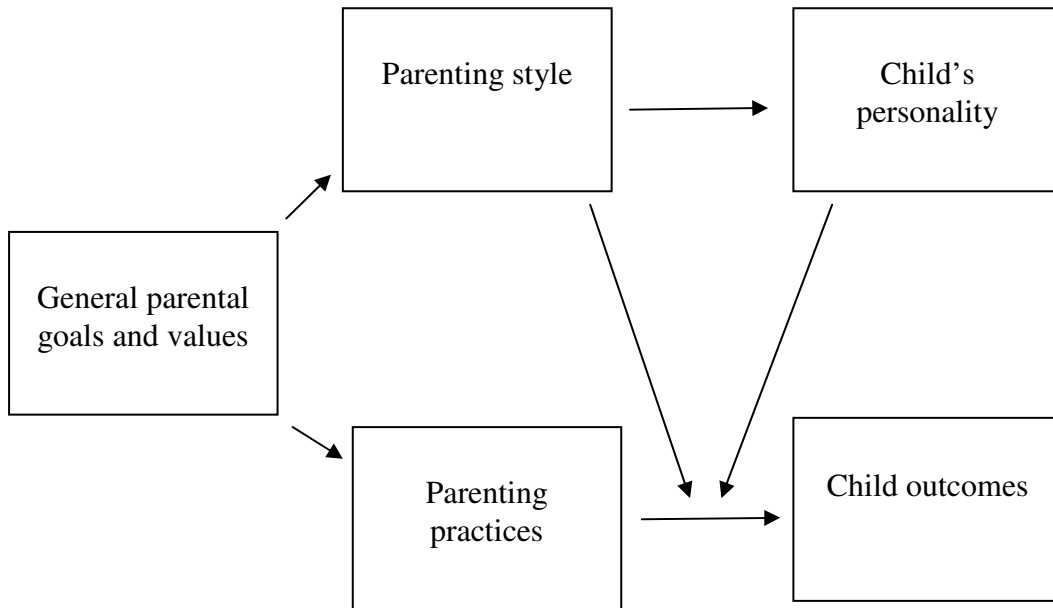


Figure 1. Darling and Steinberg's contextual model.

The proposed model for guiding the current study describes the impact parents have with regard to healthy eating and physical activity. This is illustrated in Figure 2. This model represents the modifications that will be made to Darling and Steinberg's (1993) model for the purposes of this study. First, the relation between parents' goals and values and parenting styles and practices will be excluded. Second, the role of the child will be modified. Rather than claiming that the association between the practices and outcomes varies as a function of the child's personality, this study proposes an indirect relation between parenting practices and

children's health behaviors. In other words, children's self-beliefs, such as self-worth, serve as a pathway between parental influences and children's health behaviors. Children's self-beliefs guide and shape their behaviors and affect their health-related choices.

The pathway for children's self-beliefs, shown in Figure 2, is supported by the work of Bandura (1986, 1997) on self-efficacy, which demonstrated that social influences, including parents, might affect children's beliefs about themselves. These beliefs, in turn, determine which behaviors they choose to engage in. Self-beliefs are the means by which children understand themselves in relation to their environment. Specifically, self-efficacy, a person's confidence in learning and/or performing specific tasks, determines the degree of effort children will expend on an activity and their perseverance and resiliency in light of conflict or difficulty (Bandura, 1989, 1997). Children with a highly developed sense of efficacy are able to exert influence over their own behaviors through self-reflective and self-regulatory processes (Bandura, 1989, 1997).

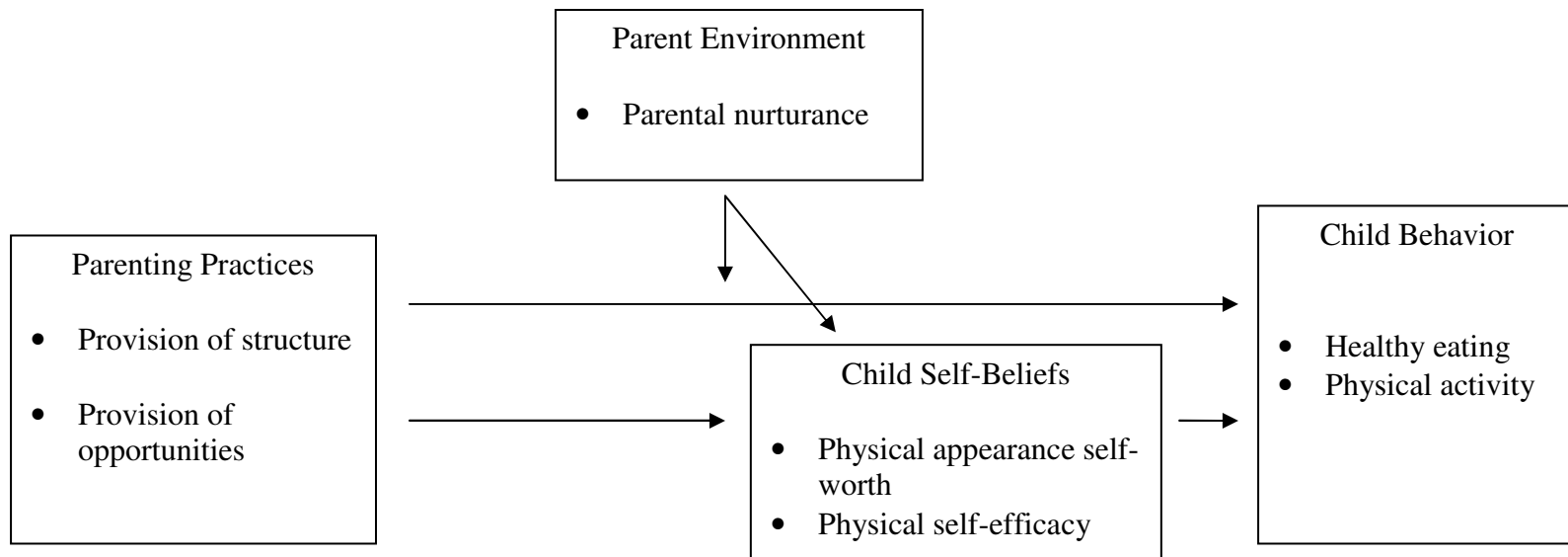


Figure 2. Parent model for healthy eating and physical activity.

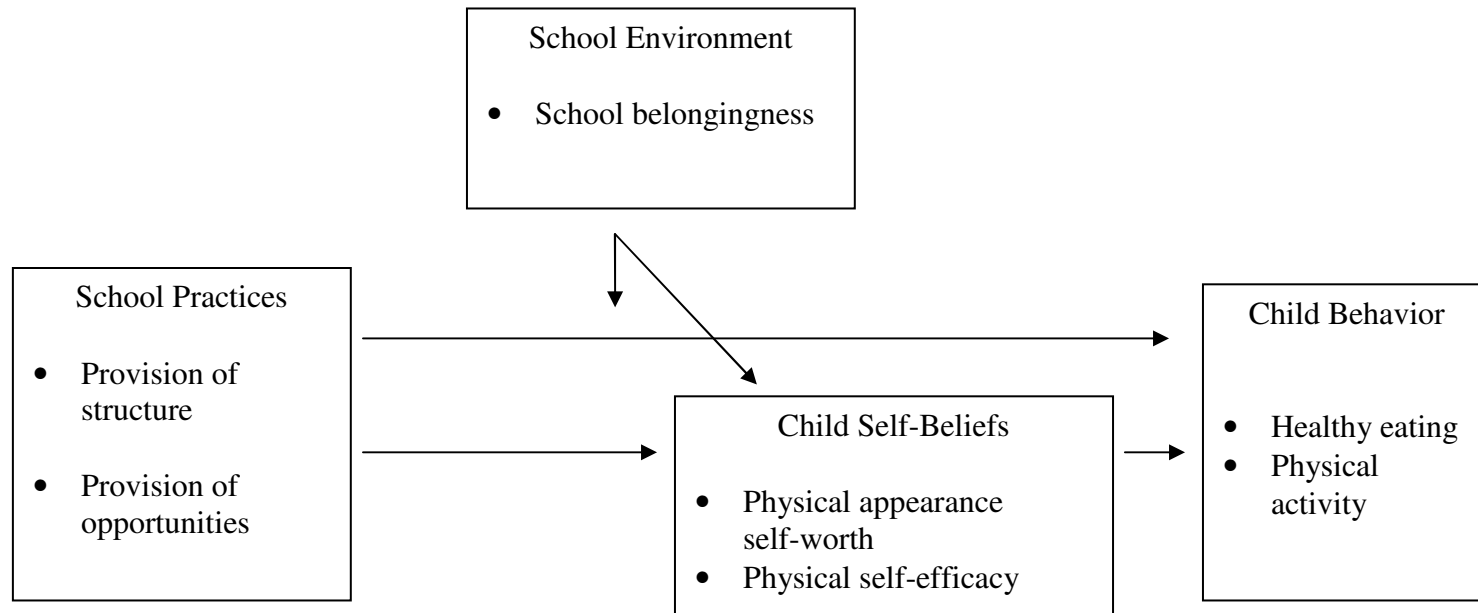


Figure 3. School model for healthy eating and physical activity.

In addition, children's physical appearance self-worth, defined as one's overall sense of worth and value in terms of physical appearance, is also related to their efficacy and self-regulation processes. The environments that parents and schools create and the information and opportunities they provide to children affect each child's perceived competence and ability, but also contributes to their self-worth and, eventually, to their behaviors. Children with higher levels of self-worth are more likely to have higher degrees of self-efficacy and the ability to self-regulate. That is, self-regulation and efficacy often require children to step outside of their comfort zones in terms of what they do well, pushing them to learn new behaviors and skills or to continue to improve on their current abilities.

Based on the work of Darling and Steinberg (1993) and the modifications suggested for the parent model, a school model for healthy eating and physical activity was also proposed for this study. Figure 3 shows how the model depicts school practices as directly affecting children's health behaviors. The model further illustrates that the school environment moderates the relation between school practices and children's health behaviors. That is, the direct relation between school practices and children's behaviors might vary depending on the school environment. Finally, as with the parent model, the school model also demonstrates that children's self-beliefs serve as a pathway between school practices and children's behaviors. In the next section, I discuss the research related to parental, school, and other influences in terms of children's healthy eating and physical activity behaviors. In addition, I

discuss how two environments (i.e., parent and school) might jointly affect children's health behaviors.

Parental and School Influences on Children's Positive Health Behaviors

Darling and Steinberg's (1993) contextual model was discussed within an ecological framework that focuses specifically on how the parenting context influences children's behavior. In line with this model, the current study was interested in the proximal influences (such as processes and mechanisms in homes and schools) that directly affect children through interpersonal relationships and influence their development of healthy eating and physical activity behaviors (Bronfenbrenner, 1989). Therefore, Bronfenbrenner's (1989) process-person-context model was used as a framework to describe the research related to parent and school influences on children's healthy eating and physical activity. This framework helps to identify research gaps, while also providing support for the two theoretical models examined in the current study (Figures 2 and 3).

Bronfenbrenner (1989) described *context* variables as being the surroundings in which people live and interact. For this study, the main context variables are the parent and school environments and the specific practices of parents and schools. The *person* variables are the characteristics of children. The *person* variable for this study is children's physical self-worth and physical self-efficacy. The *process* refers to the mechanisms of change. In other words, the arrows in models are the processes that were examined in the current study.

Specifically, these processes included 1) the direct associations between parent and school practices and children's physical activity and healthy eating, 2) the

relation between parent and school practices and children's physical activity and healthy eating as a function of the parent and school environment, and 3) the indirect association between parent and school practices and children's physical activity and healthy eating via children's self-beliefs. These processes allow for a greater explanation of how and why parents and schools affect the health behaviors of children. In the following sections on parental and school influences, the *context* variable (parent and school environments and practices) is discussed first, followed by the *person* variable (children's physical appearance self-worth and physical self-efficacy), and finally, when applicable, the *processes* are described.

Parental Influences

In general, an authoritative parenting style (that is, high in responsiveness and demandingness) appears to create the parenting environment that facilitates children's development of personal, social, and academic competencies (Baumrind, 1991a, 1991b; Skinner, Carruth, Bounds, Ziegler, & Reidy, 2002; Weiss & Schwarz, 1996). Consistent with this research, studies have shown that an authoritative parenting style correlates with increased healthy eating and physical activity among children and adolescents (see, for example, Berge, Wall, Loth, & Neumark-Sztainer, 2010; Lohaus et al., 2009). For example, authoritative parenting has been associated with higher fruit and vegetable intake (Lytle et al., 2003) and a lower level of sedentary behavior (Schmitz et al., 2002). For this current study, the term "parent environment" will be used instead of "parenting style"; however, both are defined as the emotional climate in which the parents' practices are expressed (Darling & Steinberg, 1993, p. 488). The parent environment can be identified as an individual parenting dimension, such

as responsiveness or demandingness, or as a combination of these individual parenting dimensions, referred to as parenting styles.

Researchers have rarely used individual parenting dimensions to predict children's behaviors; however, Barber (1997) and others have argued that individual parenting dimensions have stronger associations with specific adolescent outcomes than parenting styles. One specific individual parenting dimension of interest for this study is parental nurturance. Parental nurturance is an important variable throughout the developmental process, appearing to be a significant factor in the positive development of children and adolescents (Ahlberg & Sandnabba, 1998; Maccoby, 2007). Parental nurturance is defined as a positive atmosphere for the parent-child relationship and the children's emotional development. It is expressed by mothers and/or fathers through loving behavior, responsiveness, and involvement (Barnes & Windle, 1987; Baumrind, 1967).

Research has shown that when parents are emotionally warm, available, and affectionate, and when they balance these qualities with high expectations and a firm but fair disciplinary style, they create an emotional context in which children tend to be more secure, well-adjusted, and generally healthier and safer than peers raised in other settings (Baumrind, 1991a; Steinberg, 2001). In addition, because such children feel loved and supported by their parents, they are more likely to please and listen to their parents and to adopt their values and beliefs (Grusec & Goodnow, 1994). A few studies investigating healthy eating and physical activity have demonstrated that nurturant parenting is associated with children that are more physically active and make healthier food choices (Kim, Anding, Kubena, Reed, & Moon, 2008; Schmitz et

al., 2002). However, discrepancies have been found between mothers and fathers in this context. For example, some studies have suggested that father nurturance is not associated with children's healthy behaviors (Schmitz et al., 2002), whereas other studies have shown that there is a correlation between father nurturance and healthier food choices made by children (Kim et al., 2008). For this study, the individual parenting dimension, parental nurturance, will be examined as one aspect of parent environment. In addition, nurturance on the part of the mother and father will be examined separately in order to understand the unique contributions of each.

In contrast to the parent environment, parenting practices are goal-directed behaviors (conscious or unconscious) parents engage in to change or shape their children's behavior (Darling & Steinberg, 1993). As shown in Figure 2, parenting practices are directly related to children's health behaviors. Children develop attitudes, beliefs, and expectations about physical activity and eating that have been instilled in them through interactions with their parents (Beets et al., 2007a; Birch & Davison, 2001). These interactions include the teaching, modeling, and reinforcing of healthy behaviors by parents (Bandura, 1986; Sallis, Alcaraz, McKenzie, & Hovell, 1999). In addition, these practices can be thought of in terms of the provision of structure and the provision of opportunities (Wentzel, 1994).

Parents provide the provision of structure through clear and consistent guidelines, expectations, and rules for specific behaviors. For example, parents might have rules regarding the types of foods their children eat after school or regulating how much television they watch. In addition, parents might establish expectations about eating healthy foods such as fruits and vegetables and exercising in the home.

These practices have been shown to positively affect children's health behaviors (Norman, Schmid, Sallis, Calfas, & Patrick, 2005; Young et al., 2004).

In addition, parents provide opportunities that support specific health behaviors. Specifically, the provision of opportunities includes the interaction of parents with their children and/or the degree to which they demonstrate interest and attention. For instance, parents might exercise with their children, encourage them to eat healthy foods and engage in physical activity, spend time eating meals with them, and watch them be physically active. These practices have also been shown to positively affect children's health behaviors (i.e., Lee et al., 2010; Ornelas, Perreira, & Ayala, 2007; Young et al., 2004).

Although studies have shown that both the parent environment and specific parenting practices are related to children's healthy eating and physical activity behaviors, few researchers have examined the ways in which the parent environment affects the association between specific parenting practices and children's healthy eating and physical activity (Kremers, Brug, de Vries, & Engels, 2003; Symonds, 1939; van der Horst et al., 2007). For example, van der Horst et al. (2007) found that parenting practices were more effective at lowering children's sugar-sweetened beverage consumption with parents that exhibited moderate strictness and high involvement (i.e., an authoritative parenting style) than other variations of strictness and involvement. In other words, the practices that parents implemented were more effective at encouraging children to engage in healthier behaviors in homes with a higher level of parental nurturance. However, researchers have not explored this moderating effect for physical activity, nor have they replicated these studies within

the U.S. population in terms of other healthy eating behaviors. Therefore, this study examined whether the parent environment, as assessed by parental nurturance, affected the association between parenting practices and children's healthy eating and physical activity.

In addition, as shown in Figure 2, there is an indirect relation between parenting practices and children's health behaviors via children's self-beliefs. Studies have revealed connections between parent environments and practices and children's health behaviors (i.e., Berge et al., 2010; Lee et al., 2010; Lohaus et al., 2009; Ornelas et al., 2007). However, researchers have not clearly shown how these connections are related to the individual child. Some studies have suggested that these self-beliefs are associated with children's behavioral choices, such as healthy eating and physical activity (Cullen, Bartholomew, Parcel, & Koehly, 1998; Perez-Lizaur, Kaufer-Horwitz, & Plazas, 2008; Sallis, Prochaska, & Taylor, 2000; Sharma, Wagner, & Wilkerson, 2005). However, there has not been a great deal of research on developing an understanding of how parents influence their children's self-beliefs and how these relations, in turn, affect their health behaviors. Therefore, this study examined whether and to what degree children's physical appearance self-worth (belief about their physical appearance) and physical self-efficacy (perceived physical ability) serves as a pathway between parenting practices and children's healthy eating and physical activity, respectively.

School Influences

According to the ecological framework, multiple social contexts influence child and adolescent development (Bronfenbrenner, 1989). Most studies related to

healthy eating and physical activity have focused only on children and their parents, paying little attention to external influences such as schools, despite the fact that schools are partially responsible for developing children's health behaviors (Centers for Disease Control and Prevention, 1996, 1997). Building on Baumrind's (1967) parenting framework, a similar theoretical framework can be used to explain how schools optimize student health through the promotion of a school environment that is nurturing. Furthermore, the model presented by Darling and Steinberg (1993) also suggests that, as with parenting, the school environment and specific school practices might need to be considered as separate processes.

The school environment, also referred to as the school climate, is defined as the relatively enduring characteristics of a school that are experienced by its students (Blum, McNeely, & Rinehart, 2002). In this regard, there are psychosocial structures that shape school climate. For example, students that believe that adults and peers at the school care about their learning (Ryan & Deci, 2000), and about them as individuals, feel a sense of belonging; this is usually a result of frequent, positive interactions with teachers and peers (Centers for Disease Control and Prevention, 2009b; Finn, 1989). Specifically, school belongingness is defined as the students' perception of being accepted and respected in the school setting (Finn, 1989; Goodenow, 1993). Given the amount of time that children and adolescents spend in educational settings, the sense of belongingness students experience in those settings is particularly important for their healthy development (Battistich, Solomon, Watson, & Schaps, 1997; Centers for Disease Control and Prevention, 2009b; Finn, 1989). LaRusso, Romer, and Selman (2008) demonstrated that schools with supportive

teachers have students with a greater sense of social belonging and fewer symptoms of depression.

In the school model (Figure 3), school belongingness serves a similar role as the parental nurturance construct does in the parent model. As discussed earlier, children in a supportive and nurturing environment tend to engage in healthier behaviors. For example, students with a high sense of school belongingness have lower levels of physical and emotional distress and better academic outcomes. They are also less likely to engage in risky health behaviors compared to those students with a lower sense of belongingness (see, for example, Goodenow, 1993; McNeely & Falci, 2004; Resnick et al., 1997). Similar to the affect of parental nurturance, children that feel supported and respected by their peers and teachers are more likely to follow and comply with the rules and expectations of the school (Grusec & Goodnow, 1994). Few studies have examined the school environment with regard to children's physical activity and healthy eating. Consequently, this study examined how the school environment, as assessed by student's perceptions of school belongingness, is associated with children's healthy eating and physical activity.

Similarly to parents, schools provide specific policies, structures, and organizational features that change or shape children's behavior. These practices are a product of the schools' goals, as well as district, state, and/or national policies, directed toward children's health behaviors. School practices also can be considered in terms of the provision of structure and the provision of opportunities, as described for parents. Schools provide direct instruction through classroom education regarding nutrition and physical activity. For example, Lytle et al. (2004) demonstrated that

children's eating patterns are more likely to improve when changes in the school environment are integrated with classroom nutritional education.

Schools also provide opportunities to students that might affect their health behaviors, such as the use of physical activity equipment and vending machines. For example, Story et al. (2009) found an association between the availability of snacks and drinks sold in schools and higher intake levels for students of total calories, soft drinks, total fat, and saturated fat, as well as lower intake levels of fruits and vegetables. Few studies have examined the ways in which school practices are related to children's health behaviors, especially with regard to physical activity. The current study examined these direct relations.

Furthermore, as depicted in Figure 3, researchers have not examined the school environment as a factor that might influence the association between specific school practices and children's healthy eating and physical activity. Studying the matter in this context might reveal that if children are in schools where they feel accepted and respected by peers and teachers, they might be more willing to engage in, accept, and/or follow the healthy eating and physical activity related practices promoted by their schools. To address this gap, and based on the parenting literature, the model presented by Darling and Steinberg (1993) was adapted for schools so as to explain the ways in which the school environment might affect the relation between school practices and children's health behaviors.

Similarly to the parent model, the school model also includes an indirect relation between school practices and children's health behaviors via the children's self-beliefs, as illustrated in Figure 3. Consistent with the parenting literature, studies

have made connections between school environments and practices and children's health behaviors (i.e., Lytle et al., 2004; Story et al., 2009). However, researchers have not clearly demonstrated how these connections are related to the individual child. A couple of intervention studies have included suggestions for ways in which to increase self-efficacy through skill-building opportunities (e.g., Dishman et al., 2004; Dzewaltowski et al., 2009); however, most of the studies reported only whether the intervention increased healthy behaviors, not how the students' self-efficacy contributed to that increase. In addition, studies have not examined the role of children's self-beliefs. Thus, this study investigated whether children's physical appearance self-worth and physical self-efficacy serves as a pathway between school practices and children's healthy eating and physical activity.

Other Influences

Researchers have found differences in terms of sex, race/ethnicity, and socioeconomic status (SES) with regard to children's healthy eating and physical activity. The Centers for Disease Control and Prevention's (CDC) 2009 Youth Risk Behavior Survey (YRBS) indicated that boys are more likely than girls to be physically active and to eat fruits and vegetables five or more times per day. As for race/ethnicity, Black high school students are more likely than White and Hispanic students to use computers for three or more hours per day for purposes not related to schoolwork (Centers for Disease Control and Prevention, 2010). In addition, the 2009 YRBS found that Black students are more likely than Hispanic and White students to eat five or more daily servings of fruits and vegetables (Centers for

Disease Control and Prevention, 2010), whereas White students are less likely than Black and Hispanic students to be physically inactive.

In addition, several studies have shown that lower a SES is associated with physical inactivity and unhealthy eating (Ball et al., 2009; Giskes, Turrell, & Patterson, 2002; Neumark-Sztainer, Story, & Resnick, 1996; Wardle, Jarvis, & Steggle, 2003). For example, in a 1992 national study, adolescents aged 12–17 years were less likely to report physical inactivity and inadequate consumption of fruit and vegetables as the SES (based on education or family income) of the responsible adult in the family increased, after controlling for age, sex, race/ethnicity, and school enrollment status (Lowry, Kann, Collins, & Kolbe, 1996).

Finally, studies have shown a relation between BMI and children's healthy eating and physical activity. For example, Delva, O'Malley, & Johnston (2007) found that the frequency of eating breakfast, eating fruits and vegetables, and exercising regularly are inversely associated with children's being overweight or obese (BMI at or above the 85th percentile). As described here, other influences besides parent and school environments and practices might explain children's healthy eating and physical activity behaviors. To account for these factors, child sex, race/ethnicity, and family SES were controlled for in this study. Child's body mass index was not included as a control for the current study because exploratory analyses showed children's physical activity did not significantly differ as a function of child's body mass index as well as the issue of temporal sequence. That is, research is needed to determine whether body mass index is a determinant or a consequence of a children not engaging in healthy eating or physical activity behaviors.

Multiple Context

Children grow up in multiple contexts, including the home and school, each of which uniquely and jointly influence their development. Although there is considerable research already existing for parent and school contexts individually, researchers have argued that individual context studies can be misleading unless supplemented by studies of joint contexts (Cook, Herman, Phillips, & Settersten, 2002). For example, if the multiple contexts are opposing in nature (that is, if parents and schools implement conflicting practices related to healthy eating and physical activity, or the parent environment is nurturing and the school environment is not), it is possible to not only examine their singular influence on children's health behaviors but also their joint influence. By studying contexts jointly, researchers can determine whether parents or schools have a greater influence on children's health behaviors at a given developmental period.

Figure 4 shows the parent and school model combined. The figure demonstrates that parent and school environments and practices do not function independently of each other; rather, they work in tandem to affect children's health behaviors. Specifically, this model demonstrates that children receive messages from both parents and schools via practices related to healthy eating and physical activity. As discussed previously, these practices, promoted and modeled by both parents and school, can directly affect children's health behaviors, and the environment in which the specific practices are implemented can determine whether children agree with, adopt, or follow the practices and show changes in their behaviors. Furthermore, the practices that children are exposed to contribute to their degree and type of self-

awareness, self-motivation, and competence in engaging in healthy behaviors. Thus, with the same rationale for how parents and schools individually affect children's behaviors, the process through which parents and schools jointly affect children's health behaviors might be explained by children's beliefs about their own abilities, self-regulation, and perceptions of control over health outcomes (Bandura, 1986, 1989). For example, if children effectively regulate the demands of the parent and school environment, their knowledge of healthy behaviors is likely to increase, which, in turn, might lead to higher self-worth and healthier behaviors (Zimmerman & Cleary, 2006).

Unfortunately, studies examining joint contexts related to healthy eating and physical activity are rare. Only a few studies have explored and reported how multiple contexts affect children's behaviors (i.e., Barber & Olsen, 1997; Cook, Herman, Phillips, & Stettersen, 2002). However, none of these studies have examined parent and school contexts in relation to children's healthy eating and physical activity behaviors. Therefore, to begin to understand these connections, this study explored the joint effects of parent and school influences on children's healthy eating and physical activity.

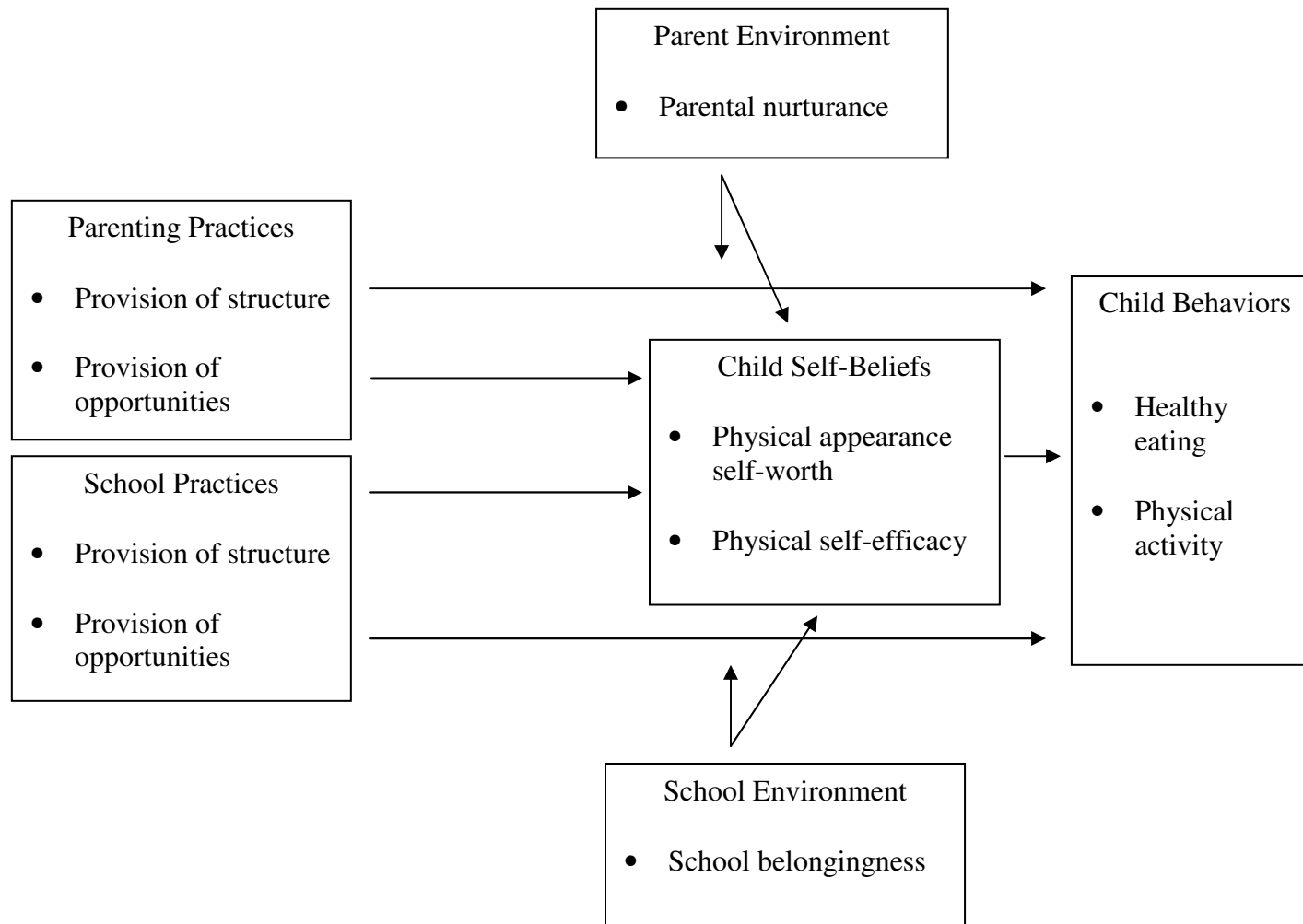


Figure 4. Combined parent and school model for healthy eating and physical activity.

The Current Study

The first purpose of this study was to apply an adapted version of Darling and Steinberg's (1993) model to explain how and why parental influences are associated with children's healthy eating and physical activity (Figure 2). A parent was defined as anyone who serves as the primary caregiver (e.g., biological parents, single biological parent, and non-parent such as a grandparent or other family member) of the child's basic needs. This person also plays a significant role in the child's emotional and social development. This study examined the direct association between specific parenting practices and children's healthy eating and physical activity behaviors. Additionally, this study explored whether the parent environment affects the relation between parenting practices and children's health behaviors. One final aspect of the parent model that was examined is the indirect relation between parenting practices and a child's health behaviors via children's self-beliefs. As discussed earlier, this was a deviation from Darling and Steinberg's model.

The second objective of this study was to apply the framework used by Darling and Steinberg (1993) to a school setting (Figure 3). The same three relations were examined for the school model. Specifically, this study examined the direct relation between school practices and children's healthy eating and physical activity behaviors. In addition, to fully understand the role of the school environment, this study determined whether the relation between specific school practices and children's health behaviors varies as a function of the school environment, as defined

by school belongingness. Finally, the indirect relation between school practices and children's behaviors via children's self-beliefs was examined.

The final objective of this study was to combine the parent and school models, as shown in Figure 4. This model included the same direct and indirect paths that are shown in the individual parent and school models. The purpose of the combined model was two-fold. First, the model demonstrated whether the same pathways exist in the combined model. Secondly, the combined model evaluated the additive benefits of including multiple contexts in a single model and attempted to provide a better explanation of why children engage in healthy behaviors.

To summarize, this study examined three relations within the parent model. These relations included 1) a direct relation between parenting practices and children's health behaviors, 2) whether the parent environment moderates the relation between parent practices and children's health behaviors, and 3) an indirect relation between parent practices and children's health behaviors. These same three relations were examined in the school model. Lastly, a final model explored whether the same pathways and effects exist when the parent and school models are combined into one model. The research questions and predictions for this study are as follows:

1. How are parenting practices (in terms of the provision of structure and the provision of opportunities) associated with children's healthy eating and physical activity behaviors? I predicted that there is a positive association observed between the provision of structure regarding healthy eating and physical activity from parents and higher levels of healthy eating and physical activity among children. Similarly, I predicted that there is a positive association observed

- between the provision of opportunities regarding healthy eating and physical activity from parents and higher levels of healthy eating and physical activity among children.
2. How does parental nurturance affect the association between parenting practices and children's healthy eating and physical activity behaviors? In accordance with Darling and Steinberg (1993), I predicted that the association between parenting practices and children's healthy eating and physical activity behaviors might differ as a function of parental nurturance. Specifically, I predicted that these parent practices are related more strongly to the health behaviors in the context of parent environments that are more nurturing, as compared to parent environments that are less nurturing.
 3. To what extent do children's self-beliefs serve as a pathway between parental influences (environment and practices) and children's healthy eating and physical activity behaviors? I predicted that parental influences (environment and practices) are indirectly related to children's health behaviors through their associations with specific child self-beliefs. In turn, these child self-beliefs are predicted to have a significant relation to children's healthy eating and physical activity.
 4. How are school practices (in terms of the provision of structure and the provision of opportunities) associated with children's healthy eating and physical activity behaviors? I predicted that there is a positive association observed between the provision of structure provided by schools regarding healthy eating and physical activity and higher levels of healthy eating and physical activity among children.

- Similarly, I predicted that there is a positive association observed between the provision of opportunities regarding healthy eating and physical activity from schools and higher levels of healthy eating and physical activity among children.
5. How does school belongingness affect the association between school practices and children's healthy eating and physical activity behaviors? In accordance with Darling and Steinberg (1993), I predicted that the association between school practices and children's healthy eating and physical activity might differ as a function of school belongingness. More specifically, I predicted that these school practices are more strongly related to health behaviors in school environments with higher levels of school belongingness, as compared to schools with lower levels of school belongingness.
 6. To what extent do children's self-beliefs serve as a pathway between school influences (environment and practices) and children's healthy eating and physical activity behaviors? I predicted that school practices are indirectly related to children's health behaviors through their associations with specific child self-beliefs. In turn, these child self-beliefs are predicted to have a significant relation with children's healthy eating and physical activity behaviors.
 7. To what greater extent does a model combining both parent and school contexts explain children's healthy eating and physical activity, as compared to one that uses just the parent model? This is an exploratory research question. However, I predicted that the combined model provides a greater explanation of children's healthy eating and physical activity behaviors compared to examining a singular parent model.

Use of the Healthy Passages Study Dataset

The current study used the Healthy Passages dataset to address the research questions. The overarching objective of Healthy Passages was to provide an empirical basis for effective policies and intervention programs to promote the health and optimal development of adolescents and adults (Windle et al., 2004). The intent of Healthy Passages was to identify the developmental patterns of intraindividual change across time and the relative contribution of important risk and protective factors (e.g., family, peers, school, and community) on health behaviors. The Healthy Passages study included the six priority health-risk behaviors among children and adolescents: physical inactivity, unhealthy dietary behaviors, tobacco use, alcohol and other drug use, unintentional injuries and violence, and sexual behaviors that contribute to unintended pregnancies and sexually transmitted diseases.

The design of the current study is in line with the original intent of the Healthy Passages study. Specifically, the current study was interested in parental and school influences on the promotion of two positive health behaviors (i.e., healthy eating and physical activity) among children. In addition, the path models examined in the current study are original and were not part of the initial design of Healthy Passages. However, the path models were developed to align with the purpose of Healthy Passages. In addition, the opinions, ideas, and interpretations included in this study are those of the student and not necessarily those of the Healthy Passages investigators.

Although many longitudinal studies such as the National Longitudinal Study of Adolescent Health, National Longitudinal Survey of Youth, and National

Educational Longitudinal Study have contributed to an understanding of the associations between protective and risk factors and children's health behaviors, there were several reasons why Healthy Passages was the most appropriate dataset for the current study. First, Healthy Passages selected elementary students (fifth graders) compared to middle school students as the sample for Wave I. Research has indicated that students in fifth grade are less likely to engage in unhealthy behaviors, and therefore, serve as a good baseline age group with regard to health behaviors (Windle et al., 2004).

Another reason for using this dataset was that the selection of risk and protective factors for assessment were comprehensive, and included such factors as parenting practices, school practices, and children's self-beliefs. Specifically, the study provided an in-depth examination of school influences in conjunction with more traditional individual and family factors. This study also included multiple influences during the preadolescence period and critical transitions (e.g., from elementary school to middle school, from prepubescence to puberty), so when future waves of data are available this study can be replicated with older age group. Finally, there was sufficient statistical power to examine racial/ethnic and socioeconomic factors that might contribute to health disparities among Black, Hispanic, and White children. Therefore, future studies can examine the differences among racial/ethnic and socioeconomic groups in relation to the path models examined in the current study.

Definition of Terms

1. Parents: Parents were defined as anyone who serves as the primary caregiver of the child's basic needs (e.g., feeding, safety). This includes the biological parents, biological single parents, non-parents such as grandparents, or foster, step, or adoptive parents. Parents also provide the guidance and upbringing of the child, which includes the interaction process between the parent and child that contributes to the child's emotional and social development. In this study, the terms "parent", "parental", and "primary caregiver" were interchangeable.
2. Parent environment (parenting style): The parenting environment is the emotional climate in which parental practices are expressed (Darling & Steinberg, 1993, p. 488). The environment can be identified as either responsive or demanding. The type of environment that parents implement is the result of positive parent-child interactions, the degree to which parents have social support, the existence of manageable mental health issues, and whether or not parents grew up in nurturing homes. The parent environment has been shown to impact the behaviors of children.
3. Parental nurturance: Parental nurturance is considered to be one aspect of the parent environment. Parental nurturance creates a positive atmosphere for the parent-child relationship and the child's emotional development. It is the expression of love, responsiveness, and involvement on the part of the mother and/or father (Barnes & Windle, 1987; Baumrind, 1967). There are two aspects of nurturance: emotional expressions (e.g., hugs, verbal statements of love, and communication of acceptance) and instrumental acts (e.g., playing together, doing

favours, and helping) (Baumrind, 1967; Locke & Prinz, 2002). Levels of parental nurturance are the result of positive parent-child interactions, the existence of social support for parents, the absence or existence of manageable mental health issues, and whether or not parents grew up in nurturing homes. Children with nurturing parents tend to engage in positive and healthy behaviors.

4. Parenting practices: Parenting practices are specific, goal-directed behaviors parents engage in so as to change or shape the behavior of their children. Parenting practices include opportunities for the provision of structure and the provision of opportunities (Wentzel, 1994). These practices are a result of the parents' goals and beliefs with a specific intended outcome. The practices that parents implement will affect the behaviors that their children engage in.
5. School environment (climate): School environment refers to the set of relatively enduring characteristics of a school that are experienced by its participants and which affect their actions, and are based on the collective perceptions of behavior within the school. The element of school environment also encompasses the degree to which students experience a sense of belongingness, influencing student outcomes by, in part, establishing norms and expectations for behavior.
6. School belongingness: School belongingness is considered one aspect of the school environment. School belongingness is the belief of students that adults and peers within the school care about their learning and about them as individuals. A sense of belonging is the result of frequent, positive interactions with individuals. The greater the degree to which a student feels accepted, the

more that he or she is able to express him- or herself and engage in positive behaviors.

7. School practices: School practices are specific policies, structures, and organizational features that change or shape the behavior of children. School practices include opportunities for the provision of structure and the provision of opportunities (Wentzel, 1994). These practices are a result of the schools' goals and direct district, state, or national policies implemented to achieve specific outcomes. The practices that schools implement will affect the behaviors that children engage in.
8. Provision of structure: Parents/schools provide clear and consistent guidelines, expectations, and rules for a specific behavior (e.g., physical activity). This is considered an overarching parent and school practice.
9. Provision of opportunities: Parents/schools provide physical resources (e.g., availability of healthy foods) that support a specific behavior. In addition, parents interact with the child and provide opportunities to engage in supportive behavior, showing interest in and paying attention to the child related to a specific behavior. This is considered an overarching parent and school practice.
10. Self-beliefs: Self-beliefs are beliefs that children use to guide and shape their behaviors and affect their choices. Self-beliefs are how children understand themselves in relationship to their environment.
11. Physical appearance self-worth: Self-worth refers to a self-belief concerning the degree to which one values oneself as a person in terms of his or her physical appearance (Harter, 1983). Physical appearance self-worth is the result of social

interactions and the individual's experiences with the environment. High levels of physical appearance self-worth in children have been associated with positive behaviors.

12. Physical self-efficacy: Physical self-efficacy is a person's confidence in learning and/or performing specific tasks related to his or her perceived physical ability (Bandura, 1986, 1997). There are four key sources that result in the development of self-efficacy: performance attainment, vicarious reinforcement, verbal persuasion, and physiological/affective states (Bandura, 1997). Physical self-efficacy has been shown to be an important predictor for the physical activity among children.
13. Health behaviors: Health behaviors are actions or activities taken by an individual, regardless of actual or perceived health status, for the purpose of promoting, protecting, or maintaining mental and physical health. Two health behaviors of interest are physical activity and healthy eating. Physical activity is defined as any bodily activity that enhances or maintains physical fitness and overall health. Healthy eating is defined as consuming a well-balanced diet that regularly includes foods that meet the body's requirements for the variety of nutrients necessary for staying healthy. Individuals engage in these healthy behaviors as a result of having the knowledge and ability to do so and of having the necessary social support. Individuals who engage in these healthy behaviors tend to have reduced feelings of anxiety and depression and increased well-being and optimal growth.

Chapter 2

Introduction

Healthy eating and physical activity, two positive health behaviors, are essential for the healthy development of children and adolescents. Research has documented numerous health benefits children gain as a result of healthy eating and physical activity: improved cardiorespiratory fitness, strengthened bones and muscles, reduction in the likelihood of becoming overweight, reduced feelings of anxiety and depression, and enhanced optimal growth and intellectual development (Centers for Disease Control and Prevention, 1996, 1997; Eisenmann, 2003; Strong et al., 2005; U.S. Department of Health and Human Services, 1996). On the other hand, children who are physically inactive and who engage in unhealthy eating behaviors face increased risks of becoming overweight or obese and of incurring other serious health complications, such as high blood pressure, high cholesterol, and type 2 diabetes (Ogden, Carroll, & Flegal, 2008).

National surveys have indicated that U.S. adolescents are highly likely to be physically inactive and to eat foods high in sugar and low in nutritional value (CDC, 2008). Although many social and environmental influences shape and reinforce healthy eating and physical activity behaviors, parents play a particularly significant role in the formation of healthy habits during the years spanning childhood and adolescence (Baranowski, Cullen, & Baranowski, 1999; Trost et al., 2003). Specifically, the eating practices and physical activity habits that parents model can promote healthy behaviors that help protect their children from obesity and other health complications later in life (Baranowski et al., 2003; Cullen et al., 2001).

Children also spend large amounts of time at school; therefore, they can develop healthy behaviors there. Schools are a natural location for the implementation of practices and policies that positively affect students' tendencies to eat healthy diets and to be physically active. For example, Healthy People 2020 has set national objectives to increase the degree to which children and adolescents engage in physical activity and healthy eating via school programs, such as those offering daily physical education or providing nutritious foods and beverages outside of school meals (U.S. Department of Health and Human Services, 2010b). Some research has examined the association of these practices with children's health behaviors (see, for example, Kahn et al., 2002; Knai, Pomerleau, Lock, & McKee, 2006). However, compared to the number of studies on parenting correlations, fewer studies have examined how school practices are related to children's health behavior. Additionally, few studies have considered the ways in which these two social contexts jointly affect children's health behaviors. These findings warrant further exploration of parental and school influences on the development of healthy eating and physical activity among children.

Two central questions were addressed in this literature review. The first pertains to how parenting styles and practices are associated with children's healthy eating and physical activity behaviors; the second is the relation of school environment and practices to children's healthy eating and physical activity behaviors. To address these two questions, I will first provide a theoretical overview of parental and school influences on children's health behaviors. Next, I will provide

a brief summary of gender, racial/ethnic, and socioeconomic (SES) differences in terms of healthy eating and physical activity as a rationale for including these variables in this study. I also describe specific research findings regarding parental and school influences on children's healthy eating and physical activity behaviors. In addition, I will describe the findings related to children's individual beliefs and their healthy eating and physical activity behaviors. Finally, I will propose new research models for parents and schools, based on the strengths and shortcomings of the current research.

Several terms are used repeatedly throughout this literature review. The two outcome behaviors that are considered are healthy eating and physical activity. Physical activity is defined as any bodily activity that enhances or maintains physical fitness and overall health. Healthy eating is defined as a well-balanced diet regularly including the variety of nutrients necessary for a human body to remain healthy. Parent environment, parenting practices, school environment, and school practices are defined in the next section. For the purposes of this literature review, the term *parent environment* is used interchangeably with *parenting style*, and *school environment* is interchangeable with *school climate*.

Theoretical Framework

The literature review is based on Darling and Steinberg's (1993) contextual model. This model attempted to refine, conceptually, Baumrind's (1967) model and to improve the possibilities for discovering mechanisms that explain child and adolescent outcomes (Darling & Steinberg, 1993). This section discusses the historical development of parenting styles and the fundamental ways in which they

differ from parenting practices. Next, this section presents an in-depth description of Darling and Steinberg's contextual model and its use for understanding parenting and health behaviors. The following subsection discusses the ways in which this model can be applied to a school setting.

Historical Overview of Parenting Styles

Since the 1930s, the concept of parenting style has been studied. Researchers have studied different processes of the parent-child relationship and various dimensions of parenting style. These dimensions of parenting style include acceptance/rejection and dominance/submission (Symonds, 1939), emotional warmth/hostility and detachment/involvement (Baldwin, 1955), love/hostility and autonomy/control (Schaefer, 1959), warmth and permissiveness/strictness (Sears, Maccoby, & Levin, 1957), and warmth/hostility and restrictiveness/permissiveness (Becker, 1964). In general, various researchers have proposed similar dimensions of parenting style and emphasized them as being common variables that shed light on the influence parents have over the behaviors and outcomes of their children and adolescents. These historically addressed dimensions are also similar to the two dimensions (responsiveness and demandingness) commonly used in current parenting literature.

Also in the 1930s, Lewin, Lippitt, and White (1939) began to examine the following three group atmospheres: authoritarian, democratic, and laissez faire (similar to permissiveness). Their studies found that boys raised in democratic atmospheres were more competent and successful than the boys in the other two groups. The same approach was then applied to families. Baldwin (1955), who had

studied under Lewin, organized a longitudinal study with parenting style as its subject. As a result of Baldwin's work, researchers discovered differences in child outcomes between parents who were scientific-democratic (that is, emotionally detached) and those who were warm-democratic (that is, balanced between psychological detachment and warm emotionality). Warm-democratic parenting was associated with stronger intellectual development, increased spontaneity, and lesser degrees of anxiety in children (Baldwin, 1955). As a result of these findings, Baldwin and others supported the concept that parents should not be controlling but should express unconditional love and acceptance toward their children (a *laissez faire* or permissive attitude) (Baldwin, 1955).

However, Baumrind and colleagues disagreed with such an interpretation of the research findings (Baumrind & Black, 1967). Baumrind and Black (1967) argued that *laissez faire* was not the parenting style that most effectively supported optimal functioning in children. In the 1960s, Baumrind conducted a study of over 100 preschool-aged children in order to better understand the parenting dimensions (Baumrind, 1967). Using observations, parental interviews, and other research methods, she identified four important dimensions of parenting: parental control, parental maturity demands, parent-child communications, and parental nurturance. Based on these dimensions, Baumrind and Black (1967) suggested that the majority of parents displayed one of three different styles: authoritative, authoritarian, and permissive. Maccoby and Martin (1983) subsequently analyzed Baumrind's theory and identified two dimensions of parenting reflecting the different types of parenting styles. The two dimensions were acceptance/involvement (i.e., responsiveness) and

strictness/supervision (i.e., demandingness or control). Maccoby and Martin also suggested that parents with a permissive parenting style could be split into two types: the neglectfully permissive parents, who are low in responsiveness, and the indulgently permissive parents, who are high in responsiveness. Consequently, Maccoby and Martin suggested the addition of a fourth parenting style, which they labeled as neglectful.

Researchers have since identified parental responsiveness and parental demandingness as being two principal domains of parenting behavior that reflect four parenting styles (Maccoby & Martin, 1983; Steinberg, Lamborn, Darling, Mounts, & Dornbusch, 1994). These four parenting styles are as follows: *authoritative parenting*, characterized by high levels of both demandingness and responsiveness; *authoritarian parenting*, characterized by high levels of demandingness and low levels of responsiveness; *permissive (indulgent) parenting*, characterized by low levels of demandingness and high levels of responsiveness; and *neglectful parenting*, characterized by a lack of both demandingness and responsiveness (Maccoby & Martin, 1983; Rothbaum & Trommsdorff, 2007).

To elaborate, researchers have characterized authoritative parenting as involving high levels of nurturance, involvement, sensitivity, reasoning, and encouragement of autonomy (Baumrind, 1991a; Steinberg et al., 1994). Parents who are authoritative tend to encourage their children to be independent and to make their own decisions, based on their own reasoning; these parents, however, still place limits and controls on their children's actions (Baumrind, 1991a; Steinberg et al., 1994). Authoritarian parenting falls at the opposite end of the continuum. Parents who are

authoritarian exhibit highly directive behaviors, high levels of restriction, frequent rejection, and power-asserting behaviors (Baumrind, 1991a; Steinberg et al., 1994). Additionally, they have high expectations of conformity to and compliance with parental rules and directions. Opportunities for open dialogue between parent and child are limited. Permissive or indulgent parenting, on the other hand, is characterized by the making of few demands of the child, exhibiting non-controlling behaviors, and administering minimal punishment (Baumrind, 1991a; Steinberg et al., 1994). While this type of parenting sets few behavioral expectations for the child, the parents are nurturing and accepting, and are extremely responsive to the child's needs and wishes. Finally, neglectful parenting describes parental disengagement, detachment, and dismissiveness (Maccoby & Martin, 1983; Steinberg et al., 1994). Neglectful parents are low in warmth and control, fail to set limits, and are seldom involved in their child's life. They do, however, meet the child's basic needs.

In general, an authoritative parenting style, emphasizing both responsiveness and demandingness, most effectively facilitates the development of personal, social, and academic competencies in children (Baumrind, 1991a; Skinner, Johnson, & Snyder, 2005; Weiss & Schwarz, 1996). Associations between authoritative parenting and indicators of academic performance and social development are similar for boys and girls but are different across ethnic groups. Steinberg, Dornbusch, and Brown (1992), for example, reported that authoritative parenting is positively related to the psychological development and mental health of Asian-American and African-American youth but is unrelated to their academic performance. Researchers have also reported that authoritarian, permissive, and neglectful styles are less than ideal

for White children and adolescents (Dornbusch, Ritter, Liederman, Roberts, & Fraleigh, 1987; Steinberg et al., 1994).

Although many researchers have used the model of parenting styles proposed by Baumrind (1967), sufficient research is lacking regarding why and how authoritative parenting produces competent, successful children and adolescents. To address this limitation and enhance understanding of the means by which parenting styles influences child and adolescent development, Darling and Steinberg (1993) developed a contextual model to distinguish global parent characteristics (i.e., parenting styles) from specific parenting practices.

Darling and Steinberg's (1993) Contextual Model

According to the contextual model of Darling and Steinberg (1993), developed almost 20 years ago, parenting style is the “constellation of attitudes toward the child that are communicated to the child and that, taken together, create an emotional climate in which the parent’s behaviors are expressed” (Darling & Steinberg, 1993, p. 488). Parenting practices, on the other hand, are defined as parents’ specific, goal-directed behaviors that seek to change or shape the child’s behavior. Darling and Steinberg’s contextual model (see Figure 1) posited that both parenting styles and parenting practices are directly influenced by the parent’s overarching goals and values.

Darling and Steinberg’s (1993) model supports the idea that parenting practices are directly related to children’s outcomes, and that they are the mechanisms through which parents directly help their children to attain their socialization goals. For example, parents prepare healthy meals for their children in order to facilitate the

development of healthier eating behaviors. The model further suggests that parenting style moderates the relationship between parenting practices and child outcomes. In other words, parenting practices are most effective if the home's emotional climate renders the child more receptive to being shaped by those practices.

Furthermore, Darling and Steinberg (1993) posited that parenting style directly influences a child's personal beliefs or willingness to be socialized, which, in turn, affects the relation between parenting practices and child outcomes. For example, parents with an authoritarian parenting style could negatively affect their child's self-perception, which might then negate the positive relation between the parent's habit of watching the child play sports (a specific parenting practice) and the child's tendency to be physically active (a child outcome). Finally, Darling and Steinberg argued that this contextual model could address three research issues related to parenting influences on child and adolescent development: 1) an explanation of the fact that the influence of parenting style varies for children of different cultural backgrounds, 2) an explanation of parenting style's effect on the development of an adolescent, and 3) the antecedents of parenting style.

Darling and Steinberg's (1993) contextual model—the only model that theoretically explains the associations among parenting goals, parenting styles, and parenting practices—holds promise with regard to explaining the influence parenting style and parenting practices have on children's levels of healthy eating and physical activity. By distinguishing between parenting styles and parenting practices, researchers should be able to understand how parenting practices related to healthy eating and physical activity operate in the context of different parenting

environments. Furthermore, the model could determine the circumstances under which parenting practices are most effective. The growing interest of researchers in the relation between parenting and children's positive health behaviors warrants a thorough review of these issues.

Application of Darling and Steinberg's Model to Schools

Based on family socialization models, Wentzel and Looney (2006) identified three general mechanisms in schools that are able to affect child and adolescent development and behavior. The first mechanism is comprised of schools' structural and organizational features that can directly promote or hinder healthy development. Second, children's continuous interactions with peers, teachers, and school resources might influence the development of attitudes and standards for health behaviors. Third, the quality of those interactions might influence their decisions to engage in certain behaviors. Although all three mechanisms are important, this review focuses on specific structural and organizational features (i.e., school practices) and the quality of students' interactions (one aspect of the school environment). These two mechanisms are consistent with the model of Darling and Steinberg (1993), which indicates that schools' overarching environments and specific practices affect students' behaviors.

Building on the work of Baumrind (1967), a similar theoretical framework can be used to explain the ways in which the school optimizes student health through an environment that students perceive as nurturing. Most research on the school environment has been conducted by researching the school climate, a perspective that regards the relatively enduring characteristics of a school to be experienced by its

participants. The school environment affects children's behaviors and is based on students' individual perceptions (Blum et al., 2002).

The school climate is comprised of several different dimensions, such as school belongingness, safety, discipline, and social relationships. These dimensions are similar to the dimensions of parenting styles (responsiveness and demandingness). This literature review will primarily examine school belongingness. Other researchers have studied similar concepts, using such terms as *school connectedness* or *school bonding*, but this review will label the concept *school belongingness*. School belongingness refers to students' perceptions of being accepted and respected at school (Finn, 1989; Goodenow, 1993). Baumeister and Leary (1995) suggested that all people have an innate need to belong to social groups and to form positive interpersonal relationships with others. Considering the amount of time that children and adolescents spend in educational settings, their sense of belonging in those settings is particularly critical to their healthy development. School belongingness is parallel to parental nurturance; when students feel supported and cared for by the people they deem important in their lives, they are more inclined to engage in positive behaviors (Grusec & Goodnow, 1994; Wentzel, 1997).

Parallel to the process described for parenting, school practices are defined as the specific policies, structures, and organizational features that change or shape children's behavior. Of interest to the current research are school practices specific to healthy eating and physical activity. For example, a school might offer a physical education class or recess, and these policies might directly affect whether or not students are physically active. Darling and Steinberg's (1993) philosophy for

distinguishing between parenting styles and practices can be applied to schools; school environment and school practices each uniquely contribute to children's behaviors and should be identified as distinct constructs. For example, the schools' goals and values are directly associated with the school environment and practices. In addition, school practices directly impact children's behaviors. Furthermore, the school environment moderates the relation between school practices and adolescent outcomes. In other words, the direct relation between school practices and children's behaviors can vary, depending on the school environment. Lastly, the school environment directly influence children's individual beliefs, which go on to affect the relation between school practices and children's outcomes.

Summary

This section discusses the history of parenting research. First, the development of parenting styles is discussed; thereafter, the more recent work of Darling and Steinberg (1993) is discussed. In addition, this section describes the parallel between parents and schools and the application of Darling and Steinberg's model to schools. The next section examines the general differences in age, gender, race/ethnicity, socioeconomic status (SES), and body mass index (BMI) in relation to children's healthy eating habits and engagement in physical activity.

Healthy Eating and Physical Activity Among Children

In the United States, unhealthy eating and physical inactivity are two of the three behaviors, along with tobacco use, associated with the three leading causes of death: cardiovascular disease, stroke, and cancer (Mokdad, Marks, Stroup, &

Gerberding, 2004; National Center for Health Statistics, 2009). Data from the Centers for Disease Control and Prevention's (CDC's) 2009 National Youth Risk Behavior Survey (YRBS) indicated that only about 22% of high school students consumed the recommended five or more servings per day of fruits and vegetables (Centers for Disease Control and Prevention, 2010). In addition, only 18.4% of students were physically active for at least 60 minutes per day (on each of the 7 days before the survey). Moreover, 32.8% of students watched television for three or more hours per day on an average school day. Homes and schools are the most logical environments in which to address these behaviors. However, prior to investigating the ways in which these environments are associated with these behaviors, it is important to understand the role that age, sex, race/ethnicity, socioeconomic status (SES), and weight plays as they relate to healthy eating and physical activity among children and adolescents.

Consideration of Sociodemographics and Other Related Variables

Age plays a significant role in children's and adolescents' level of physical activity and in their eating behaviors. Longitudinal trends indicate that adolescents decrease their daily intake of fruit and vegetables during the transition from early to middle adolescence and again during the transition from middle to late adolescence (Larson, Neumark-Sztainer, Hannan, & Story, 2007). These trends are also consistent with respect to physical activity. For example, in a 2005 survey of middle schools across several states, the percentage of students who attended physical education classes on a daily basis decreased from 6th grade to 8th grade (Centers for Disease Control and Prevention, 2007).

In addition, researchers have found sex differences related to healthy eating and participation in physical activities. Thus, for example, the CDC's 2009 YRBS indicated that boys are more likely than girls to be physically active and to eat more fruits and vegetables five or more times per day (Centers for Disease Control and Prevention, 2010). However, another study found no gender differences related to adolescents' compliance with the dietary guidelines for fat consumption and servings of fruits and vegetables (Sanchez et al., 2007); however, this research was not conducted on a national scale. Other studies have also found girls to participate in lower overall levels of physical activity than boys (e.g., van der Horst et al., 2007). In addition, boys are more likely to meet the specific guideline of engaging in 60 minutes of physical activity a day (Sanchez et al., 2007). The CDC found no gender differences, however, with respect to children and adolescents' habit of watching three or more hours of television per day (Centers for Disease Control and Prevention, 2010).

Studies have shown that economically disadvantaged and racial/ethnic minority populations generally face substantial environmental challenges that hinder their level of physical activity and healthy eating habits (Delva, Lloyd, & O'Malley, 2007; Taylor, Evers, and McKenna, 2005). According to the CDC's 2009 YRBS, Black high school students are more likely than White and Hispanic students to be physically inactive and to use computers for three or more hours per day (Centers for Disease Control and Prevention, 2010). In addition, Gordon-Larson, McMurray, and Popkin (2000) found that on average physical activity was lower for Black and Hispanic adolescents than for White adolescents. On the other hand, Black students

are less likely than Hispanic and White students to eat fruits and vegetables less than five times per day (Centers for Disease Control and Prevention, 2010). Another study found White children to have a higher preference for vegetables than Black children (Granner et al., 2004).

Understanding the effects of SES on physical activity and eating behaviors is more difficult, partly because measuring SES has several dimensions, as it is measured by taking into account the family income, parent education, parent's prestige of occupation, or a combination of these highly correlated variables. Several studies have demonstrated that a lower SES status is associated with physical inactivity and unhealthy eating behaviors (Ball et al., 2009; Giskes et al., 2002; Wardle et al., 2003; Neumark-Sztainer et al., 1996). For example, in a national study, adolescents between the ages of 12 and 17 years were increasingly less likely to report physical inactivity and low fruit and vegetable consumption, as the SES of the responsible adults in their families increased (Lowry et al., 1996). In that study, the SES was based upon education and family income, and the study's results were controlled for age, sex, race/ethnicity, and school enrollment status.

In another study, the mother's education was inversely associated with physical inactivity, and a high family income was associated with increased physical activity (Gordon-Larson et al., 2000). Similarly, Janssen, Boyce, and Simpson (2006) found that families living in areas populated exclusively with residents with high school educations are more likely to eat unhealthy foods and to be physically inactive. In general, families with low SES must overcome many barriers in order to engage in behaviors associated with healthy eating habits and physical activity.

The mechanisms underlying the socioeconomic variation in children's levels of physical activity and in their diets are not fully understood. Some researchers argue that SES does not directly affect children's behavior; instead, important and modifiable mediators of the socioeconomic disparity must be identified (e.g., Birch & Fisher, 1997). For example, by means of multiple mediation analyses, researchers showed that educational and income disparities can be explained in terms of the degree of access that children have to fruits and vegetables at home (Bere, van Lenthe, Klepp, & Brug, 2008). In addition, parent and school practices influence children's level of physical activity and their healthy eating behaviors, and these influences vary according to the SES. Furthermore, racial and socioeconomic differences in children's physical activity levels and eating habits may be mediated, in part, by racial and socioeconomic differences in parenting and school practices.

Studies have also shown a relation between weight, body mass index (BMI), and children's healthy eating habits and degree of participation in physical activity. BMI is calculated by dividing body weight, in kilograms, by height, in square meters. Thus, for example, Delva et al. (2007) found that the frequencies of eating breakfast, eating fruits and vegetables, and exercising regularly are inversely associated with children being overweight or obese (i.e., BMI is at or above the 85th percentile). Similarly, Bayne-Smith et al. (2004) found that overweight children are less likely to eat fruits, vegetables, and breakfast. Overweight children are also less likely to exercise when compared with children of healthy weight (Centers for Disease Control and Prevention, 1996).

Summary

Baranowski, Anderson, and Carmack (1998) suggested focusing on subgroups within the population in order to gain a more in-depth understanding of healthy eating habits and physical activity among children and adolescents. As described in this section, several characteristics—age, sex, race/ethnicity, SES, and BMI—are related to children's healthy eating and physical activity behaviors. However, additional research is needed to enhance and complete researchers' understanding of these characteristics' contributions to children engaging in healthy behaviors. For example, differences found with respect to race/ethnicity and SES might be explained by parent and school environments and by parent and school practices. In the current study, child's sex, child's race/ethnicity, and family SES were employed as control variables. The next section reviews research related to parent and school characteristics and children's healthy eating and physical activity behaviors.

Review of Parent and School Literature Related to Healthy Eating and Physical Activity Behaviors

The literature review on parents and schools will be discussed in terms of the environment and specific practices, as defined by Darling and Steinberg (1993). The main purpose of this section is to describe the research that has been conducted related to parent and school influences and children's healthy eating habits and their levels of physical activity. In particular, this study was interested in the more proximal influences (such as processes and mechanisms in homes and schools) that directly affect children through interpersonal relationships and influence their development of healthy eating and physical activity behaviors (Bronfenbrenner,

1989). For this purpose, the process-person-context framework presented by Bronfenbrenner (1989) has been applied as a guiding framework. This approach will assist in systematically identifying not only the research that has been done, but also the remaining research gaps. Bronfenbrenner describes *context* variables as the surroundings in which people live and interact. *Person* variables are defined as characteristics of children and parents, and *processes* are the mechanisms by which change occurs. For example, the *context* variables in this review are the parent and school environments and the parent and school practices. This review captures the *person* by including constructs of the child's self-beliefs, which will be discussed in the next section. Furthermore, there are several *processes* to be considered, including the direct associations between parent and school environments and children's physical activity and healthy eating behaviors, those between parent and school practices and children's physical activity and healthy eating behaviors, and the ways in which parent and school practices vary as a function of parent and school environments. Processes that have not yet been studied will be discussed in the final section of this review.

The literature review begins with the findings related to the parenting environment and children's healthy eating and physical activity behaviors. Most of the research related to the parent environment has been studied in terms of parenting styles; thus, the term parenting styles is used interchangeably with that of parent environment. Next, findings for parenting practices are reported. In addition, measurement and design issues related to parenting styles and practices are discussed. Similarly, findings related to the school environment and children's healthy eating

and physical activity behaviors are given, followed by the findings related to school practices. Measurement and design issues associated with the school environment and school practices are also discussed.

Methods

A computer-based search of the literature was conducted using the PsychInfo, Social Service Abstracts, Sociological Abstracts, and Medline databases. Keywords related to parent environment, parenting styles, parenting practices, school environment, school climate, school practices, physical activity, and healthy eating were identified. In order to search the literature fully, an ancestry approach was used by examining the reference sections of articles to identify additional studies on parenting and school influences on children's healthy eating and physical activity behaviors (White, 1994).

The focus of this review was elementary and secondary school-aged children (grades K through 12). Only peer-reviewed articles published in English between 1990 and 2011 were included. Only articles in which healthy eating (e.g., fruit and vegetable consumption, low-fat foods) and physical activity were examined as distinct dependent variables were included. As for parent related articles, only those with predictor variables addressing the parenting environment, such as parenting styles or a specific parenting dimension (e.g., nurturing or controlling), were included, and the parenting practices had to be specific to healthy eating and physical activity behaviors. Similarly, for schools, the predictor variables that addressed the school environment, such as school climate, or a specific dimension, such as school

belongingness, were included, and the school practices had to be specific to healthy eating and physical activity behaviors.

Parental Influences

Parent Environment (Parenting Styles)

Some researchers, including Baumrind (1991b), have examined the association between parenting styles and health-risk behaviors, such as alcohol and other drug use, tobacco use, and violence. For example, several studies have indicated neglectful or authoritarian parenting styles are associated with increased drinking, smoking, and/or using drugs among adolescents (Adalbjarnardottir & Hafsteinsson, 2001; Bronte-Tinkew, Moore, & Carrano, 2006; Myers, Newcomb, Richardson, & Alvy, 1997; Patock-Peckham, Cheong, Balhorn, & Nagoshi, 2001; Radziszewska, Richardson, Dent, & Flay, 1996; Weiss & Schwarz, 1996). Very few studies have attempted to explore the relation between parenting styles and children's positive health behaviors. However, the extant literature on parenting styles and healthy eating and physical activity behaviors will be reviewed in the following sections.

Healthy eating. Only in the last decade have researchers examined the relation between parenting styles and healthy eating habits. As shown in Table 1, nine articles have examined parenting style and healthy eating habits. Among these nine articles, five were conducted with samples from the United States, and the other four were conducted with students from other countries. The sample sizes ranged from 221 to over 3,000 participants. All of the studies examining parenting style and healthy eating behaviors included children with approximately equal percentages of

boys and girls, although only a few studies reported the differences between these two groups.

Table 1:

Parenting Styles and Healthy Eating, Physical Activity, and Obesity

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Styles	Measure for Health Behavior	Findings
Healthy Eating							
Cullen et al., (2001)	N=221; US	4 th - 6 th grades	41% boys; 59% girls	37% Mexican-American; 29% European American; 25% African American; 9% Asian/other	Used the Authoritative Parenting Index (API)	Fruit, juice, and vegetable consumption	No association between fruit and vegetable consumption and parenting styles, but there was a weak correlation between parental control and juice consumption.
Berge et al., (2010)	N=2,516; US	Time 1: 12.8 - 15.8 mean ages Time 2: 17.4 -20.4 mean ages	49.9% boys; 55.1% girls	48.4% European American; 19.2% Asian; 18.7% African American; 5.8% Latino; 3.6% Native American; 4.3% Mixed/other	Based on Baumrind (1989) and Maccoby (2000)	Fruits and vegetables consumption	Positive association between authoritative fathers and daughters' fruit and vegetable intake.
Kim et al., (2008)	N=106; US	13 - 15 years old	52% boys; 48% girls	78% non-Hispanic European American	Based on Macoby & Martin (1983) and Devereux et al. (1962)	Energy and nutrient intake	Association between father nurturing and lower sodium intake and lower percentage of calories from carbohydrates and greater percentage of calories from fat.

Continued on next page

Table 1 (continued): *Parenting Styles and Healthy Eating, Physical Activity, and Obesity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Styles	Measure for Health Behavior	Findings
Kremer et al., (2003)	N=643; international	16 - 17 years old	45.8% boys; 54.2% girls	All Dutch	Based on Steinberg et al., (1989) and Lamborn et al., (1991)	Fruit consumption	Association between authoritative homes and increased adolescent fruit intake.
Lohaus et al., (2009)	Sample 1: N=432 Sample 2: N=366; international	2 nd - 5 th grades and 4 th -7 th grades	Sample 1: 53.2% boys; 46.8% girls Sample 2: 44.8% boys; 55.2% girls	All German	Used an instrument by Reitzle et al., (2001)	General nutrition (i.e., high-grade nutrition, low-grade nutrition)	Association between an authoritative parenting style and higher levels of positive and lower levels of negative health-related behavior.
Lytle et al., (2003)	N=3878; US	7 th grade	51.1% boys; 48.9% girls	66.8% European American; 11.2% African American; 7.0% Asian; 2.8% Hispanic; 1.7% Native American; 10.5% Other	Used the API	Fruit and vegetable consumption	Association between high maternal authoritative parenting style and adolescents consuming more servings of fruits and vegetables, and an association between high paternal nonauthoritative parenting style and adolescents consuming more servings of fruits and vegetables.

Continued on next page

Table 1 (continued): *Parenting Styles and Healthy Eating, Physical Activity, and Obesity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Styles	Measure for Health Behavior	Findings
van der Horst et al., (2007)	N=383; international	12-17 years old	44.9% boys; 55.1% girls	All Dutch	Based on Steinberg et al., (1989)	Sugar-sweetened beverage consumption	Association between moderate strictness and high involvement and decreased sugar-sweetened beverage consumption.
Vereecken et al., (2009)	N=1957; international	6 th grade	51.6% boys; 48.4% girls	98% Belgian	Based on Macoby & Martin (1983); Lamborn et al., (1991); Steinberg et al., 1994; and Kremer et al., (2003)	Fruit, vegetables, soft drinks, sweets, and breakfast	No association between parenting styles and adolescent's daily consumption of the food items.
Young et al., (2004)	N=366; US	6 th - 8 th grades	43.4% boys; 56.6% girls	81.7% European American; 6.4% African American; 4.2% Multiracial; 2.8% Asian; 2.5% Hispanic; 2.5% American Indian	Used the API	Fruit and vegetable consumption	No association between student's fruit and vegetable consumption and authoritative parenting.

Continued on next page

Table 1 (continued): *Parenting Styles and Healthy Eating, Physical Activity, and Obesity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Styles	Measure for Health Behavior	Findings
Physical Activity							
Berge et al., (2009)	N=2,516; US	Time 1: 12.8 - 15.8 mean ages Time 2: 17.4 -20.4 mean ages	44.9% boys; 56.6% girls	48.4% European American; 19.2% Asian; 18.7% African American; 5.8% Latino; 3.6% Native American; 4.3% Mixed/other	Based on Baumrind (1989) and Maccoby (2000)	General physical activity	Time 1 paternal neglectful parenting predicted less physical activity in sons at Time 2 compared to sons of authoritative fathers.
Lohaus et al., (2009)	Sample 1: N=432; Sample 2: N=366; international	2 nd - 5 th grades and 4 th - 7 th grades	Sample 1: 53.2% boys; 46.8% girls Sample 2: 44.8% boys; 55.2% girls	All German	Used an instrument by Reitzle et al., (2001)	General physical activity	Association between an authoritative parenting style and higher levels of positive and lower levels of negative health-related behavior.
Schmitz et al., (2002)	N=3798; US	7 th - 8 th grades	N/A	67% European American	Used the API	Physical activity and sedentary leisure habits	Association between nonauthoritative mothers and physical activity for boys. In contrast, there was an association between authoritative mothers and physical activity for girls.

About half of the healthy eating studies used the authoritative parenting index (API) developed by Jackson, Henriksen, and Foshee (1998). The API was based on the previous work of Baumrind, Dornbusch, and Steinberg (Baumrind, 1991a; Dornbusch et al., 1987; Steinberg et al., 1994; Steinberg, Elmen, & Mounts, 1989). The API consists of 20 items that are used to assess responsive and demanding parenting behaviors and to measure children's perceptions of parenting behaviors, rather than self-reported parenting behaviors. As shown in Table 1, the measures for healthy eating assessed different aspects of nutritional intake, such as the consumption of fruits and vegetables, sugar-sweetened beverages, and breakfast (although most included fruit and vegetable consumption).

Some studies found authoritative parenting to predict higher levels of healthy eating behaviors among children, compared to other parenting styles (e.g., authoritarian or neglectful), while other studies indicated no association. For example, Lytle et al. (2003) examined whether mothers' or fathers' authoritative or non-authoritative parenting styles predicted fruit and vegetable consumption in seventh-grade students. The researchers found that the relation between the parent's gender and the children's fruit and vegetable consumption differed according to parenting style. Specifically, mothers' authoritative parenting style predicted greater fruit and vegetable consumption, whereas the non-authoritative style was associated with greater fruit and vegetable consumption for fathers. In contrast, Young et al. (2004) found that authoritative parenting was not associated with children's fruit and vegetable consumption. This study was also conducted with middle school students

(grades 6-8). However, Young et al. (2004) did not examine maternal and paternal authoritative parenting separately, a factor that might explain the discrepancy in the findings.

Other researchers examined healthy eating habits by assessing adolescent (ages 13-15) intake of such nutrients as carbohydrates, fats, and sodium. In general, the researchers found that an authoritative parenting style served as a protective factor for total calorie intake and fat intake (Kim et al., 2008); the dimensions of parenting included nurturing (i.e., responsiveness) and control (i.e., demandingness).

Researchers found that paternal nurturing was associated with a lower sodium intake and that paternal control predicted that a lower percentage of calories stemmed from carbohydrates, whereas a larger percentage of calorie intake came from fat. The researchers also found maternal nurturing to be associated with a lower total calorie and fat intake, while no associations were found for maternal control. The differences found among mothers and fathers might reflect the fact that the two parents have differential effects upon their children during different developmental phases.

Although most of the studies related to parenting styles and healthy eating behaviors primarily included White participants, two studies examined more ethnically diverse populations. Cullen et al. (2001) examined the influence of parenting styles on vegetable consumption among an ethnically diverse group—African American (25%), Mexican American (27%), Euro-American (29%), and Asian (9%)—in grades 4 through 6. In contrast to the demandingness and responsiveness factors that emerged from the API in the Jackson et al. (1998) study

involving predominantly White students in grades 4 through 9, the API yielded supportive and permissive factors. Therefore, Cullen et al. (2001) were unable to create scores for traditional parenting styles (authoritative, authoritarian, and permissive), instead assessing the ways in which different dimensions of parenting (i.e., responsiveness and permissiveness) were related to children's fruit, juice, and vegetable consumption. No association was found between students' consumptions of fruits and vegetables and the parenting dimensions. The reason for this particular finding might be that the API instrument is not appropriate for ethnically diverse populations or that other cultural factors were not taken into account.

Another study assessed fruit and vegetable consumption among ethnically diverse adolescents, but in an older population of middle school and high school students. This study was longitudinal, with 5 years between Time 1 and Time 2 (Berge et al., 2010). The researchers employed the four parenting styles based on the conceptualizations of Baumrind (1967) and Maccoby (2007). Among daughters, the paternal permissive parenting style predicted a higher intake of fruits and vegetables at the 5-year follow-up, as compared with the authoritarian style. No significant association was found between paternal parenting styles and sons' food intake. This finding supports previous research suggesting that the opposite-sex parent plays a unique role in influencing adolescent health behaviors. In addition, there were no significant findings for the relation between maternal parenting style and fruit and vegetable consumption among adolescents, findings that are relatively consistent with those of Kim et al. (2008) and once again support the idea that mothers and fathers might have differential effects, depending upon the child's developmental age.

Of the nine articles related to parenting styles and healthy eating, nearly half of the studies used samples from countries outside the United States. Lohaus et al. (2009) found that children and adolescents who experienced authoritarian and neglectful parenting styles had lower levels of positive health behaviors (e.g., eating several fruits and vegetables several times a week) compared to those who had parents with authoritative styles. This result was consistent for both samples in this study—children in German schools in grades 2 through 5 and in grades 4 through 7. These results were also consistent over time. Vereecken, Legiest, De Bourdeaudhuij, and Maes (2009) explored the impact of parenting styles on sixth-grade Belgian students' dietary habits, specifically in terms of the consumption of breakfast, fruit, vegetables, soft drinks, and sweets. Similar to the findings of Young et al. (2004) and Cullen et al. (2001), none of the general parenting styles showed significant effects on adolescents' daily consumption of the food items. In this study, the researchers examined both parenting styles and parenting practices; however, they did not assess whether the relation between parenting styles and adolescents' healthy eating was in any way affected by parenting styles. Therefore, the inclusion of both parenting style and parenting practices without using any specific interaction terms might explain the lack of findings for parenting styles in this particular study.

Physical activity. Even fewer studies have examined physical activity in relation to parenting style—only three were in existence at the time of this review. As shown in Table 1, two studies were conducted in the United States with fairly large samples of adolescents. The third study examined a relatively smaller sample of German students ranging from grades 2 through 7. Although the studies used a

different measure of physical activity and a different measure for parenting style, in general, they showed that authoritative parenting was associated positively with physical activity and negatively with sedentary behaviors. Schmitz et al. (2002) used the API to examine parenting style as a predictor of physical activity and sedentary leisure habits in seventh- and eighth-grade students. Gender differences were found between mothers' parenting styles and their adolescents' physical activity and leisure activities. Mothers with an authoritative parenting style had daughters who engaged in a greater amount of physical activity and who were less sedentary, whereas mothers with non-authoritative parenting styles were associated with increased physical activity levels in their sons. This suggests that girls are more responsive to nurturing behavior on the part of mothers with regard to physical activity, whereas boys are more responsive to controlling behavior on the part of mothers. In this study, the father's parenting style never emerged as a significant predictor. Only having two categories for the parenting style measure might have led to inaccuracy and limited the findings. This also might explain the null findings for fathers.

With an ethnically diverse group of adolescents, Berge et al. (2010) found that paternal neglectful parenting style at Time 1 (the first data collection point of the longitudinal study) predicted less frequent physical activity in sons at Time 2, in comparison with sons of authoritative fathers. There were no significant associations between paternal parenting style and daughters. This is consistent with the research of Schmitz et al. (2002). In addition, there were no significant associations between maternal parenting styles and physical activity among adolescents. This finding, however, is consistent with Schmitz et al. (2002). The reason for the discrepancy

may be due to the measures used for parenting style. Schmitz et al. (2002) used the API and Berge et al. (2010) used a measure based on Baumrind (1989) and Maccoby (2000). In another longitudinal study, Lohaus et al. (2009) found that the authoritarian and neglectful parenting styles were associated with adolescents being less physically active compared to adolescents with authoritative parents. In contrast, children with parents who employed authoritarian and neglectful styles were more likely to engage in sedentary leisure activities such as watching television or playing video games compared to children with authoritative parents. This result was consistent for children in German schools in grades 2 through 5 and those in grades 4 through 7.

Moderating effects. Two studies, van der Horst et al. (2007) and Kremers et al. (2003), examined whether parenting styles moderated the relationship between parenting practices and healthy eating, as prescribed by the contextual model of Darling and Steinberg (1993). Van der Horst et al. (2007) examined whether perceived parenting style moderated the association between parenting practices (e.g., “My father/mother tells me how much sugar-sweetened beverages I am allowed to consume,” “My mother/father tells me which sugar-sweetened beverages I am allowed to consume”) and Dutch middle school students’ consumption levels of sugar-sweetened beverages. The researchers developed dimensions of perceived strictness and involvement (i.e., responsiveness and demandingness) to measure parenting style based on the previous work of Steinberg et al. (1989). Rather than dichotomizing the scores on both dimensions, they decided to retain the dimensions of strictness and involvement as continuous measures.

In this study, van der Horst et al. (2007) found that adolescents who perceived their parents' parenting style as being moderate in strictness and high in involvement consumed fewer sugar-sweetened beverages than adolescents whose parents were high in strictness or were not strict at all and less involved. They also found that parenting practices (as described above) were more effective (i.e., lower sugar-sweetened beverage consumption) for parents with a more authoritative parenting style (moderate strictness and high involvement) than were parents with other variations of strictness and involvement. They also found that the association between parenting practices and sugar-sweetened beverage consumption was stronger among adolescents who perceived their parents as moderately strict and highly involved than it was among those whose parents were highly strict or not strict at all and less involved. This finding supports the moderating effects of parenting styles proposed by Darling and Steinberg's (1993) contextual model.

Another cross-sectional study with older Dutch adolescents (ages 16 and 17) examined the ways in which parenting style was related to fruit consumption (Kremers et al., 2003). This study also assessed whether parenting styles moderated the association between parenting practices and healthy eating (as measured by fruit consumption instead of sugar-sweetened beverage consumption). In comparison to the study conducted by van der Horst et al. (2007), Kremers et al. (2003) developed an instrument to measure the four common parenting styles (authoritative, authoritarian, permissive, and neglectful). Researchers showed that adolescents who were raised in authoritative homes ate significantly more fruit than adolescents who were raised with other parenting styles. The study also found that adolescents from

indulgent homes consumed more fruit than adolescents from authoritarian or neglectful homes. The researchers did not find any differences between authoritarian and neglectful parenting styles. In support of Darling and Steinberg's (1993) contextual model, Kremers et al. (2003) found that adolescents with authoritative parents perceived the highest degree of social support for eating fruit compared to those with parents with other parenting styles. Further, adolescents who perceived that people important to them ate at least two pieces of fruit per day were more likely to come from authoritative homes than from authoritarian, permissive, or neglectful homes.

Summary. Most of the research included in this review examined parenting style and how it relates to healthy eating. Researchers were able to demonstrate that authoritative parenting styles predicted adolescent healthy eating. However, there were a few studies in which researchers found no associations between parenting style and children's healthy eating. Although the findings seemed to be generally consistent across the various relevant factors for healthy eating (such as fruit and vegetable consumption, sugar-sweetened beverage consumption, and nutrient intake), researchers showed that (depending on the healthy eating topic), mothers and fathers had differing effects on healthy eating among children and adolescents. For example, in one study, mothers' authoritative parenting was associated with fruit and vegetable consumption among adolescents (Lytle et al., 2003), while in another study, mothers' authoritative parenting was not associated with children's intake of nutrients such as fats and carbohydrates (Kim et al., 2008). This was also the only domain (healthy eating) that included studies based upon the contextual model of Darling and

Steinberg (1993). Using the contextual model, the researchers showed that the environment that parents cultivated in the home affected the relation between parenting practices and children's healthy eating.

Unfortunately, much less research has been conducted on physical activity as it relates to the various parenting styles. Consistent with the findings for healthy eating, researchers found that an authoritative parenting style predicted children's levels of physical activity; however, in one study, this held true only for girls, not boys. Researchers also were able to demonstrate that nonauthoritative parenting styles predicted sedentary behaviors among adolescents. Interestingly, Schmitz et al. (2008) found differences between parenting styles and sedentary behaviors for girls and boys, although no gender differences were found for parenting style and physical activity. This suggests the importance of examining these as representing two separate behaviors, rather than considering them to be the reverse of each other.

In summary, the research on parenting style as it relates to healthy eating and physical activity is scant. More research is needed examining parenting style and positive health behaviors in order to further bolster the current findings and address issues related to design and measurement. In particular, more research is needed using Darling and Steinberg's (1993) contextual model to be able to understand how parenting style as a context factor affects the impact of parenting practices related to healthy eating and physical activity. The next section describes the different parenting practices related to healthy eating and physical activity, which is followed by a discussion of school influences.

Parenting Practices

Although there is substantial support indicating that the parenting styles described by Baumrind (1967) are related to children's behavior, the styles alone do not explain how these behaviors are developed or altered. However, by differentiating parenting practices from parenting styles, a deeper understanding of parental influence on health behaviors might be established. This can be facilitated by examining the different aspects of the parent–child relationship that uniquely contribute to a particular type of child behavior, rather than attempting to examine the overall parenting environment.

As described earlier, Darling and Steinberg (1993) suggested that parenting practices are specific behaviors that convey the socialization goals held by parents for their children. For example, if parents believe that physical activity is important for the health of their children, they might be more inclined to be physically active with their children or to encourage them to be physically active. Parenting practices are believed to have a direct effect on health behaviors and outcomes (Cullen et al., 2001; Kremers et al., 2003; Moore & Harre, 2007; Ornelas et al., 2007; Vereecken et al., 2009; Young et al., 2004). In addition, the parenting climate might also influence the effectiveness of parenting practices. For example, if parents use an authoritative parenting style, they might have a greater impact on their adolescents' positive health behaviors when modeling physical activity and eating healthy food choices (such as fruits and vegetables) than they would if they had another parenting style (such as authoritarian or neglectful). Researchers have addressed several specific parenting

practices related to healthy eating and physical activity (see Table 2 for examples).

These studies are reviewed in the following sections and are shown in Table 3.

Table 2:

Examples of Parenting Practices for Healthy Eating and Physical Activity/Sedentary Behaviors

Healthy Eating
<ul style="list-style-type: none">• Eating meals together• Modeling eating healthy food choices• Supplying home with healthy food options• Limiting unhealthy food options in the home• Involving adolescents in menu planning• Involving adolescents in food purchasing• Involving adolescents in food selection• Involving adolescents in food preparation• Encouraging adolescents to eat healthy foods• Praising adolescents if they eat healthy foods• Explaining why healthy eating is important• Overseeing the types of foods adolescents eat• Having rules related to food choices• Using foods as a reward for good behavior
Physical Activity and Sedentary Behaviors
<ul style="list-style-type: none">• Allowing adolescents to play outside• Being physically active with adolescents• Modeling physical activity• Playing sports or being physically active with adolescents• Observing adolescents being physically active• Providing transportation to sports practice or events• Enrolling adolescents in sports• Paying fees for team sports, dance, karate or any other form of physical activity• Encouraging adolescents to be physically active• Praising adolescents if they are physically active• Explaining why physical activity is important• Providing punishment for exercising• Providing rewards for exercising• Limiting amount and type of TV shows, video games, and computer access

Table 3:

Parenting Practices and Healthy Eating and Physical Activity

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Healthy Eating							
Brown et al., (2004)	N=112 adolescents and N=137 parents	9-13 years old	12.4% boys; 87.6% girls	82% European American; 6% Asian; 1% African American; and 1% other	<ul style="list-style-type: none"> Overseeing the types of food adolescents eat (e.g., how often are you firm about what your child should eat? how often do you allow your child a free choice of what to eat?) Using food as a reward or punishment (e.g., how often do you treat your child with food for good behavior?) 	Snack foods	Children whose parents reported higher levels of control over their children's diet reported eating more of both the unhealthy and healthy snack foods.
Corwin et al., (1999)	N=714 children	4th grade	47.8% boys; 52.2% girls	54.2% European; 45.8% African American	<ul style="list-style-type: none"> Involving adolescents in food selection (e.g., how confident the child feels about choosing low fat foods?) Involving adolescents in food preparation (e.g., How often the child participates in breakfast, lunch, and dinner preparation?) Modeling eating healthy food choices (e.g., How often does the child eat or tastes a food because the parent does?) 	Dietary intake for 28 individual food items (e.g., fruit and vegetables)	Association between medium to higher levels of involvement in food selection and preparation and higher levels of fruit and vegetable exposure. No significant findings for modeling.

Continued on next page

Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Cullen et al., (2000)	N=109 parents	4 th -6 th grades	N/A	51 European; 17% African-American; and 32% Hispanic-American	<ul style="list-style-type: none"> Involving adolescents in food preparation (4 items for lunch/snack, e.g., how often do you tell your child to include a fruit in his/her lunch? and 3 items for dinner, e.g., how often does your child prepare his/her own dinner?) Modeling eating healthy food choices (6 items, e.g., regularly tell your child you like fruit for snacks) Encouraging adolescents to eat healthy foods (8 items, e.g., regularly encourage your child to eat fruit) Supplying home with healthy food options (6 items, e.g., regularly have cut-up fruit available for your child's snack) 	Fruit, juice, and vegetable consumption	Child dinner fruit, juice, and vegetable preparation was significantly negatively correlated with child juice consumption. No other associations were found.
Cullen et al., (2001)	N=221 students	4 th – 6 th grades	41% boys; 59% girls	29% European American; 27% Mexican 25%; African Americans; 9% Asian/other	<ul style="list-style-type: none"> Involving adolescents in food preparation (e.g., she lets me prepare my lunch) Modeling eating healthy food choices (34 items, e.g., my parents eat vegetables at lunch when I with them) Supplying home with healthy food options 	Fruit, juice, and vegetable consumption	Parental modeling was weakly correlated with eating fruit, juice, and total fruit, juice, and vegetable intake. No other associations were found.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Frenn et al., (2005)	N=127 students	7 th grade	37.8% boys; 62.2% girls	47.2% Hispanics; 31.5% African American; 21.3% other	<ul style="list-style-type: none"> Encouraging and praising adolescents to eat healthy foods (5 items about encouragement to eat fruits and vegetables and praise for eating a healthy amount of food) Modeling eating healthy food choices (focused on whether or not the child's mother or father eats 5-6 servings of fruits and vegetables each day; eat whole grain breads and cereals; and eat high-fat foods) 	Low fat foods	No associations were found for encouraging, praising, and parental modeling and adolescents healthy eating.
Gillman et al., (2000)	N= 16,202 adolescents	9-14 years old	46.4% boys; 53.6% girls	N/A	<ul style="list-style-type: none"> Eating meals together (e.g., how often do you sit down with other members of your family to eat dinner or supper?) 	Quality of food intake	An increased frequency of family dinner was associated with substantially higher intake of several nutrients; and lower intake of saturated and trans fat as a percentage of energy.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Granner et al., (2004)	N=736 adolescents	11-15 years old	45.3% boys; 54.7% girls	51.1% European American; 48.9% African American	<ul style="list-style-type: none"> Eating meals together (e.g., frequency of family dinners per week) Modeling eating healthy food choices (items adapted from Cullen, et al., 2001) 	Fruit and vegetable consumption and self-efficacy	Family dinner frequency and parental modeling were associated with increased adolescent efficacy for fruit and vegetable intake, but there was not a direct relation to fruit and vegetable intake.
Larson et al., (2006)	N=4,079 students	7 th -12 th grades	50.1% boys, 49.9% girls	48.5% European American; 19.0% African American; 19.2% Asian American; 5.8% Hispanic; 3.5% Native American; 3.9% mixed/other	<ul style="list-style-type: none"> Encouraging adolescents to eat healthy foods (e.g., my mother cares about eating healthy food, my mother encourages me to eat healthy food) Eating meals together (e.g., there was at least one parent in the room when you ate dinner) Supplying home with healthy food options (e.g., soda pop is available in my home) 	Calcium, dairy, and milk intake	Parental presence at meals was a positive predictor of milk intake for both boys and girls. No associations for soda in the home, but the presence of milk at meals was a significant predictor of calcium and dairy intake.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Neumark-Sztainer et al., (2003)	N=4,746 students	11-18 years old	50.2% boys, 49.8% girls	48.5% European American; 19.0% African American; 19.2% Asian American; 5.8% Hispanic; 3.5% Native American; 3.9% mixed/other	<ul style="list-style-type: none"> Eating meals together (e.g., during the past seven days, how many times did all, or most, of your family living in your house eat a meal together?) 	Healthy food intake (e.g., fruits, vegetables, grains, calcium-rich foods, snack foods, and no soft drinks)	Frequency of family meals was positively associated with intake of fruits, vegetables, grains, and calcium-rich foods and negatively associated with soft drink consumption. Positive associations were also seen between frequency of family meals and energy; protein (percentage of total calories); calcium; iron; folate; fiber; and vitamins A, C, E, and B-6.
Young et al., (2004)	N=366 students	6 th – 8 th grades	43.4% boys; 56.6% girls	81.7% European American; 6.4% African American; 2.8% Asian American; 5.5% Hispanic; 2.5% Native American; 4.2% Multiracial	<ul style="list-style-type: none"> Modeling eating healthy food choices (15 items assessing the type of foods parents eat food in front of their adolescents) Encouraging adolescents to eat healthy foods (13 items that assessed perceived support of parents for eating healthy foods) Supplying home with healthy food options 	Fruit and vegetable consumption	Perceived parent modeling, parent support, and fruit and vegetable availability were significant predictors of fruit and vegetable intake.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Physical Activity							
Anderssen et al., (1992)	N=904 students	7th grade	55.1% boys; 44.9% girls	All from western Norway	<ul style="list-style-type: none"> Encouraging adolescents to be physically active (e.g., frequency (per week) of encouragement to participate in fitness-related exercise for mothers and fathers and help from parents in organizing exercise sessions of physical activities) 	Leisure-time physical activity	Encouragement and help from parents predicted leisure-time physical activity.
Bauer et al., (2008)	N=2516 student	Time 1: 12.8 - 15.8 mean ages Time 2: 17.8-20.8 mean ages	44.9% boys; 55.1% girls	48.5% European American; 19% African American; 19.2% Asian American; 5.8% Hispanic; 3.5% Native American; 3.9% Multiracial	<ul style="list-style-type: none"> Encouraging adolescents to be physically active (e.g., how much has your mother/father encouraged you to be physically active and how much has she cared about staying fit and exercising) 	Moderate to vigorous physical activity and TV/video watching	Mother encouragement was not associated with moderate to vigorous physical activity, but father encouragement was associated to moderate to vigorous physical activity of males. Mother encouragement was associated with decreased TV/video watching for younger females.
Beets et al., (2006)	N=363 students	5 th - 8 th grades	52.1% girls; 47.9% boys	96% European American	<ul style="list-style-type: none"> Encouraging adolescents to be physically active Providing transportation to sports practice or events Observing adolescents being physically active 	Self-reported physical activity	There was a positive association between parent providing transportation and praise and adolescent physical activity.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Beets et al., (2007)	N=68 student and N=115 parents	3 rd – 5 th grades	42.6 % boys; 57.4% girls	97% European American	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active • Observing adolescents being physically active • Being physically active with adolescents 	Total daily activity	For boys, fathers' doing weekend activity with them was positively associated with increased activity levels. For the girls, mothers' using outdoor play as recreation during the weekday was the only significant contributor to activity. No other significant relations were observed.
Bungum et al., (1997)	N=852 adolescents	14-18 years old	100% girls	73.4% African American; 26.6% European American	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active (e.g., my parents have encouraged me to exercise, exercised with me, have discussed exercise with me) • Modeling physical activity (e.g., my mother/father exercises) 	Self-reported physical activity	Father encouragement and modeling were positively associated with physical activity. No other significant relations were observed.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Davison et al., (2003)	N=180 adolescents	9 years old	100% girls	100% European American	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active • Enrolling adolescents in sports 	Girls' general tendency or inclination toward activity.	Mother and father support (encouragement and enrolling them in sports) were associated with higher physical activity among girls. Girls reported significantly higher levels of physical activity when at least one parent reported high levels of overall support in comparison to no parents.
DiLorenzo et al., (1998)	N=111 students	Phase I: 5 th and 6 th grades Phase II: 8 th and 9 th grades	51.1% boys; 48.9% girls in both phases	93% European American	<ul style="list-style-type: none"> • Modeling physical activity • Providing punishment for exercising (e.g., criticizes exercise, complains about time spent exercising) • Providing rewards for exercising (e.g., reward exercise behavior) 	Self-reported physical activity	Family modeling and family punishment/rewards were not associated with children's exercise.
Frenn et al., (2005)	N=127 students	7 th grade	37.8% boys; 62.2% girls	47.2% Hispanics; 31.5% African American; 21.3% other	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active • Modeling physical activity 	Self-reported physical activity	Total support was associated with higher physical activity for girls.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Heitzler et al., (2006)	N=3,314 parent-child pairs	9-13 years old	51.1% boys; 41.2% girls	61.5% European American; 15.4% African American; 17.1% Hispanic; 6.0% other	<ul style="list-style-type: none"> • Enrolling adolescents in sports (e.g., I think I can ask my parents to sign me up for a sport or other physical activity) • Playing sports or is physically active with adolescents (e.g., if I asked my parents to do physical activities with me, they probably would) • Modeling physical activity (e.g., my parents show or tell me they really like it when I do physical activities) 	Self-reported physical activity	Children's perception of parental support and parent's reports of direct support were strongly related to organized physical activity. Feeling safe, having lots of places to be active, and parental participation with their child were strongly related to free-time physical activity.
Lee et al., (2010)	N=5,177 parent-child pairs	9-13 years old	51% boys; 49% girls	60.9% European American; 15.5% African American; 17.2% Hispanic; 6.5% other	<ul style="list-style-type: none"> • Being physically active with adolescents 	Self-reported physical activity	More than three-quarters of parents (77.6%) reported co-physical activity at least one day in the past week. Child's perception of parental support was significantly associated with co-physical activity.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Norman et al., (2005)	N=878 adolescents	11-14 years old	46.4% boys; 53.6% girls	57.9% European American; 6.6% African American; 3.4% Asian American; 13.1% Hispanic; 0.7% Native American; 18.3% Multiracial	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active (e.g., encourages you to spend less time being sedentary; tells you that you are doing a good job reducing your sedentary habits) • Explaining why physical activity is important (e.g., discusses with you how sedentary habits can be unhealthy; helps you think of ways to reduce the time you spend on sedentary habits) 	Leisure-time sedentary behaviors	For girls, family support and television/video rules were associated with sedentary behaviors.
Ornelas et al., (2007)	N= 13,246 students	7 th – 12 th grades	49.5% boys; 50.5% girls	60.0% European American; 49.4% African American; 52.8 Hispanic; 52.5% Asian American	<ul style="list-style-type: none"> • Limiting amount of TV 	Self-reported physical activity	No associations were found.
Prochaska et al., (2002)	N=138 students	6 th – 8 th grades	35% boys; 65% girls	28% European American; 23% Asian; 7% African American; 5% Latino; 37% other	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active • Praising adolescents if they are physically active • Providing transportation to sports practice or events • Playing sports or being physically active with adolescents 	Self-reported and monitored physical activity	Parent encouragement, praise, transportation, and exercise with kids were associated with self-reported physical activity.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Sallis et al., (1992)	N=297 children and parents	4th grade	50.2% boys; 49.8% girls	84% European American	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active • Providing transportation to sports practice or events • Playing sports or being physically active with adolescents 	Physical activity (there were four measures: weekday self-report, weekend self-report, weekday objective measures, and weekend objective measures)	Availability of transportation by parents to sport and fitness activities were significantly related to adolescent physical activity. No other significant relations were observed.
Sallis et al., (1999)	N= 732 students	4 th - 5 th grades	49.5% boys; 50.1% girls	82% European American, 12% Asian/Pacific Islander, 4% Hispanic, 2% African American	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active • Providing transportation to sports practice or events • Playing sports or being physically active with adolescents 	One day recall of physical activity and accelerometer	Frequency of parents transporting children to activity locations explained significant proportions of variance of physical activity for girls and boys.
Stucky-Ropp et al., (1993)	N=242 child- mother pairs	5th - 6th grades	50 % boys; 50% girls	93% European American	<ul style="list-style-type: none"> • Modeling physical activity 	Self-reported physical activity	Direct parental modeling of physical activity predicted physical activity for girls not boys.

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Table 3 (continued): *Parenting Practices and Healthy Eating and Physical Activity*

Citation	Sample	Age/ Grade	Gender	Race	Measure for Parenting Practices	Health Behavior Outcome	Findings
Trost et al., (1997)	N=229 students	5 th - 6 th grades	45% boys; 55% girls	64% African- American; 36% European American	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active • Playing sports or being physically active with adolescents 	Self-reported physical activity during the after-school hours	Influence of family was not found to be an important predictor of physical activity behavior in rural youth.
Trost et al., (2003)	N=380 students	7th - 12th grades	45% boys; 55% girls	84.2% European American	<ul style="list-style-type: none"> • Encouraging adolescents to be physically active • Playing sports or being physically active with adolescents • Providing transportation to sports practice or events • Observing adolescents being physically active • Explaining why physical activity is important 	Self-reported physical activity	Parental support (encouragement, physically active with child, providing transportation, watching the child be physically active, and saying why it is important) was related to adolescent physical activity both directly and indirectly through its positive association with adolescent self-efficacy perceptions.
Welk et al., (2003)	N=994 children and N=536 parents	3 rd – 6 th grades	17% boys; 82% girls	68% European American; 18% African American; 4% Hispanic; 8% Asian; 2% other	<ul style="list-style-type: none"> • Modeling physical activity • Encouraging adolescents to be physically active 	Self-reported physical activity	Parental encouragement was found to be a significant predictor for adolescent physical activity, but not parental modeling.

Healthy eating. Most of the research related to healthy eating examines parenting practices and young children. However, several studies supported a direct relation between parenting practices and healthy eating among older children. Specifically, researchers have demonstrated a link between children's healthy eating and parents encouraging their children to eat healthy foods (Larson et al., 2006; Young et al., 2004); partially through eating family meals together (Gillman et al., 2000; Neumark-Sztainer, Hannan, Story, Croll, & Perry, 2003), providing healthy foods and opportunities to prepare healthy foods together (Corwin, Sargent, Rheaume, & Saunders, 1999; Cullen et al., 2000a), and modeling healthy eating behaviors for their adolescents (Young et al., 2004). However, there was limited support for each type of parenting practice.

Only a couple of studies examined the relation between parents' encouragement of healthy eating and the degree to which children actually practiced healthy eating. For example, researchers found that perceived encouragement to consume fruits and vegetables had a positive effect on fruit and vegetable consumption in middle school students (Young et al., 2004). Similarly, Larson et al. (2006) found that parental encouragement of healthy eating in general for adolescents was significantly and positively related to calcium intake in male adolescents. In contrast, Frenn et al. (2005) found no associations between parental encouragement or praise and increased healthy eating (i.e., consumption of low-fat foods) among African American adolescents. This discrepancy might be explained by ethnic differences – the sample used by Larson et al. (2006) was mostly White, whereas the

sample used by Frenn et al. (2005) consisted mostly of African Americans. In addition, these two studies examined two different aspects of healthy eating.

The practice of families eating meals together also tends to predict the degree to which children make healthier food choices. In one study, researchers found that the frequency of family meals was positively associated with adolescent intake of fruits, vegetables, grains, and calcium-rich foods, while it was negatively associated with soft-drink intake (Neumark-Sztainer et al., 2003). Similarly, Gillman et al. (2000) showed that family dinners are associated with healthy eating patterns among adolescents. For example, increasing the frequency of family dinners was associated with higher consumption of fruits and vegetables and, accordingly, several beneficial nutrients, including fiber, foliate, calcium, iron, and vitamins B6, B12, C, and E. Researchers also found that parental presence at meals was a significant positive predictor of milk intake among both girls and boys in grades 7 through 12 (Larson et al., 2006). Research has also shown indirect associations between eating meals together and healthy eating. For instance, Granner et al. (2004) demonstrated that parents eating meals with their adolescents were associated with higher adolescent efficacy for healthy eating, which in turn was related to increased fruit and vegetable intake.

In general, parents decide what types of foods are available in the home, how accessible healthy options are to their children, what rules are established in the home regarding food (e.g., meal times and snacking in front of the television), and whether they choose to consider their children's preferences in food. Studies have shown that adolescents will make healthy food choices if parents provide them at home. For

example, Young et al. (2004) found that fruit and vegetable availability significantly predicted fruit and vegetable intake. Researchers also found that medium to higher levels of adolescent involvement in food selection and preparation were associated with higher levels of fruit and vegetable exposure (Corwin et al., 1999). Cullen et al. (2000a) found a correlation between adolescent meal planning with parents and fruit and vegetable consumption.

In addition, parents can serve as role models for health for their children. A few studies have examined parental modeling and healthy eating (Corwin et al., 1999; Cullen et al., 2000a; Cullen et al., 2001; Frenn et al., 2005; Granner et al., 2004; Young et al., 2004), with researchers finding that parents modeling the consumption of fruits, vegetables, and juices were positively but weakly correlated with total fruit, juice, and vegetable consumption by adolescents (Cullen et al., 2001). Similarly, Young et al. (2004) found that parental modeling was a significant predictor of fruit and vegetable consumption among adolescents when there was a high availability of fruits and vegetables at the home. Other researchers found an indirect relation, in that parental modeling was associated with higher adolescent efficacy for healthy eating, which in turn was related to increased fruit and vegetable intake (Granner et al., 2004). However, three of the studies found no associations at all between parental modeling and healthy eating (Corwin et al., 1999; Cullen et al., 2000a; Frenn et al., 2005). None of these studies used the same dependent variable or the same measurement for parent modeling. This might explain why there were discrepancies in the findings among these studies.

It is also clear that parents can apply too much pressure on children concerning the foods they eat, such as by telling their children to clean their plates. Researchers found that when parents use more palatable foods (e.g., sweets), which are usually not healthy foods, to reward their children for good behavior (such as eating their vegetables), children are trained to prefer unhealthy food (Birch & Davison, 2001). In contrast, children who are forced to eat certain foods (such as vegetables) or to clean their plates will most likely end up not liking the foods they are forced to eat, preferring sugar- and calorie-rich foods instead. This preference, established in childhood, continues into adolescence. For example, Brown (2004) found that adolescents showed higher levels of consumption of both unhealthy and healthy snack foods if their parents were more concerned about what and when they ate than parents who were less concerned about their adolescents' diets.

Physical activity. More researchers have examined parenting practices related to physical activity. In this review, almost 20 studies were identified. It was clear that these studies demonstrated a link between children engaging in physical activity and parental encouragement to be physically active (Beets, Vogel, Forlaw, Pitetti, & Cardinal, 2006; Davison, Cutting, & Birch, 2003; Sallis et al., 1999), such as by praising them for engaging in physical activity (Beets et al., 2006); enrolling them in team sports (in school or in the community) (Davison et al., 2003; Heitzler, Martin, Duke, & Huhman, 2006); observing them while playing sports or exercising (Troost et al., 2003); modeling physical activity (Beets et al., 2006; Heitzler et al., 2006); exercising with them (Beets et al., 2007a); and limiting sedentary behaviors (Norman

et al., 2005). Similarly to healthy eating, there was limited support for each type of parenting practice, except for encouragement and praise.

Researchers found that encouragement and help from parents was a predictor of leisure-time physical activity (Anderssen & Wold, 1992; Frenn et al., 2005). In particular, the study revealed that boys received more encouragement for physical activity than girls did. However, the association between girls' physical activity levels and encouragement was stronger. Similarly, Trost et al. (2003) found a relationship between parental encouragement and involvement (e.g., playing sports with adolescents or watching them play sports) and children's physical activity levels. Several other studies showed a similar relation between parental encouragement of physical activity and children's physical activity levels. In addition, a couple of studies indicated that parents who praise their children for being physically active were more physically active than parents who did not (Beets et al., 2006; Prochaska, Rodgers, & Sallis, 2002; Welk, Wood, & Morss, 2003). Interestingly, Bauer et al. (2008) found an association between encouragement on the mother's part and decreased sedentary behaviors among females, while Bungum and Vincent (1997) found that only encouragement on the part of the father was associated with children's physical activity. However, a few studies found no association whatsoever between parental encouragement and praise and physical activity (Bauer, Nelson, Boutelle, & Neumark-Sztainer, 2008; Trost et al., 1997). These studies with no significant association involved predominantly African American children, whereas the studies with an association were conducted with White children, or with

predominantly Hispanic populations. In addition, the measures used to assess encouragement and praise varied among the studies.

Parents also can encourage children to become involved in organized sports. Parents who provide transportation to sporting events or recreational facilities, or who pay fees for team sports, also have children who participate in higher levels of physical activity than do parents who do not provide such direct support. For example, researchers found that the strongest correlates of organized physical activity (considering both child and parental variables) were the parents' perceptions of the importance of organized physical activity and the adolescents' perceptions of parental involvement. Examples of parental involvement included signing up children for a sport, parents believing that children should engage in physical activities, and parents telling children that they like it when they observe them engaging in physical activity (Heitzler et al., 2006). Similarly, Sallis et al. (1992) found that the availability of transportation by parents to sports and fitness activities was significantly related to adolescent physical activity. Another parenting practice that has been found to correlate with children's physical activity is observation by parents of their children, while the children are playing sports or exercising. Trost et al. (2003) found that parents watching their children participate in physical activity or sports were correlated with increased levels of physical activity among children both directly and indirectly, through a positive association with child self-efficacy perceptions.

Studies examining parental modeling of physical activity found some positive associations with children's physical activity (Frenn et al., 2005; Sallis et al., 1992; Stucky-Ropp & DiLorenzo, 1993). In addition, studies examining parent gender

differences found that fathers' explicit modeling and mothers' logistic support were associated with significantly higher levels of physical activity among daughters (Davison et al., 2003). In contrast, some studies found little or no relationship between parent modeling and adolescent physical activity (Anderssen & Wold, 1992; DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham, 1998; Welk et al., 2003). The difference in findings might be a product of how physical activity and parent modeling was measured. It is less clear how parent-child coparticipation (parents and adolescents engaging in activities together) predicts adolescent physical activity. However, a recent study revealed that parent-child coparticipation is an important factor in adolescents being physically active (Lee et al., 2010). In addition, Beets et al. (2007a) found that mothers' playing outside with their children during weekdays were significantly associated with children being physically active.

Finally, parents can limit the extent to which they allow their children to engage in sedentary behaviors such as watching television, playing video games, and surfing the Internet. Sedentary behavior, and specifically television viewing, may reduce the amount of time that children have to spend on physical activities (Norman et al., 2005; U.S. Department of Agriculture, 2009). These sedentary behaviors contribute to increased calorie consumption through excessive snacking and the habit of eating meals in front of the television, which influence children to choose high-calorie, low-nutrient foods through exposure to food advertisements (Caroli, Argentieri, Cardone, Masi, 2004; U.S. Department of Agriculture, 2009).

Studies have shown that parents having rules in the home regarding television watching are effective in decreasing sedentary behaviors, which creates more time for

children to be physically active and gives them less of an opportunity to consume unhealthy foods. For example, Hohepa et al. (2009) found that children who watch less television and are more physically active were more likely to have parents that provide at least one parental strategy such as setting television rules compared to children who watch more television and are less active. Furthermore, Carlson et al. (2010) found that when children recognized their parents had rules about screen time (e.g., watching television, on the computer or playing video games) they were less likely to exceed those limits. In addition, although Lee et al. (2010) found that parents setting limits on children's television viewing was not significant to children's physical activity, they found parents who set limits on children's TV viewing reported being extremely confident about influencing their child's free time physical activity and were more likely to report co-physical activity (parent and child exercise together).

Summary. Based on this body of literature, it is clear that parenting practices are directly associated with children's positive health behaviors. However, it is difficult to identify which parenting practices are most salient, given that none of the studies examined all of the parenting practices simultaneously. However, there were five different parenting practices (i.e., encouraging adolescents to eat healthy foods, eating family meals together, providing healthy foods, providing opportunities to prepare healthy foods together, and modeling healthy eating behaviors for adolescents) that were shown to be related to healthy eating, and that were discussed and supported by recent studies. Of these five practices, parents who ate meals with their children seemed to have the greatest impact. Similar to research related to

parenting styles, researchers used various topics related to healthy eating (e.g., fruit and vegetable consumption, dairy intake, and nutrient intake), making it difficult to draw conclusions about the findings. More research is needed on the different parenting practices related to healthy eating in order to identify which ones are most salient.

There were seven different parenting practices (i.e., encouraging adolescents to be physically active, praising them for engaging in physical activity, enrolling them in team sports, observing them while playing sports or exercising, modeling physical activity, exercising with them, and limiting sedentary behaviors) related to physical activity that were discussed and supported by recent studies. Of these seven practices, parental encouragement of physical activity seemed to be the most frequently studied. Similarly to the parenting practices related to healthy eating, more research is needed in order to identify which parenting practices most strongly predict children's physical activity levels.

In the next section, I will argue [based on the contextual model of Darling and Steinberg (1993)] why parenting style and parenting practices need to be studied in conjunction with each other. In particular, I will explain the moderating effect parenting style has on the relation between parenting practices and children's levels of healthy eating and physical activity.

How Do the Findings for Parenting Styles and Parenting Practices Compare?

In general, there were more studies investigating parenting practices than parenting styles. For parenting styles, nine studies examined healthy eating and three examined physical activity, whereas for parenting practices, there were ten studies for

healthy eating and 18 for physical activity, notably more than there were for parenting styles. All of the studies except for three examining the association between parenting styles and healthy eating and physical activity had significant findings (i.e., Cullen et al., 2001; Vereecken et al., 2009; Young et al., 2004). Similarly, many of the studies examining parenting practices had significant findings. Specifically, positive parenting practices were associated with increased levels of healthy eating and physical activity. However, the studies for parenting practices usually included more than one practice for which significant effects were observed and more than one practice for which no significant effects were observed.

Furthermore, the strength of the associations varied across the studies. Specifically, for parenting styles, positive weak to moderate associations were found for authoritative parenting and healthy eating, physical activity, and obesity (Kim et al., 2008; Kremers et al., 2003; Lohaus et al., 2009; Lytle et al., 2003). Longitudinally, the strength of the associations between authoritative parenting styles and healthy eating was attenuated (Berge et al., 2010; Lohaus et al., 2009; Mellin, Neumark-Sztainer, Story, Ireland, & Resnick, 2002). This also held true for physical activity (Lohaus et al., 2009; Schmitz et al., 2002). The associations between parenting practices and health-related behaviors were also weak to moderate; however, whether the associations were positively or negatively correlated depended on how the question was asked.

It is difficult to conclude whether parenting styles or parenting practices have a stronger association with children's positive health behaviors. Both parenting styles and parenting practices seem to yield similar findings. This might suggest that

positive parenting styles and parenting practices alone might contribute to a lesser degree than taking them both into account. Another possibility might reflect how researchers conceptually define parenting styles and practices and then operationalize those definitions. In general, the findings of these studies indicated that a positive parenting style (i.e., authoritative) and positive parenting practices (e.g., eating dinner with adolescents or watching them play sports) showed a positive association with children's healthy eating and physical activity behaviors.

Although a clear distinction exists between parenting styles and parenting practices, most researchers have studied these variables separately and assessed their direct relation with children's positive health behaviors. This is, however, counter to the suggestion of Darling and Steinberg (1993) that researchers not only make this distinction between parenting styles and parenting practices but also investigate it jointly to describe the influence of parents on their child's development. More specifically, instead of examining parenting styles and parenting practices separately, children's development in terms of positive health behaviors might be explained better by considering how parenting style moderates the relation between parenting practices and child behaviors and outcomes—that is, whether the strength of the association between parenting practices and child outcomes varies as a function of parenting style. Darling and Steinberg (1993) posited that parenting styles indirectly influences the development of children's habits regarding healthy eating and physical activity, indicating that parenting style is a contextual variable, while parenting practices are the mechanisms through which parents directly affect the development

of children's healthy eating and physical activity, with the effectiveness of this relation being dependent upon the contextual variable, parenting styles.

Few researchers have examined whether parenting style moderates the relationship between parenting practices and child outcomes (Steinberg et al., 1992). Even fewer researchers have examined parenting style as an environmental contextual factor that may influence the effectiveness of specific parenting practices related to healthy eating and physical activity (Kremers et al., 2003; Symonds, 1939; van der Horst et al., 2007). As described in the previous section, only two studies have tested this moderation effect for healthy eating, and not for physical activity. Therefore, one goal of the current study was to examine not only the direct effects of parenting practices on children's health behaviors, but also the moderating effects of the parenting environment. In the next two sub-sections, design and measurement issues are discussed, which are relevant for understanding the literature on parenting style and practices.

Design-Related Issues

Several design-related issues are important to consider when reading the literature on parenting and children's healthy eating and physical activity behaviors. These include the type of designs and samples used, moderating effects, and mediating effects. Most of the studies examining parenting styles and parenting practices were correlational in nature, meaning that no causal relationships can be inferred. Future longitudinal studies and experimental studies with control groups might shed light on inconsistencies in the associations found, helping researchers gain a deeper understanding of the associations between parenting and children's healthy

eating and physical activity behaviors. These designs could also inform the development of family-focused interventions that promote physical activity and healthy eating, and ultimately help to prevent adolescents from becoming overweight or obese.

In addition, there have been only a handful of studies examining parenting styles and positive health behaviors with a United States sample, and none discussing the relation between parenting styles and parenting practices as described in the Darling and Steinberg (1993) model. These studies need to be replicated with a United States sample to find out if they yield the same results. The United States has the highest rates of obesity compared to any other country in the world (Bassett, Pucher, Buehler, Thompson, & Crouter, 2008), suggesting the possibility that Americans might have different environmental and social factors influencing the unhealthy behaviors that lead to obesity, compared to other countries. One explanatory variable might be parenting. Furthermore, most studies examining the influence of parenting styles and practices on children's health behaviors have primarily included samples of White participants, limiting the ability to generalize about the findings. Studying different racial/ethnic groups might reveal cultural processes that alter children's interpretations and responses to parenting styles and practices.

By distinguishing between parenting styles and parenting practices, researchers will be able to identify the sources of the sociocultural differences in parenting. Understanding these sources will be especially useful in terms of health behaviors, because minority groups are less likely to make healthy food choices and

be physically active. In fact, overweight and obesity occur at higher rates in African American and Hispanic American populations when compared with White Americans (Ogden et al., 2008). Although obesity is a complex health issue and there are many factors contributing to it, parenting has been identified as an important factor (Ogden et al., 2008; Rhee, 2006). Research has shown that parental socialization goals do not vary dramatically by ethnicity with respect to academic achievement (Spera, 2005; Wentzel, 1998). However, this might not be the case with respect to health behaviors.

A few studies have examined the moderating effects of the gender of the child, the gender of the parent, and SES on the relation between parenting styles and positive adolescent health behaviors. Specifically, researchers examined how the gender of the child moderated the relationship between parenting style and healthy eating and physical activity. For example, researchers found that girls who have authoritative mothers had higher levels of physical activity, which was not the case for boys (Schmitz et al, 2002). In addition, differences in parenting could exist between mothers and fathers. For example, a mother might have an authoritative parenting style, while the father might have an authoritarian parenting style. Lytle et al. (2003) found that a maternal authoritative parenting style predicted fruit and vegetable consumption on the part of adolescents, while for fathers, a non-authoritative style predicted the same outcome. Findings regarding variations in the parenting styles of mothers and fathers, as well as regarding the impact of having two parents with different parenting styles, have been inconclusive (i.e., Baumrind, 1991a; Simons & Conger, 2007). However, most of the research assessing parenting styles examines adolescents' perspectives of mothers only, fathers only, or parents in

general (for example, researchers ask children about parents but do not specifically ask about mothers or fathers). If researchers ask only about parents in general, adolescents might describe the parenting of the dominant parent, which is usually the mother.

Moreover, none of these studies addressed the role that socioeconomic status (SES) and family demographics (such as the difference between a two-parent home and a one-parent home) play in terms of parenting style and positive health behaviors. Studies have shown that SES is a predictor of health-related behavior (Hupkens, Knibbe, & Drop, 2000). In particular, families living in areas of low SES are less likely to have or afford healthy food options and have safe areas in the neighborhood for adolescents to engage in physical activity, which might make a difference in their parenting styles. In addition, low SES and certain ethnic minority populations are associated with increased rates of obesity in adolescents (Institute of Medicine, 2004; Mei et al., 1998). Because parental attitudes toward child rearing are influenced by cultural norms and socio-cultural issues, parenting practices related to health might differ across ethnic groups (Trommsdorff, 2006).

Parenting styles also might vary for single parents. For example, some research has shown that single parent homes are more likely to have low control and low warmth (i.e., a neglectful parenting style) (Steinberg, 2001). This is usually due to the necessity of the parent working long hours to support the household. There is a need to test empirically whether these factors predict children's health outcomes. Understanding how race or family dynamics affect the association between parenting styles and children's health behaviors might inform the types of

strategies or programs that would be most beneficial for those groups. The characteristics of gender, single- versus two-parent households, and SES would be interesting moderating factors to investigate in future studies.

In addition, researchers have suggested that mediating factors need to be accounted for when examining the association between parenting practices and children's behaviors. In terms of mediation, self-efficacy seems to be a psychological construct impacting the association between parenting and adolescent health behaviors (Resnick et al., 1997), although few studies have accounted for adolescent psychological processes in studies of positive health behaviors (Trost et al., 2003; Young et al., 2004). By including mediators and moderators, researchers might find alternative explanations and pathways regarding parenting practices and positive health behaviors.

Although not all of these design issues can be resolved in a single study, the current study attempted to address several of them. For example, this was the first study to apply the model presented by Darling and Steinberg (1993) to understanding the relation between parenting and healthy eating and physical activity behaviors in children from the United States. This study also explored moderating and mediating effects. Specifically, this study examined whether the parental environment moderates the relation between parenting practices and children's health behaviors. Furthermore, there is evidence that nurturance by mothers and fathers differs (see, for example, Kim et al., 2008; Schmitz et al., 2002); as a result, the current study included nurturance for both mothers and fathers. As for mediating relations, to fully understand the child's role, this study examined the indirect relation between

parenting environment and practices and children's health behaviors via children's self-beliefs.

Measurement-Related Issues

Measurement issues existed for both parenting styles and practices, in terms of how they relate to healthy eating and physical activity. There is controversy regarding the most effective way to measure parenting style, because each of the various methods (observations of parent-child interactions, parental self-reports, children's reports, and so forth) has strengths and weaknesses (Brown, Mounts, Lamborn, & Steinberg, 1993). For example, a researcher observing interactions between parents and adolescents might be able to explain better the behaviors of parents and children and how the interaction of those behaviors affects the parent-adolescent relationship than would parent and child self-reports, although in addition to the practical issue of such an effort being more time-consuming, there are validity issues and potential biases of the observer that might become problematic. On the other hand, self-report measures capture more global and fewer transitory aspects of behavior. Thus, rather than selecting one method over another, it might be more beneficial to use multiple methods that are complementary to each other.

Although almost half of the studies reviewed used a form of the API to measure parenting style, there were inconsistencies in how the measure was used. For example, one researcher was unable to recreate the dimensions (i.e., responsiveness and demandingness) found by the developers of API and, therefore, used another dimension to assess parenting style. In addition, some of the studies assessed an authoritative or non-authoritarian parenting style, but did not examine the

other two parenting styles as they relate to healthy eating and physical activity. Furthermore, some of the studies in this review did not use validated measures or have high reliability for parenting styles. This supports the need to replicate previous studies using the same measures, including all four parenting styles, or to use the individual parenting dimensions as a way to measure the parent environment.

In addition, researchers have not clearly differentiated between parenting style and parenting practices. They have used dimensions of parenting (such as parental acceptance, parental behavioral control, and parental psychological autonomy or responsiveness and demandingness) to develop measures for parenting style (Baumrind, 1991a; Maccoby & Martin, 1983; Steinberg et al., 1989). In other words, there is a disconnect between the conceptual and operational definitions of these constructs. The general parenting dimensions—responsiveness (i.e., warmth, involvement, and acceptance) and demandingness (i.e. control and monitoring)—should be used to measure parenting style. These terms should be avoided when discussing specific parenting practices and behaviors. However, the same full scales used to measure parenting style, based on these dimensions, have been used again by other researchers and labeled as practices (see, for example, Avenevoli, Sessa, & Steinberg, 1999; Lohaus et al., 2009; van der Horst et al., 2007). Therefore, it is difficult to review the literature and determine whether measures are conceptually tapping parenting style or parenting practices without careful examination.

Furthermore, measures used to assess parenting practices and positive health behaviors are often inconsistent with regards to the types of practices assessed, how the questions are asked, and the rating scales used. When examining parenting

practices, researchers need to ensure that they are using domain-specific (i.e., healthy eating and physical activity) rather than global measures. A larger issue is that most of the parenting practice measures are single items. This poses a problem in terms of the validity and reliability of the measures. Researchers must develop a group of items that measure a similar construct of parenting practice as it relates to children's healthy eating and physical activity.

The current study addressed some of the measurement-related issues identified in this section. First, to address the issues related to the measurement of parenting styles, this study examined the parental environment within the context of an individual parenting dimension, parental nurturance. This supports the argument that some researchers have made regarding individual parenting dimensions (e.g., parental nurturance) having stronger associations with specific child outcomes than a combination of the dimensions (i.e., authoritative parenting style) (Barber, 1997). Furthermore, this study clearly defined and operationalized parenting environment and parenting practices as being two different constructs. That is, parenting practices are clearly domain-specific (in this case, related specifically to healthy eating and physical activity), whereas the parent environment is a global measure of the parenting climate. In addition, this study drew on the work of Wentzel (1994), discussing parenting practices in terms of the provision of structure and the provision of opportunities as a way to organize the practices. In the next section, a parallel discussion is provided as to how the school environment and school practices affect children's healthy eating and physical activity behaviors.

School Influences

Schools are another context in which children's health behaviors can be affected. In this section, research related to school influences in terms of children's healthy eating and physical activity behaviors are examined. Similarly to the parent influences section, research pertaining to the school environment and to children's levels of healthy eating and physical activity are discussed, followed by an examination of the research on school practices. This section concludes with a discussion of the design and measurement related issues.

School Environment (School Climate)

School climate has been both directly and indirectly related to health risk behaviors, including smoking, drinking, drug use, truancy, fighting, and weapons carrying (Catalano et al., 2004; Kuperminc, Leadbeater, Emmons, & Blatt, 1997; Roeser & Eccles, 1998; Roeser, Eccles, & Sameroff, 2000), as well as to mental health problems including symptoms of depression, anxiety, and suicidality (Kuperminc et al., 1997; Kuperminc, Leadbetter, & Blatt, 2001; Roeser & Eccles, 1998; Roeser et al., 2000). Very few researchers, however, have explicitly examined the associations between the various aspects of school climate (such as the sense of belonging a school fosters, safety, discipline, and social interactions) and children's healthy eating and physical activity behaviors.

Only one study indicated that school climate is positively related to student participation in physical activities. For example, Birnbaum, Story, Perry, and Murray (2005) found an association between school climate (as measured by the level of support provided by teachers) and girls' levels of physical activity. However, there

were no associations found between peer support and girls' levels of physical activity. In contrast, Hohepa, Schofield, and Kolt (2006) conducted focus groups with high school students to explore their views regarding physical activity, finding that students identified a lack of peer support as one reason for not being physically active. No studies were found examining healthy eating and aspects of the school environment.

School Practices

Healthy People 2020 set several objectives that are focused on school-specific practices (U.S. Department of Health and Human Services, 2010b). These practices include the offering of nutritious foods and beverages outside of school meals, requiring schools to make fruits and vegetables available whenever other food is offered or sold, to provide daily physical education, to provide a minimum of 60 minutes of physical activity daily, and to mandate regularly scheduled elementary school recess. Table 3 displays articles discussing and demonstrating the association between various school practices and children's health behaviors. Of these articles, 27 discussed healthy eating, and 16 addressed physical activity; some articles addressed both. In terms of healthy eating, 14 studies examined elementary schools, six examined middle schools, three examined high schools, and five examined multiple grade levels. In terms of physical activity, 10 studies examined elementary schools, two examined middle schools, one examined high schools, and one examined multiple grade levels. Two studies provided ages, rather than grade levels.

Table 4:

School Practices and Healthy Eating and Physical Activity

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Healthy Eating					
Baranowski et al., (2000)	N=1172	- Elementary school - 4 th and 5 th	84% Euro-American and 15% African American	Delivered nutrition education through extracurricular sessions	Children who received the program had higher levels of fruit and vegetable consumption, but findings had small effects.
Birnbaum et al., (2002)	N=3503	- Middle school - 7 th and 8 th	68.7% Euro-American, 10.4% African American, 6.9% Asian or Pacific Islander, 5.6% multiracial, and 8.5% other	Delivered nutrition education program through existing curriculum	No significant findings.
Breifel et al., (2009)	N=2,314	- All school levels - 1 st through 12 th	54% non-Hispanic Euro-American, 22% Hispanic, 17% non-Hispanic African American, and 7% other	Provided access to school foods and beverages	Elementary school lunch participants were significantly more likely than nonparticipants to consume healthier options.
Condon et al., (2009)	N=2,314	- All school levels - 1 st through 12 th	54% non-Hispanic Euro-American, 22% Hispanic, 17% non-Hispanic African American, and 7% other	Provided program that offered healthy school breakfasts and lunches	School lunch and breakfast participants were significantly more likely than nonparticipants to consume foods in the four food groups.

Continued on next page

Table 4 (continued): *School Practices and Healthy Eating and Physical Activity*

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Cullen et al., (2000)	N=594	- Elementary school - 4 th and 5 th	50% Euro-American, 15% African American, 25% Mexican American, and 10% Asian	Offered competitive foods (a la carte and snack food bars)	Fifth graders who ate from the snack bar ate less fruits and vegetables than children who ate school lunches.
Cullen & Zakeri, (2004)	N=594	- Elementary school - 4 th and 5 th	50% Euro-American, 15% African American, 25% Mexican American, and 10% Asian	Offered competitive foods (a la carte and snack food bars)	The fourth-grade cohort consumed fewer fruits, regular vegetables, and less milk and consumed more sweetened beverages and high-fat vegetables during year 2.
Dollahite et al., (1998)	N=548	- Elementary school - K through 5 th	19% Euro-American, 76% African American, 5% Hispanic	Delivered enhanced nutrition education and modified school lunch program	Program participants in 4 th and 5 th grade had improved knowledge, behavioral intent, and behaviors, and 2 nd and 3 rd graders had improved knowledge.
Donnelly et al., (2009)	N=110	- Elementary school - 3 rd through 5 th	94% Euro-American	Delivered enhanced nutrition education and modified school lunch program	Program participants had less sodium intake than control at year 2. No other findings were significant.
Dunton et al., (2009)	N=668	- Middle school - 7 th and 8 th	N/A	Delivered enhanced nutrition education program	Program participant's diary intake increased and their intake of sugars/sweets decreased.

Continued on next page

Table 4 (continued): *School Practices and Healthy Eating and Physical Activity*

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Farty et al., (1996)	N=346	- High school - 9 th through 12 th	3% Euro-American, 47% African- American, 9% Asian-American, 21% Hispanic, and 19% other	Delivered nutrition education through extracurricular sessions	Program participants had improved dietary habits.
Foerster et al., (1998)	N=151	- Elementary school - 4 th and 5 th	N/A	Delivered nutrition education program through existing curriculum	Program participants had increased fruit and vegetable intake.
Gemmill et al., (2005)	N=10 schools districts in Delaware	- All school levels - K through 12 th	N/A	Availability of vending machines	Food and drink items sold in school vending machines are of minimal nutritional value.
Gordon & Fox, (2007)	N=287 schools	- All school levels - K through 12 th	N/A	Offered USDA's National school lunch program and school breakfast program	Compared to lunches of nonparticipants, the average lunches consumed by participants at all school levels had significantly better nutrient intake. Few significant differences in mean breakfast intakes were found for elementary and high school participants and nonparticipants.
Gortmaker et al., (1999a)	N=2103	- Elementary school - 5 th	91% African American	Delivered nutrition education program through existing curriculum and provided incentives	Program participants had increased fruit and vegetable intake.
Gortmaker et al., (1999b)	N=1295	- Middle school - 6 th through 8 th	Ethnically diverse	Delivered nutrition education program through existing curriculum and opportunities for skill building	Program participants had increased fruit and vegetable intake.

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Table 4 (continued): *School Practices and Healthy Eating and Physical Activity*

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Grainger et al., (2007)	N=varied for program years (ranged from 480- 566)	- High school	Mostly Euro- American	Offered USDA's National school lunch program and school breakfast program	The new lunch program was associated with an improvement in the nutritional quality of students' food choices.
Hopper et al., (1996)	N=97	- Elementary school - 2 nd and 4 th	N/A	Delivered enhanced nutrition education program	Program participants had increased nutrition knowledge among children.
Johnston et al., (2007)	N=37,543	- Middle and high school - 8 th , 10 th , and 12 th	N/A	Offered soft drinks and contract advertising and sales	Most high school students had soft drinks available to them in the school environment both through vending machines and in the cafeteria at lunch, with middle schools providing somewhat less access.
Kubik et al., (2003)	N=598	- Middle school - 7 th	N/A	Availability of vending machines and à la carte programs	À la carte availability was inversely associated with fruit and fruit/vegetable consumption and positively associated with total and saturated fat intake. Snack vending machines were negatively correlated with fruit consumption.
Leupker et al., (1996)	N=5106	- Elementary school - 3 rd through 5 th	Ethnically diverse	Delivered enhanced nutrition education and modified school lunch program	Intake from fat among students in the intervention schools was significantly reduced compared with that among students in the control schools. With school lunches, the percentage of energy intake from fat fell significantly more than in control lunches.

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Table 4 (continued): *School Practices and Healthy Eating and Physical Activity*

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Lytle et al., (2004)	N=3503 (7 th) and 3010 (8 th)	- Middle school - 7 th and 8 th	68.4% Euro-American, 8.4% African-American, 8.4% Asian-American, 3.1% Hispanic, 1.5% Native American, 5.1% multiracial and 5.3% other	Delivered enhanced nutrition education program	The positive effects of the intervention were not seen for the primary outcomes at the end of the 2nd year. Positive effects were seen only for a food choice score.
Lytle et al., (2006)	N=3600	- Middle school	N/A	Delivered enhanced nutrition education program	Compared to control schools, intervention schools offered and sold a higher proportion of healthier foods on a la carte, but no effects were seen for fruit and vegetables sales as part of the regular meal pattern lunch.
Nicklas et al., (1998)	N=2,213	- High school - 9 th through 12 th	84% Euro-American	Delivered enhanced nutrition education program	Program participants had increased fruit and vegetable intake.
Parmer et al., (2009)	N=115	- Elementary school - 2 nd	N/A	Offered school garden for additional nutritional education	The nutrition education and garden group was more likely to choose and consume vegetables in a lunchroom setting at post-assessment than either the nutrition education only or control groups.
Perry et al., (1998)	N=536	- Elementary school - 4 th	48.0% Euro-American, 25.2% Asian American, 1.3% Native American, 6.4% Hispanic, and 19.1% African American	Delivered nutrition education program through existing curriculum and opportunities for skill building	Program participants had increased fruit and vegetable intake.

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Table 4 (continued): *School Practices and Healthy Eating and Physical Activity*

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Perry et al., (2004)	N =1668	- Elementary school - 1 st and 3 rd	N/A	Delivered modified school lunch program	Program participants had increased their total fruit intake.
Reynolds et al., (2000)	N=1,698	- Elementary school	83% Euro-American, 16% African-American, and 1% other	Delivered nutrition education program through existing curriculum	Program participants had increased fruit and vegetable intake.
Physical Activity					
Boyle-Holmes et al., (2010)	N=1,195	- Elementary school - 4 th and 5 th	71.6% Euro-American, 13.5% African American, 6.2% American Indian, 5.4% Multiracial, and 3.3% other	Delivered enhanced physical education program	Program participants showed significantly stronger results in motor skills but not fitness outcomes.
Donnelly et al., (2009)	N=110	- Elementary school - 3 rd through 5 th	94% Euro-American	Delivered enhanced physical education program	Physical activity in the classroom was greater for children in the intervention group compared to the control group, but physical activity outside of school was less for the intervention group compared to the control group.
Dunton et al., (2009)	N=668	- Middle school - 7 th and 8 th	N/A	Delivered enhanced physical education program	Program participants showed an increase in total physical activity and a decrease in watching TV/DVDs and playing electronic game/computer use.

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Table 4 (continued): *School Practices and Healthy Eating and Physical Activity*

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Ewart et al., (1998)	N=88	- High school - 9 th grade	N/A	Delivered enhanced physical education program	Girls participating in the aerobic exercise group exhibited improvements in aerobic fitness compared with girls in standard physical education classes.
Gordon-Larson et al., (2000)	N=17,766	- Middle and high school	53% Euro-American, 22% non-Hispanic African American, 18% Hispanic, and 8% Asian	Provided opportunities to engage in physical activity at school	Participation in daily school physical education program classes and use of a community recreation center were associated with an increased likelihood of engaging in high level moderate to vigorous physical activity.
Gortmaker et al., (1999a)	N= 2103	- Elementary school - 5 th	91% African American	Delivered physical education program through existing curriculum	Program participants showed a marginal reduction in television viewing but no significant findings for physical activity.
Gortmaker et al., (1999b)	N=1295	- Middle school - 6 th through 8 th	Ethnically diverse	Delivered physical education program through existing curriculum	The intervention reduced television hours among both girls and boys but no significant findings for physical activity.
Harrell et al., (1999)	N=422	- Elementary school	N/A	Delivered enhanced physical education program	There was an increase in physical activity among risk-based group and post-test knowledge in the classroom-based groups were significantly higher than the control group.
Hopper et al., (1996)	N=97	- Elementary school - 2 nd and 4 th	N/A	Delivered enhanced physical education program	Program participants were associated with increased fitness knowledge.

Continued on next page

Table 4 (continued): *School Practices and Healthy Eating and Physical Activity*

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Luepker et al., (1996)	N=5106	- Elementary school - 3 rd	Ethnically diverse	Delivered enhanced physical education program	The intensity of physical activity in physical education classes during the program increased significantly in the intervention schools compared with the control schools.
McKenzie et al., (1996)	N=11,173	- Elementary school - 3 rd	N/A	Delivered enhanced physical education program	Program participants engaged in more moderate-to-vigorous physical activity than in control schools and reported 12 more minutes of daily vigorous physical activity.
Sallis, (1997)	N=955	- Elementary school - 4 th and 5 th	N/A	Delivered enhanced physical education program	Students in the program were more physically active in physical education classes than students in the control group. There were no differences for physical activity outside of school.
Ridgers et al., (2007)	N=228	- 7-9 year olds	England	Provided school recess	Boys engaged in more moderate, high, and very high intensity activity than girls during recess.
Verstraete et al., (2006)	N=122	- ~10-11 year olds	Belgium	Availability of school fitness equipment	Children's moderate and vigorous physical activity significantly increased in the intervention group, while it decreased in the control group. Providing game equipment was effective in increasing children's moderate physical activity, while it decreased in the control group.

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Table 4 (continued): *School Practices and Healthy Eating and Physical Activity*

Citation	Sample	School Level, Grade, and/or Age	Race	School Practice	Findings
Verstraete et al., (2007)	N=764	- ~11 year olds	Belgium	Delivered enhanced physical education program	The moderate-to-vigorous physical activity engagement during physical education classes was significantly higher in the intervention condition than in the control condition.
Zack et al., (2001)	N=3,912	- Elementary school - K through 6 th	Australian	Provided school recess	Levels of engagement in physical activity were significantly higher during lunch periods than during recess. Physical activity engagement in smaller schools was significantly higher than in larger schools.

Healthy eating. Schools provide information on healthy eating through health education classes, integrated sessions in regular classes, and special programs. The 2006 School Health Policies and Program Study (SHPPS) found that 70% of states required that the topics of nutrition and dietary behavior be taught at the elementary, middle, and high school levels as a component of the health education curriculum (Kann, Telljohann, & Wooley, 2007). Comprehensive nutrition education refers to planned, sequential, instructional programs that provide knowledge and teach the skills necessary to help students adopt and maintain lifelong healthy eating patterns (Lohrmann & Wooley, 1998). This curriculum should begin in preschool and continue through secondary school.

Several studies have examined the ways in which nutritional education programs in schools affect children's healthy eating behaviors, such as their levels of fruit and vegetable consumption (see, for example, Dollahite, Hosig, White, Rodibaugh, & Holmes, 1998; Donnelly et al., 2009; Dunton, Lagloire, & Robertson, 2009; Fardy, White, & Haltiwanger-Schmitz, 1996; Foerster et al., 1998; Gortmaker, Cheung, Peterson, Chomitz, & Cradle, 1999a; Gortmaker, Peterson, Wiecha, Sobol, & Dixit, 1999b; Hopper, Munoz, Gruber, & MacConnie, 1996; Luepker, Perry, & McKinlay, 1996; Perry et al., 1998; Perry et al., 2004; Reynolds, Franklin, Binkley, Raczynski, & Harrington, 2000). For example, one study demonstrated that a 12-session school nutrition program positively influenced fourth and fifth graders in terms of fruit and vegetable consumption (Baranowski et al., 2000). Another program demonstrated that the provision of a behavioral curriculum (including skill-

building and problem-solving activities, snack preparation, taste testing, and stories) was associated with increased fruit consumption, both at lunchtime and throughout the day (Perry et al., 1998). However, this association was found only for girls, not for boys.

Similarly for middle school students, following the implementation of a two-year school-based program that integrated health sessions within existing curricula in core subject areas, Gotmaker et al. (1999b) found increased fruit and vegetable consumption in students who participated in the program. In addition, Nicklas et al. (1998) found that high schools that participated in a school-health program that provided classroom workshops and appealing messages about healthy eating had students who consumed more fruits and vegetables than students at the control schools. In contrast, studies such as Birnbaum et al. (2002) found no association whatsoever between eating habits and such programs. The differences in the findings might be explained by the particular delivery methods or educational materials used by the various programs.

In addition, children's eating patterns have been found to be more likely to improve when changes in the school environment are integrated with classroom nutrition education (Lytle et al., 2004). For example, researchers found that school gardens as a component of nutrition education can result in increased fruit and vegetable knowledge and behavioral changes among children (Parmer, Salisbury-Glennon, Shannon, & Struempfer, 2009). However, few studies have explored the additional benefits of farm-to-school and school garden education programs and their association with children's levels of physical activity and healthy eating.

Besides providing education to children regarding healthy eating, schools provide opportunities for students to purchase both healthy and unhealthy foods. For example, schools participating in the national school breakfast and lunch programs are required to adhere to the U.S. Department of Agriculture (USDA) Dietary Guidelines for Americans, and must provide more nutritious foods to students than nonparticipating schools. In a recent national study, researchers found that most schools offered meals that met the majority of the recommendations of the Dietary Guidelines for Americans 2005; however, many schools did not meet the recommendations for sodium and fiber (Crepinsek, Gordon, McKinney, Condon, & Wilson, 2009). In addition, researchers found that school lunch program participants in elementary and secondary schools consumed fewer sugar-sweetened beverages at school compared to nonparticipants, but in the secondary schools consumed a greater quantity of foods higher in fat, such as french fries and baked goods (Briefel, Crepinsek, Cabili, Wilson, & Gleason, 2009). Another study found that school breakfast participants were more likely than nonparticipants to consume milk and fruit and less likely to consume beverages other than milk or 100% fruit juice (Condon, Crepinsek, & Fox, 2009). This study also revealed that school lunch participants were more likely than nonparticipants were to consume milk, fruit, and vegetables, and less likely to consume desserts, snack items, and beverages other than milk or 100% juice (Condon et al., 2009).

Furthermore, Perry et al. (2004) examined whether a cafeteria-based intervention consisting of daily activities intended to increase the availability, attractiveness, and encouragement of fruits and vegetables would increase student

consumption of these foods. The researchers found that students in the intervention schools significantly increased their total fruit intake. Another study that examined the effects of enhancing the lunch program through the provision of healthier options (such as trans-fat-free foods, foods high in fiber with low levels of sugars (including high-fructose corn syrup), organic whole-grain cookies, 100% juice drinks, and freshly made salads and sandwiches) found that such enhancements were associated with an improvement in the nutritional quality of students' food choices (Grainger, Senauer, & Runge, 2007). The study also found that girls tended to purchase relatively healthier foods than did boys, but that boys made greater improvements overall in terms of food choices.

Although schools are making efforts to provide healthy meals that meet the USDA requirements, the availability of foods competing with school meals is increasing (U.S. General Accounting Office, 2003). Such foods are often sold during mealtimes in or around school cafeterias and in vending machines or school stores. Federal nutritional guidelines apply to school foods provided through the national school lunch and breakfast programs, but few federal regulations apply to additional foods and drinks sold on school grounds. These foods are termed *competitive foods*, and are often high in calories, fat, and sugar (Center for Science in the Public Interest, 2004; Gross & Cinelli, 2004). Gemmill and Cotugna (2005), for example, found that the most commonly sold food and drink items in school vending machines were of minimal nutritional value. Additionally, children attending schools where competitive foods are sold consume fewer fruits and vegetables than do children

attending schools where competitive foods are not sold (Cullen, Eagan, Baranowski, Owens, & deMoor, 2000b).

In 2004, Congress passed legislation requiring all school districts to develop a Wellness Policy, a component of which consists of nutritional guidelines for competitive foods. However, both the 2006 School Health Policies and Programs Study (SHPPS) and the third School Nutrition and Dietary Assessment study found that schools' current offerings do not fully support healthy eating for children and adolescents (Gordon & Fox, 2007; O'Toole, Anderson, Miller, & Guthrie, 2007). For example, Kubik et al. (2003) found school à la carte availability to be inversely correlated with daily fruit and vegetable consumption and positively correlated with daily total fat and saturated fat intake.

In addition, Cullen and Zakeri (2004) examined middle school students who, upon gaining access to on-campus snack bars, consumed fewer healthy foods compared with the previous school year, when they were still in elementary schools and only had access to the lunch meals served at school. The fourth-grade cohort consumed fewer fruits, vegetables that were not fried, and less milk, while consuming increased quantities of sweetened beverages and high-fat vegetables during year 2. In general, the presence of these competitive foods appears to negatively impact the eating habits of children and adolescents. Interestingly, a national study found that national school lunch program participants consumed fewer competitive foods (Gordon & Fox, 2007).

Of significant importance in terms of the influence of competitive foods are the service operations and contracts that schools have with certain companies

allowing them to sell foods on-campus. Schools are able to enter contracts with food and beverage companies, with school administrators being most frequently in charge of negotiating such vending contracts (Gemmell & Cotugna, 2005). Based on a study of the largest school districts in the United States, Greves and Rivara (2006) found that 41% of school districts sold branded fast foods (such as Pizza Hut, Taco Bell, McDonald's) as part of the school lunch program, without any requirement that such foods meet the USDA requirements. In addition, 29% of school districts had exclusive contracts with a beverage vendor (Greves & Rivara, 2006). Few studies have examined the associations between such contracts and children's eating behaviors. Briefel et al. (2009), however, found that children attending middle schools without pouring rights contracts consumed fewer calories from sweetened beverages obtained at school than children who attended schools that had such contracts. The results of another study revealed that students from lower-socioeconomic backgrounds were more likely to attend schools that allowed soft drink companies to advertise to students and to sponsor middle school events (Johnston, Delvaux, & O'Malley, 2007).

Physical activity. Similarly to healthy eating, several studies have shown that instruction and education regarding physical activity are positively related to children's levels of physical activity (i.e., Dunton et al., 2009; Ewart, Young, & Hagberg, 1998; Gordon-Larsen et al., 2000; Gortmaker et al., 1999b; Harwell & LeBeau, 2010; Hopper et al., 1996). Standard physical activity guidelines recommend that children engage in 60 minutes per day of moderate-to-vigorous physical activity (that is to say, activities that cause increased heart rate and heavy

breathing some of the time) (National Association for Sport and Physical Education (NASPE) and American Heart Association (AHA), 2006; U.S. Department of Health and Human Services, 2008). Schools are ideal places for children and adolescents to meet that guideline. For example, Dunton et al. (2009) found that after a physical activity program for middle school students was implemented, the number of days on which children were physically active for at least 60 minutes increased, and the number of hours they were engaged in sedentary behaviors decreased. Similarly, Gotmaker et al. (1999a, 1999b) found that student participation in two different school-based interventions, which included several health sessions integrated into existing physical education and other classes, decreased their overall levels of sedentary behaviors but found no significant findings for physical activity. This discrepancy in findings might be due to the fact that the studies used different programs and grade levels.

It is clear that the physical education provided by schools provides opportunities for students to be physically active. In addition, studies have shown that physical education is associated with increased levels of physical activity (Boyle-Holmes et al., 2010; Gordon-Larsen et al., 2000; Verstraete, Cardon, De Clercq, & De Bourdeaudhuij, 2007). For example, Gordon-Larsen et al. (2000) found that student participation in daily physical education classes at school was associated with an increased likelihood of engaging in moderate to vigorous physical activity. Another study indicated that school-based physical education led by qualified instructors teaching movement skills and the enjoyment of physical activity resulted in higher levels of physical activity among students attending such schools (Sallis et al., 1997).

Furthermore, a recent study conducted by Boyle-Holmes et al. (2010) showed that an Exemplary Physical Education Curriculum (EPEC) was more effective than a standard physical education curricula at improving motor skill performance (in fourth- and fifth grade cohorts) and at increasing self-reported motor skill-specific self-efficacy and physical activity (in a fourth grade cohort). EPEC is a physical education curriculum focused on developing the knowledge, attitudes, skills, and behaviors associated with lifelong physical activity through education and motor skills learning progressions. Two additional studies used an enhanced physical education program with third graders at different schools; both studies indicated that elementary schools participating in the innovative program had students that engaged in more frequent physical activity than students from the schools without the program (Luepker et al., 1996; McKenzie, Marshall, Sallis, & Conway, 1996). These studies suggest that the quality and type of activities are important and have an effect on children's levels of physical activity.

Another factor to consider is the number of minutes children spend in physical education class. Several national organizations, including the National Association for Sport and Physical Education, recommend that elementary schools provide at least 150 minutes of physical education per week and that secondary schools provide at least 225 minutes per week. Unfortunately, few states require a set number of minutes to be spent in physical education classes for elementary schools, and even fewer do so for secondary schools (National Association for Sport and Physical Education, 2004). One study found that children participating in an elementary physical education program promoting 90 minutes per week of moderate to vigorous

physical activity had significantly higher levels of physical activity during the school day and on weekends, and also exhibited higher levels of physical activity on weekdays compared to children in control schools (Donnelly et al., 2009). The results further indicated that children in the intervention schools had greater levels of physical activity over three years when compared to children in control schools.

School recess also provides opportunities for children to be physically active during the school day. Currently, there are no physical activity guidelines for recess. There is limited research focused on understanding the association between children's activity levels during recess and their overall levels of physical activity. However, researchers have found that boys engage in more physical activity during recess than girls (Ridgers, Stratton, & Fairclough, 2005; Zask, van Beurden, Barnett, Brooks, & Dietrich, 2001), and that students attending smaller sized schools have higher levels of physical activity during recess than students at larger sized schools (Zask et al., 2001). In addition, studies have shown that the availability of sporting equipment to students was associated with increased levels of physical activity (Griew, Page, Thomas, Hillsdon, & Cooper, 2010; Ridgers et al., 2005; Verstraete, Cardon, De Clercq, & De Bourdeaudhuij, 2006).

Finally, schools implementing school-based body mass index (BMI) screening have found it to be a useful vehicle for engaging children and families in discussions of information pertaining to healthy lifestyles and management of weight problems (Institute of Medicine, 2004; Nihiser et al., 2007). In addition, students who are aware of their own BMI and what it means are often motivated to adopt or maintain healthy behaviors, such as healthy eating and increased physical activity. BMI

screening refers to the measurement of height and weight to determine if a person is overweight or obese. It is calculated by dividing a person's weight in kilograms by the square of a person's height in meters (weight (kg)/height (meters)²) (Institute of Medicine, 2004; Ogden et al., 2008). There is limited research explaining the relation between BMI screening and children's health behaviors.

Summary. Researchers have not demonstrated a connection between school environment and children's healthy behaviors. However, studies have provided evidence that school practices are directly related to these health behaviors. Although it seems that there were more studies implemented for school practices than for parenting practices, most of the studies were of school interventions that mostly focused on the provision of structure. Overall, more research is needed to fully understand the contributions school influences have on children's health behaviors at various grade levels.

In addition, researchers have not applied Darling and Steinberg's (1993) model to a school context. Therefore, the current study applied a modified version of Darling and Steinberg's model to a school setting and explored whether there is a similar relation between the school environment and practices on children's health behaviors as was discussed for parenting. By so doing, a more in-depth explanation of how the school environment and practices affect children's health behaviors might result. In the following two sub-sections, design and measurement issues are discussed that are relevant for understanding the literature on parenting styles and practices.

Design-Related Issues

Unlike research conducted on the connection between parenting and healthy behaviors, little is known about the association between school environment and children's healthy eating and physical activity behaviors. However, because other research has shown correlations between various aspects of school environment, such as school belongingness and health-risk behaviors, positive health behaviors should also be examined.

Most of the studies examining nutritional education and physical activity as promoted through classroom curricula or sessions were part of larger interventions with several components. As a result, it was often difficult to discern whether the information children received from programs or school staff actually made differences in their health behaviors or if the effects were cumulative. Future studies should consider means by which to individually evaluate the various components of the programs and interventions, clarifying which aspects of the program are positively affecting the health behaviors of the children.

The majority of the studies in this review have examined students at elementary schools. As a result, it is unclear which practices are most salient for the various school levels (elementary, middle, and high school) and grade levels (K through 5th grade). Middle and high school students are generally more independent, and, as demonstrated through a study on middle school students by Cullen and Zakeri (2004), when given the opportunity to select their own foods, they tend to make unhealthy choices. This is consistent with the evidence that as children increase in age, they are more likely to exercise less and to eat unhealthy foods more frequently

(Larson et al., 2007). Because of this, researchers should examine the health behaviors of children over transition periods, thereby determining which practices are most effective across various grade and school levels. This would assist schools in the implementation of policies and practices that are capable of making significant differences and positive changes.

Another issue of concern is the lack of understanding and implementation of these school practices in terms of the various contexts of inner city, suburban, and rural areas. For example, studies have shown that opportunities to use school facilities for physical activity are lower in the schools that most need them: urban, high-minority, and high-enrollment schools (Fernandes & Sturm, 2010). Similarly, school composition (such as the percentage of students from families of low socioeconomic position or ethnic minorities) has been shown to vary between schools; consequently, it is important to understand how these characteristics affect the environment and practices within schools. Only a few studies in this review have explored how school practices varied in relation to racial composition and SES of schools. For example, Fernandes and Sturm (2010) found that children from disadvantaged backgrounds were more likely to attend schools with inferior gymnasiums and poorer playground availability.

While only limited studies have examined the moderating effects of gender, race, and SES, there have been no studies attempting to examine how the school environment impacts the association between school practices and children's health behaviors. This is one of the main assumptions underlying Darling and Steinberg's model, and has not yet been explored in schools. Furthermore, in terms of mediation,

these studies do not take into account how school practices affect the individual children attending the schools. Few studies have examined whether these school programs contribute indirectly to children's health behaviors (Dishman et al., 2004). Children's knowledge and self-beliefs might be affected by the information and opportunities schools provide to them, which, in turn, affects their health behaviors. By including mediators and moderators, researchers might find alternative explanations and pathways between school environments and practices as they relate to children's positive health behaviors.

The current study addressed some of these design-related issues. For example, the current study examined the association between the school environment and children's healthy eating and physical activity behaviors. In addition, moderating and mediating relations in schools were also examined. More specifically, this study investigated whether the relation between specific practices and children's health behaviors varies depending on the school environment, as assessed by school belongingness. Finally, to understand the child's role, the indirect relation between school practices and children's health behaviors were examined via children's self-beliefs.

Measurement-Related Issues

Similarly to the issues encountered in effectively measuring parenting style, school environment measurement is complex. With regard to parenting style measurement, researchers can either use individual parenting dimensions (such as nurturance or control) or parenting style, which is a combination of these dimensions. Researchers have argued for both approaches. Similarly for the school climate

measure, researchers must decide whether to use individual dimensions of school climate, such as school belongingness, or a general school climate measure, which includes all dimensions (such as school belongingness, order and discipline, and peer relationships). Regardless of the approach, however, the decision for one over the other should be grounded in theory, and the school climate measure should be conceptually and operationally lucid.

In addition, most of the studies included in this review addressed only a single practice. Although it would be challenging for researchers to study all of them at once, it might be appropriate for researchers to evaluate school practices related to healthy eating in one study and practices for physical activity in another study. Along the same lines, it might be useful to group school practices into overarching practices. For example, an overarching practice for schools that offer healthy foods outside of school meals or provide daily physical education might be considered the provision of opportunities. This would provide researchers with the ability to understand ways in which individual practices uniquely, as well as collectively, contribute to children's health behaviors. Furthermore, it is possible for school staff to respond to survey questions in a way that would indicate a misunderstanding of what the researchers were asking, especially if the staff member is not familiar with the elements of physical activity and healthy eating practices at the school. Because of this, the measures used should be pilot tested for cognitive understanding, so that the researchers are assured that participants understand the questions that are being asked and that their findings are therefore valid and reliable.

The current study also addressed some of these measurement-related issues. First, the school environment was assessed using an individual school dimension, school belongingness. Therefore, the parent and school environment measured a congruent construct. In addition, this study examined several school practices related to both healthy eating and physical activity. Similarly to parenting practices, school practices were discussed in terms of the provision of structure and the provision of opportunities for healthy eating and physical activity. Finally, the measures used were pilot tested, so that the researchers were assured that participants understood the questions being asked. The following section provides a brief overview of the literature pertaining to children's self-beliefs and their healthy eating and physical activity behaviors.

Children's Self-Beliefs and Healthy Eating and Physical Activity Behaviors

While researchers have made connections between the environments and practices provided by parents and schools and children's health behaviors, they have not made these connections in relation to the individual child. Darling and Steinberg's (1993) model did not place an emphasis on the individual child, except in terms of whether the child was open to being socialized by parents. The focus was related more to the temperament of the child rather than to their individual self-beliefs, such as self-efficacy or self-worth. Therefore, the missing process in Darling and Steinberg's model has to do with the ways in which children's self-beliefs are affected by parent and school characteristics and how these self-beliefs then affect children's health behaviors. As suggested by the process-person-context framework presented by Bronfenbrenner (1989), the person plays an important role in affecting

his or her context. Including the *person* variable in Darling and Steinberg's model, in this case children's self-beliefs, will strengthen and build upon existing research.

Parent and school environments and practices can influence children's beliefs about the likely outcomes of physical activity and healthy eating, as well as the value that children place on these outcomes (Norman et al., 2005). In particular, aspects of Bandura's Social Cognitive Theory demonstrate that these multiple environments can support the healthy development of children's healthy eating and physical activity behaviors (Bandura, 1986). These aspects include the provision by parents and schools to children of the knowledge and skills necessary to be able to perform an activity or choose a healthy food option. They also provide encouragement, opportunities, and reinforcement of healthy eating and physical activity behaviors. Lastly, parents and schools can help children value healthy eating and physical activity and to understand the importance of these behaviors.

Furthermore, the environment that parents and schools create and the information and opportunities they provide to children affect their levels of perceived competence, ability, and self-worth. More specifically, the information children receive from their parents and schools needs to be processed internally, and how it is processed determines what behaviors they engage in (Zimmerman & Cleary, 2006). Therefore, the process through which both parents and schools affect children's health behaviors might be explained by children's beliefs about their abilities, self-regulation, and perceptions of control over their health outcomes (Bandura, 1986, 1989). Self-regulation is an internal control mechanism that decides which behavior will be performed, and self-efficacy (a person's confidence in learning and/or

performing specific tasks) is a major determinant of self-regulation (Bandura, 1986, 1997). In addition, children's self-worth (their overall sense of worth and value) is related to their efficacy and self-regulation processes (Harter, 1983). That is, children with higher levels of self-worth are more likely to have higher self-efficacy and the ability to self-regulate.

There have been limited studies examining the relation between children's self-beliefs and their healthy eating and physical activity behaviors. The studies that have examined these relations have been inconsistent. For example, there have been various types of self-beliefs used in these studies, including self-efficacy (Annesi, 2006; Dishman et al., 2004; Dishman, Saunders, Motl, Dowda, & Pate, 2009; Domel et al., 1996; Motl et al., 2005; Resnicow et al., 1997; Reynolds, Hinton, Shewchuk, & Hickey, 1999), self-regulation (Dombrowski & Luszczynska, 2009; Kalavana, Maes, & De Gucht, 2010; Pelletier, Dion, Slovinec-D'Angelo, & Reid, 2004; Riggs, Sakuma, & Pentz, 2007; Wills, Isasi, Mendoza, & Ainette, 2007), and self-esteem/self-worth (Annesi, 2006; Hayes, Crocker, & Kowalsi, 1999; Ornelas et al., 2007; Rose & Larkin, 2002; Sallis et al., 1999). However, most studies interested in the individual child have examined self-efficacy in relation to physical activity (e.g., Annesi, 2006; Dishman et al., 2004; Dishman et al., 2009; Motl et al., 2005) and healthy eating (e.g., Ball et al., 2009; Domel et al., 1996; Resnicow et al., 1997; Reynolds et al., 1999).

An additional inconsistency is the way in which self-beliefs have been defined and operationalized. For example, some researchers have evaluated self-efficacy beliefs in terms of the ease or difficulty of overcoming personal barriers (e.g.,

sedentary choices and feelings of fatigue) and environmental obstacles (e.g., lack of time, opportunity, or social support) in terms of participating in physical activity (Dishman et al., 2004; Dishman et al., 2009; Motl et al., 2002; Neumark-Sztainer, Wall, Perry, & Story, 2003). Whereas other researchers have defined self-efficacy as being the degree of confidence children have in their ability to seek support for physical activity and resist competing activities (e.g., Beets, Pitetti, & Forlaw, 2007b). This also is true for self-efficacy related to healthy eating. Some researchers are interested in the ability of children to select healthy food options (e.g., Domel et al., 1996), while others are focused on examining the child's ability to alter their environment to provide healthier foods (e.g., Resnicow et al., 1997). With researchers using differing conceptions of self-beliefs and defining these beliefs in multiple ways, it is difficult to form any conclusions regarding the role of the individual child in relation to their healthy eating and physical activity behaviors.

There also have been differences in the way children's self-beliefs have been used in studies (e.g., direct, mediating, or moderating relations). First, researchers have examined the direct relation between children's self-beliefs and their levels of physical activity (Motl et al., 2002; Saunders, Motl, Dowda, Dishman, & Pate, 2004). For instance, Annesi (2006) found significant positive associations between self-worth, self-efficacy and students' physical activity levels. In terms of healthy eating, however, researchers have found no associations between self-efficacy and children's levels of fruit and vegetable consumption (Domel et al., 1996; Resnicow et al., 1997), although both of these researchers found stronger associations for children's outcome expectations. As for moderating relations, Dishman et al. (2009) found that self-

efficacy moderated the relation between changes in physical activity and perceived social support, demonstrating that girls with high levels of self-efficacy had a greater decline in physical activity if they perceived declines in social support. This study was the only one to examine this type of relation.

Most studies, however, have examined children's self-beliefs as a mediator (e.g., Motl, Dishman, Saunders, Dowda, & Pate, 2007; Shields et al., 2008; Trost et al., 2003). That is, they have explored how parent and school characteristics can affect physical activity by the influence they exert on the psychological functioning of children (such as in terms of self-beliefs). In turn, children's self-beliefs can have a significant influence on their healthy eating and physical activity behaviors. One study, for example, found that specific parenting practices (such as playing sports with children and watching them play sports) were associated with adolescents' confidence levels (that is, self-efficacy) in their abilities to overcome barriers to participation in physical activities (Trost et al., 2003). In turn, self-efficacy had a significant association with an adolescent's physical activity. Shields et al. (2008) also found that self-efficacy in physical activity partially mediated the relationship between family influences (e.g., parents encouraging adolescents to persist in their physical activity programs) and physical activity among adolescents whose physical activity had recently lapsed.

On the other hand, Motl et al. (2005) found that self-efficacy did not predict changes in physical activity levels. Similarly, although Ornelas et al. (2007) found that adolescents with higher levels of self-esteem were more likely to be physically active, the relationship between parental engagement and physical activity, however,

was not mediated by self-esteem. These contrasting results might be explained by the different sample types and measures used. For example, Ornelas et al. (2007) measured self-esteem rather than self-efficacy, and this study used a nationally representative sample compared to the other studies, which used non-nationally representative samples.

Only a few studies examined the mediating relation of children's self-beliefs with regard to healthy eating. These studies had conflicting findings. For instance, Ball et al. (2009) found that children's self-efficacy in terms of eating fruit and limiting junk food mediated the relation between their mother's education level and three different outcome measures of eating (fruit, energy-dense snacks, and fast food consumption). In contrast, Reynolds et al. (1999) found that children's self-efficacy did not mediate the relation between the availability of fruits and vegetables, modeling, nutrition education, and children's fruit and vegetable consumption. The discrepancies in these findings are possibly explained by the different constructs children's self-efficacy was attempting to mediate, as well as the inconsistency in the outcome variables used in the studies. The measures for self-efficacy also varied for the two studies.

In addition, student's self-efficacy has been examined as a mediator between school health education programs and children's healthy eating and physical activity behaviors (e.g., Dishman et al., 2004; Dzewaltowski et al., 2009). For example, Dzewaltowski et al. (2009) found that students in schools that received resources for an intervention program for healthy eating and physical activity had significantly increased their levels of physical activity compared to control schools, and that

students' self-efficacy in influencing the school's physical activity environments served as a mediator. However, the mediating relation was not found for fruit and vegetable consumption.

In summary, there are several mechanisms through which parents and schools can influence children's health behaviors. As demonstrated, children's self-beliefs are potential mediators of parenting and school practices regarding children's healthy eating and physical activity behaviors. However, more research is warranted for confirmation of these mediating pathways. For this study, children's self-beliefs, and physical appearance self-worth and physical self-efficacy in particular, are included as the *person* variable. Previous studies have shown that self-efficacy influences behaviors (e.g., Shields et al., 2008; Trost et al., 2003), so the current study used physical self-efficacy (perceived physical ability) as the self-belief measure in analyses with physical activity as the dependent variable. In addition, self-worth has been identified as a predictor of many other constructs that constitute psychosocial well-being.

Furthermore, positive parenting behaviors have been associated with increased self-worth in children (Maccoby & Martin, 1983; Nelson & Gordon-Larsen, 2006; Neumark-Szainer, 2005), and higher levels of self-worth have been associated with increased self-efficacy (Strong et al., 2005; Trzesniewski, Donnellan, & Robins, 2003). Therefore, physical appearance self-worth (belief about one's physical appearance) was used in the analyses with healthy eating as the dependent variable. In the final section of this document, three models to guide the current study, based on the work of Darling and Steinberg (1993), are proposed. The models include one

design for parents and one for schools. In addition, the effects of these two contexts on children's health behaviors are discussed in terms of a third model.

The Current Study

At the beginning of this literature review, I posed two questions related to the ways in which parent and school environments and practices are related to children's healthy eating and physical activity behaviors. In general, authoritative parenting styles are associated positively with adolescent consumption of healthy foods and participation in physical activity. Similarly, positive parenting practices were associated with increased levels of healthy eating and physical activity among children and adolescents. Furthermore, researchers are beginning to explore parenting styles as moderating effects between parenting practices and children's behaviors.

As for schools, sufficient research is not available to conclude whether or not, and to what extent, the school environment affects children's health behaviors. However, school practices have been shown to be directly associated with childhood healthy eating and physical activity behaviors. Researchers also have not examined whether the school environment affects the relation between school practices and student behaviors, as posited by Darling and Steinberg.

In this section, the research gaps and the suggested modifications to the contextual model of Darling and Steinberg (1993) are presented, as the parent and school models are introduced for the current study. In addition, there is a discussion regarding combining the parent and school models into a single model as a means of providing a better explanation of why children engage in healthy behaviors.

Proposed Models for the Current Study

Parent model. Figure 2 provides an illustration of how Darling and Steinberg's (1993) contextual model was modified for parents, with regard to healthy eating behavior and physical activity. Consistent with that of Darling and Steinberg, this model makes a distinction between parenting styles and parenting practices. Researchers have argued that assessing both general parenting styles (consistent across situations) and specific parenting practices (situation specific) are more effective at explaining the influence of parenting on the positive development of adolescents than assessing parenting styles alone (see, for example, Darling & Steinberg, 1993). Therefore, as shown in Figure 2, parenting practices with respect to healthy eating habits and physical activity are directly related to children's health behaviors. These practices range from the implementation of rules and expectations regarding these health behaviors to encouraging these behaviors. Although it is important to understand the ways in which these individual practices contribute to children's healthy food choices and to their being physically active, these practices can be thought of in terms of the provision of structure and the provision of opportunities.

In addition, the association between parenting practices and children's behaviors might vary, depending upon the parent environment. This notion is consistent with the model presented by Darling and Steinberg (1993). As previously discussed at length, most of the research has been examined with respect to parenting styles. The model shown in Figure 2 is interested in the individual parenting

dimensions (such as nurturance) that are used to develop the parenting styles. The reason for examining them in this way is that not all parents can be accurately classified as representative of one of the four parenting styles, as parents do not always adhere to one distinct parenting style (e.g., Lamborn, Mounts, Steinberg, & Dornbusch, 1991; Lohaus et al., 2009; Steinberg et al., 1994). Therefore, studies using parenting styles have the potential of either excluding parents who represent important subgroups or might mislabel parents as representative of particular parenting styles, hence biasing results. Furthermore, some researchers believe that individual parenting dimensions have a stronger association with a specific adolescent outcome than would a combination of the dimensions (i.e., parenting styles) (Barber, 1997). In addition, certain dimensions might be more protective than others of specific adolescent outcomes, and these specific associations would not be discovered using parenting styles.

The most significant difference between the model presented by Darling and Steinberg (1993) and the proposed model has to do with the role of the child. This aspect of Darling and Steinberg's model was not clearly articulated. The contextual model posits that the self-beliefs of children are directly influenced by parenting style, which in turn, moderates the relationship between parenting practices and children's outcomes. An alternative to consider is the ways in which children's self-beliefs, such as self-esteem, self-efficacy, and self-regulation, are affected by the parental environment and by parental practices, and, in turn, how these self-beliefs are associated with their own behaviors (National Institute of Mental Health, 2001).

School model. The model for schools is the same as that for parents. That is to say, the modifications described in the parent model also apply to the school model illustrated in Figure 3. Similarly, this model makes a distinction between the school environment and school practices. As shown in Figure 3, school practices related to healthy eating habits and the level of physical activity are directly related to children's health behaviors. As mentioned in the review on school influences, numerous relevant practices exist, such as offering healthy school meals, daily physical education, BMI screenings, and curricula on healthy eating and physical activity. Similarly to the parent model, these practices can be thought of in terms of the provision of structure and the provision of opportunities.

In addition, the association between school practices and children's behaviors might vary, depending upon the school environment. As discussed in terms of parent style, the school environment can be assessed by means of a general measure of school climate or individual dimensions, such as school belongingness. This model supports the notion of using individual dimensions rather than combining them. Lastly, as with the parent model, this model proposes an indirect association between school practices and children's health behaviors via children's self-beliefs, such as self-worth and self-efficacy.

Combined parent and school model. Although a considerable amount of research has already been conducted individually for parent and school contexts, researchers have argued that individual context studies can be misleading if they are not supplemented by joint context studies (Cook et al., 2002). By studying contexts jointly, researchers can discover which social contexts have a greater influence on a

given behavior at a given developmental period. There are two ways of studying the influence of multiple contexts. The additive approach (e.g., Sameroff, Seifer, Baldwin, & Baldwin, 1993) allows each context to affect children's healthy eating and physical activity behaviors, but the effects of any particular context do not depend upon the effects of another. One assumption this approach makes is that the combined contextual effect is larger than any single context effect. This approach can also identify the particular context that is responsible for greater or smaller effects among the relations studied and can determine whether there are similar pathways or pathways that deviate from the individual parent and school models.

The other approach is multiplicative and suggests that the joint effect surpasses the sum of the individual context effects. This approach implies a moderating effect. For example, the relation between parenting practices and children's health behaviors might differ, depending upon the quality of the children's relations in school. The current study only explored the additive approach.

The combined model is depicted in Figure 4 and includes the same direct and indirect paths that are shown in the individual parent and school models. That is to say, there is a relation between parent and school practices and children's health behaviors. In addition, the parent and school environment affect the relation between parent and school practices and children's health behaviors. Finally, the parent and school practices feed into what children believe about themselves and their abilities, which will ultimately affect their choices regarding engaging in healthy behaviors. In addition, this model examined whether there is any benefit to examining the joint effects of parent and school characteristics on children's healthy eating and physical

activity behaviors. Therefore, this combined model should be able to demonstrate whether children are able to effectively regulate the demands of parents and schools, which, in turn, might lead to a greater sense of self-worth and ultimately, to healthier behavior choices.

Conclusion

The current study builds upon the existing literature and contributes to research on parenting and children's healthy eating and physical activity behaviors. The conceptual models for this study were based upon the contextual model presented by Darling and Steinberg (1993) and the process-person-context framework of Bronfenbrenner (1989). Darling and Steinberg's contextual model served as a means of organizing the research and explaining how parental and school environments and practices relate to children's healthy eating and physical activity behaviors. In addition, Bronfenbrenner's process-person-context framework served as a tool to identify gaps in the literature and assist in designing and developing the proposed study. Thus, the constructs used and the pathways drawn in the models are anchored in theory and research.

Furthermore, this was the first study to test several aspects of Darling and Steinberg's (1993) model for children's behaviors related to healthy eating and physical activity, including the direct effects between practices and behaviors, the indirect effects between practices and behaviors via children's self-beliefs, and the moderating effects of the environment upon the relation between practices and behaviors. Another contribution involved exploring whether Darling and Steinberg's model can be applied to a school setting, and in particular, whether the same relations

examined in the parent model parallel those of the school model. Finally, this study attempted to understand the added value of examining multiple contexts. Overall, this research study aimed to assist in clarifying the effects of parental and school socialization processes on children's healthy eating and physical activity behaviors.

Chapter 3

Methods

Participants

This study used data from Wave 1 of Healthy Passages, a multi-site study of adolescent health and risk behaviors. The baseline sample consisted of 5,147 fifth graders and their primary caregivers (persons who self-identified as the primary caregiver and completed the primary caregiver survey). The primary caregivers included two biological parents (45.7%), one biological parent with a step parent (9.7%), one biological parent with other person (28%), one biological parent (11.1%), non-parent (3%), and step, foster, or adoptive parents (1.7%). Therefore, 83.4% of children had two adult caregivers in the home. The average age of the students in the sample was 10.6 years and that of the parents was 38.1. Included in the study were 2,610 girls and 2,537 boys, and 34% of these students were African American, 35% were Hispanic, 24% were White, and 6% fell into the category of “Other.” Over half of the parents had at least some college education, but nearly half had annual incomes of less than \$30,000 per year. The mean BMI for students was 20, a figure that is above the 85th percentile (at risk for overweight) for children.

The data for Healthy Passages were collected at three research sites: the University of Alabama at Birmingham, the University of Texas at Houston, and the University of California at Los Angeles/RAND. The specific geographic areas were 10 contiguous public school districts in and around Birmingham, Alabama; 25 contiguous public school districts in Los Angeles County, California; and the largest

public school district in Houston, Texas. The study population included all fifth-grade students enrolled in public schools with an enrollment of 25 fifth graders at each of the three research sites (which represents over 99% of all students enrolled in public schools at each of the three sites). In order to obtain a representative sample of fifth-grade students, a two-stage probability sampling procedure was used at each of the three sites.

In the first stage of the probability sampling procedure, schools were selected at random with probabilities proportionate to a weighted measure that was inversely proportionate to the ratio of the prevalence of a school's students to the site targets in terms of race/ethnicity for a total of 118 schools. Targets were selected to (1) maximize power to compare racial/ethnic groups across sites; (2) maximize power to compare sites for consistency of effects; (3) maximize power to compare patterns across sites within race/ethnicity; and (4) minimize the design effect within sites (specifically, the loss of statistical power associated with sampling) (Windle et al., 2004). The small number of students who were not identified as African American, Hispanic, or White were categorized as "Other" for sampling purposes. In the second stage, all fifth-grade students in regular classrooms in sampled schools were invited to participate. Of the 11,532 eligible students, 6,663 (58%) gave their permission to be contacted, and of those, 5,147 (77%) students completed interviews.

Recruitment procedures across all three sites included the recruitment of school districts, schools, and students. First, permission was obtained from superintendents to approach schools within their school district. If permission was granted, school principals were approached by local investigators or other field staff,

the study was explained, and they asked for permission to recruit fifth-grade students within their classrooms. Once the principal's permission was obtained, project staff met with fifth-grade teachers in order to explain the study and to ask for their cooperation in recruiting students. Finally, materials related to the study were distributed to students to take home and share with their primary caregivers. Immediately prior to data collection, the parent signed the informed consent form and the parent permission form, and the child signed the informed assent form. A Spanish version of the consent materials and other instruments was available and provided as needed.

Monetary incentives were provided to all participants in this study (Windle et al., 2004). For example, primary caregivers received \$50, and children received a \$20 gift card. In addition, schools were reimbursed for assisting with recruitment efforts and school record data collection. Each teacher was given a small stipend (cash or gift certificate) for assisting with recruitment and for completing the Fifth Grade Teacher Survey and the Teacher Evaluation of Student Behavior for those students who obtained parental permission.

Procedures

Institutional Review Boards at all three research sites and at the Centers for Disease Control and Prevention reviewed and approved the study protocol and all study materials. All three Healthy Passage research sites used standardized data collection materials and protocols, including training manuals, field manuals, and validation procedures. In order to standardize the data collection processes across the three sites, detailed job qualifications and job descriptions for field staff were

developed. A training model was adopted as the most effective and cost-efficient method of implementing the standardized training of all field interviewers (Windle et al., 2004).

Field interviewer training consisted of 60 hours of instruction, plus additional hours of practice in interviewing, neighborhood observation, and anthropometrics. Field interviewers were required to meet pre-established standards and to undergo a final 2-hour pass–fail certification process in order to demonstrate that they had acquired the necessary skills to conduct the interviews. For each field interviewer, a total of 10% of interviews were randomly selected for telephone validation. In addition, one of the first three interviews and up to 10% of all subsequent interviews of each field interviewer were shadowed by project staff for quality control purposes (Windle et al., 2004). If validation procedures for a particular field interviewer indicated problems, more cases were pulled and validated. These same quality control procedures were applied to neighborhood observation teams.

Data collection consisted of gathering such information as child height, weight, and waist circumference; parent height and weight; and conducting child computer-assisted personal interview (CAPI) and audio computer-assisted self-interview (A-CASI), as well as parent CAPI and A-CASI (Windle et al., 2004). Parents and children completed their interviews in separate rooms. On average, it took about three hours for the field interviewers to complete everything, including consent forms, anthropometrics, CAPI, and A-CASI with the primary caregiver and child.

Study Design

Healthy Passages is a longitudinal study designed to understand children and adolescent health behaviors. In particular, Healthy Passages focuses on protective factors, health behaviors (such as dietary practices and level of physical activity), and health outcomes (such as obesity). Healthy Passages will collect several waves of data. Currently, only two waves of data have been collected. The first wave of data was collected in 2004 using a cohort of fifth-graders and their primary caregivers. The main reason for selecting fifth-grade students is that the prevalence of many risk behaviors is low among this age group. Therefore, data collection began before most of the risky behaviors were initiated, allowing for both the initiation and escalation of those behaviors to be assessed. The second wave of data was collected two years later, in 2006, with the same children (now in seventh grade) and their primary caregivers.

Each child and his or her parent will continue to be interviewed every two years for the next ten years (until the child is about age 20). Included in the child interview are such topics as physical activity, nutrition, tobacco use, alcohol use, drug use, injuries and violence, aggressive behaviors, substance use, sexual activity, romantic interests, physical and mental health, family relationships, peer relationships, school experiences, and media exposure. The parent interview addresses such topics as family demographics, the child's health and injuries, family relationships, the child's exposure to violence, the parent's involvement in school, and neighborhood connectedness.

In addition, Healthy Passages examined school and neighborhood environments for each child and gathered school health policy information. The fifth-grade teachers were asked to answer several questions about themselves and about the school setting. In addition, the teachers answered questions about each child in their class participating in Healthy Passages. The school principal, or designee, answered questions about school policies related to health education, health services, food service, and physical education. Furthermore, school records related to grades, attendance, test scores, and special program participation were collected from the school.

The current study only analyzed data from Wave 1 of Healthy Passages, as the data collected in Wave II was not available to be analyzed. Specifically for this study, a correlational design using a casual model framework was used to investigate the associations among parenting and school practices, parent and school environments, children's self-beliefs, and children's healthy eating and physical activity behaviors at one point in time. This study also examined the joint effects that parents and schools have upon children's healthy eating and physical activity behaviors. The study employed a variable-centered approach. Items included in this study come from different informants – principals, parents, and children, which will be discussed in greater detail later in this section.

Measures

First, the measures for the two dependent variables are provided. Next, the independent variables for the parent model are provided followed by the independent

variables for the school model. Finally, the control variables are provided. Appendix A provides the questions and responses of the measures used in the current study.

Dependent Variables

Both of the dependent variables were developed using factor analytic techniques. Specifically, a principle components factor analysis was performed for both healthy eating and physical activity. A factor loading cut-off of .40 or higher was selected as the inclusion criteria for factor interpretation. See Appendix B for the loadings of the individual items for both healthy eating and physical activity.

Physical activity. Three items (On how many of the past 7 days did you exercise or take part in any kind of exercise or physical activity in which you were moving for at least 60 or more minutes?, On how many of the past 7 days did you take part in physical activity that did not make your heart beat fast or make you breathe hard for at least 30 minutes?, On how many of the past 7 days did you exercise or take part in physical activity that made your heart beat fast or made you breathe hard for at least 20 minutes?) loaded on one factor with a total variance explained of 52%. The saved regression score was used in the analyses. The Cronbach's alpha was .54. The Cronbach's alpha was only an indication of the reliability of the items in the scale but not of the reliability of the factor. These items were used in the Youth Risk Surveillance Study (YRBS) (Centers for Disease Control and Prevention, 2008, 2010). In 1998, and again in 2004, the National Association for Sport and Physical Education (NASPE) published national guidelines calling for 60 minutes, and up to several hours, of physical activity per day for children between the age of five and 12 (National Association for Sport and Physical Education, 2004).

In addition, the 2005 Dietary Guidelines for Americans recommend that children and adolescents engage in at least 60 minutes of physical activity on most, but preferably all, days of the week (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2005).

Healthy eating. Five items (During the past 7 days, how many days did you eat a serving of vegetables such as broccoli, green beans, squash, tomatoes, or other vegetables?, During the past 7 days, how many days did you eat a serving of fruit, during the past 7 days?, How many days did you drink a cup, box, bottle or can of 100% fruit juices such as orange juice, apple juice, or grape juice?, During the past week, how often did you eat a serving of green salad? , and During the past week, how often did you eat carrots?) loaded on one factor with a total variance explained of 38%. The saved regression score was used in the analyses. The Cronbach's alpha was .56. The Cronbach's alpha was only an indication of the reliability of the items in the scale but not of the reliability of the factor. These items were adapted from the Youth Risk Surveillance Study (YRBS) (Centers for Disease Control and Prevention, 2008, 2010).

Predictor Variables

Perceived parental nurturance. The Maternal Nurturance Scale assessed the extent of encouragement and guidance that children receive from a mother or father figure (Barnes & Windle, 1987). Children provided answers to 7 items (e.g., How often does your mother/father give you praise or encouragement?). The response format was a 4-point Likert scale, ranging from "almost never" (1) to "almost always" (4). Scores for each item were summed to calculate a scaled score for

mothers and fathers. The Cronbach's alpha for mother nurturance was .76 and for father nurturance was .81. These scales were used in the analyses for both healthy eating and physical activity. Mother and father nurturance were used as separate variables, please refer to Appendix C for the explanation.

Parent practices. Two aspects of parent practices were investigated: the provision of structure and the provision of opportunities. There were three items related to rules about watching television that assessed the provision of structure. One item assessed the provision of opportunities (through interaction with children and/or showing interest and attention) related to healthy eating (eating meals together) and the other item assessed physical activity (parents watching children engage in physical activity).

Rules for watching television. Children were asked, "Do you have rules in your house about how much TV you can watch?", "Do you have rules in your house about when you can watch TV?", and "Do you have rules in your house about what you can watch on TV?" The response option was dichotomous (yes/no). The sum total of the scores for these three items were used to develop a final scaled score for television rules. These similar items were used by the National Longitudinal Study of Adolescent Health (ADD Health) and the study for the Youth Media Campaign Longitudinal Survey (YMCLS) (Harris, 2009; Lee et al., 2010). This scale was used in the analyses for both healthy eating and physical activity.

Eating meals together. Parents were asked, "During the past week, how many times did you and your child eat a meal together?" The response options ranged from "not at all" to "7 or more times." This question was used as a single item in the

analysis. This item has been used by ADD Health and YMCLS (Centers for Disease Control and Prevention, 2010; Harris, 2009; Lee et al., 2010). The item was used in the analysis for healthy eating.

Watching children be physically active. Children were asked, “How often do your parents watch you participate in physical activities or sports?” This item had a 4-point Likert scale, ranging from “almost never” (1) to “almost always” (4). This question was used as a single item in the analysis. This item has been used by YMCLS (Lee et al., 2010). This item was used in the analysis for physical activity.

Child physical appearance self-worth. Child physical self-worth was measured with a 6-item physical appearance self-worth subscale of the Self-Perception Profile (Harter, 1983). Children responded to two questions for each item, for example, they were asked first to identify which contrasting description best fits them (e.g., “Some kids are happy with the way they look” and “Some kids wish their body was different”). They next were asked whether the description was “sort of true” or “really true”. Scores for each item were summed to calculate the scale score. The Cronbach’s alpha for the scale was .68. This item was used in the analysis for healthy eating.

Child physical self-efficacy. Child physical efficacy was measured with an 8-item physical subscale of the Pediatric Quality of Life Inventory (PEDsQL) (Varni, Seid, & Rode, 1999). Example questions include: “It is hard for you to run” and “It is hard for you to do sports activity or exercise”. The response format was a 5-point Likert scale ranging from “never” (1) to “almost always” (5). Scores for each item were recoded, such that higher values on the scale reflect higher levels of physical

efficacy and then averaged to calculate the scale score. The Cronbach's alpha for the scale was .73. This item was used in the analysis for physical activity.

School belongingness. The School Belongingness Scale assessed the belief by students that teachers and peers at the school care about their learning and about them as individuals (Sieving et al., 2001). Children provided answers to seven items (e.g., "You are happy to be at your school" and "You feel like you are part of your school"). The response format was a 4-point Likert scale ranging from "never" (1) to "almost every day" (4), or "strongly agree" (1) to "strongly disagree" (4). The items that used the rating of strongly agree to strongly disagree were recoded to indicate that higher scores meant higher levels of school belongingness. Scores for each item were summed to calculate a scaled score. The Cronbach's alpha for school connectedness was .78. This scale was used in the analyses for both healthy eating and physical activity.

School practices. Similarly to parenting practices, two aspects of school practices will be investigated: the provision of structure and the provision of opportunities. For the provision of structure, the education schools provide on nutrition and physical activity will be assessed. In addition, the provision of opportunities variables included the resources and opportunities that schools provided to children to be physically active and to select healthy food options.

Education about healthy eating. Principals were asked, "Which of the following topics are taught in health education to fifth-graders at this school?" The list included several health topics, including dietary behavior. The response options were "yes" or "no." This question was used as a single item in the analysis and was

coded as a binary variable, where “0” indicated no and “1” indicated yes. This item was used in the analysis for healthy eating.

Education about physical activity. Principals were asked, “Which of the following topics are taught in health education to fifth-graders at this school?” The list included several health topics, including dietary behavior and physical activity and fitness. The response options were “yes” or “no.” This question was used as a single item in the analysis and was coded as a binary variable, where “0” indicated no and “1” indicated yes. However, this item was not used in the current study because almost all (99%) children attended schools that responded with a yes.

Availability of physical activity facilities and equipment. School observations were performed by the researchers, who documented the following aspects of the availability of physical activity equipment: “gym or indoor sports facilities available,” “playground equipment available,” “outdoor sports facilities or playing fields available,” and “track available”). The response options were “yes” or “no.” These four items were summed to develop a score ranging from “0” to “4”. The value of “0” indicated that the school did not have physical activity facilities and equipment available; “1” indicated that the school has one of the four items specified above; “2” indicated that the school has two of the four items specified above; “3” indicated that the school has three of the four items specified above; and “4” indicated that the school has all four of the physical activity facilities and equipment items available. This item was used in the analysis for physical activity.

Minutes per week of physical education. Principals were asked questions related to physical education and recess. There were two items for physical

education, as follows: “On average, how many days per week are the fifth graders scheduled to take physical education?” and “On average, how many minutes is each session of physical education class scheduled to last?” The items were recomputed to reflect the number of minutes of physical education students receive each week. This item was used in the analysis for physical activity.

Minutes per week of recess. Principals were asked questions related to physical education and recess. There were two questions related to recess: “On average, how many days per week do they have recess?” and “On average, how many minutes is each session of recess scheduled to last?” The items were recomputed to reflect the number of minutes of recess students receive each week. This item was used in the analysis for physical activity.

Availability of national breakfast programs. The principals answered the following question about the availability of breakfast: “Does this school participate in the USDA reimbursable National School Breakfast program?” The response options were “yes,” “no,” and “n/a.” This question was used as a single item in the analysis and was coded as a binary variable, where “0” indicated no and “1” indicated yes. This item was used in the analysis for healthy eating.

Availability of national lunch programs. The principals answered the following question about the availability of lunch: “Does this school participate in the USDA reimbursable National School Lunch program?” The response options were “yes,” “no,” and “n/a.” This question was used as a single item in the analysis and was coded as a binary variable, where “0” indicated no and “1” indicated yes. This item was used in the analysis for healthy eating.

No vending machines. School observations were performed by the researchers, who documented the following aspects of the availability of vending machines: vending machines in areas with student access. The response options were “yes” or “no.” This question was used as a single item in the analysis and was coded as a binary variable, where “0” indicated yes and “1” indicated no. This item was used in the analysis for healthy eating.

No competitive foods. Principals were asked, “When can students purchase drinks and snack items that are not meals, such as chocolate, other candy, cookies, crackers, salty snacks (e.g., regular potato chips), ice cream or frozen yogurt, soft drinks, sport drinks, or fruit drinks (not 100% juice)?” They responded “yes” or “no” to each of the following items: “before classes begin in the morning,” “during any school hours when meals are not being served,” “during school lunch periods,” and “after school.” The items was summed to develop a score ranging from “0” to “4”. The value of “4” indicated that the school did not allow students to purchase drinks and snacks at the four times specified above; “3” indicated that the school allow students to purchase drinks and snack at one of the four times specified above; “2” indicated two of the four times specified above; “1” indicated three of the four times specified above; and “0” indicated that the school allow students to purchase drinks and snacks at the four times specified above. This item was used in the analysis for healthy eating.

Beverage and food service contracts. Principals were asked two questions about specific contractors (“Does this school offer brand-name fast foods from companies such as Pizza Hut, Taco Bell, or Subway?” and “Does this school have a

contract with a soft drink company, such as Coca-Cola, Pepsi-Cola, or Dr. Pepper, that makes beverages available to students?”). The response options were “yes” or “no.” The items were summed to develop a score ranging from “0” to “2”. The value of “2” indicated that the school did not have a specific contractor for foods or beverages; “1” indicated that the school has either a specific foods contractor or a specific beverages contractor; and “0” indicated that the school has both a specific contractor for foods and beverages. This item was used in the analysis for healthy eating.

Body mass index screening. Principals were asked, “Are most students attending this school screened at the school for height and weight or body mass?” The response options included “yes” or “no.” This question was used as a single item in the analysis and was coded as a binary variable, where “0” indicated no and “1” indicated yes. This scale was used in the analyses for both healthy eating and physical activity.

Sociodemographic and other control measures. The control variables were used in the analyses for both healthy eating and physical activity. Information on each child’s sex, race/ethnicity, parent’s highest education level, and the family’s highest annual household income was obtained during the parent interview.

Child’s sex. Because the children were only fifth graders, the parent report was used as the primary source of information regarding the child’s sex, with the child’s report being used only when the parent’s report was missing. Parents were asked to select their child’s sex (boy/female). Child’s sex was used as a single item

in the analysis and was coded as a binary variable, where “0” indicated girl and “1” indicated boy.

Race/ethnicity. The parent report was used as the primary source of information regarding the child’s race/ethnicity, with the child’s report being used only when the parent’s report was missing. Parents were asked to select their child’s race/ethnicity from the following options: American Indian or Alaskan Native (AIAN), Asian, Black or African American, Hispanic or Latino, Native Hawaiian or other Pacific Islander, White, and Other. This measure used a census-style classification, treating “Hispanic” as an ethnicity and categorizing respondents to this category as “Hispanic,” regardless of which race they endorsed. In addition, due to the low number of responses for American Indian or Alaskan Native (AIAN), Asian, and Native Hawaiian or other Pacific Islander, these categories were collapsed into the “Other” category. Therefore, there were four race/ethnicity categories used for this study: White, Black, Hispanic, and Other. They were coded “0” and “1” with Whites used as the reference group.

Family socioeconomic status (SES). There were two measures used to assess family SES: parent’s highest education level and family’s highest annual household income. Parent’s highest education level was attained by the primary caregiver and referred to one of the following options: 8th grade or less, some high school but did not graduate, high school graduate, GED, some college, two-year degree, four-year college graduate, and more than a four-year college degree. In addition, family’s highest annual household income referred to the income earned by the primary caregiver. Respondents selected from 20 response options, beginning with less than

\$5,000 per year to over \$250,000 per year. These items were summed to calculate a single score for family SES.

Variables Used Only in the Missing Data Analyses

Body mass index (BMI). Each child's BMI was based on the child's weight and standing height and was measured with standard anthropometric protocols (Kuczmarski, Ogden, & Grummer-Strawn, 2000; Ogden et al., 2008). Weight was measured to the nearest 0.1 kilogram (kg) using a Tanita electronic digital scale (BWB-800S). Standing height was measured to the nearest millimeter using a portable stadiometer (PE-AIM-101). Height was measured with the students in bare feet or socks. Two independent measurements were taken for weight and height; if the measurements differed by 0.2 kg or more for weight or 0.5 centimeters or more for height, a third measurement was taken. The two weight or height measurements closest in agreement were averaged and used to calculate the BMI, using the Quetelet index (weight (kg) / height (meters)²). BMI percentiles were calculated for children using the CDC gender- and age-specific charts (Kuczmarski et al., 2000). Classifications were constructed such that BMI < 85th percentile was not overweight, 85th ≤ BMI < 95th percentile was considered overweight, and BMI ≥ 95th percentile was defined as obese (Kuczmarski et al., 2000).

Family cohesion. The Family Cohesion Scale assessed degree of separation or connection of family members to the family (Olson, 1993). Parents provided answers to 10 items (e.g., "Family members ask each other for help" and "Family members like to spend free time with each other"). The response format was a 5-point Likert scale ranging from "almost never" (1) to "almost always" (5). Scores for

each item were summed to calculate a scaled score. The Cronbach's alpha for family cohesion was .82.

Parent depression. The Parent Depression Scale is a subscale of the brief symptom inventory 18 (BSI 18) (Derogitis, 2000). This subscale assessed the psychological problems of parents. Parents provided answers to five items (e.g., “How much were you distressed by feeling no interest in things?” and “How much were you distressed by feeling hopeless about the future?”). The response format was a 5-point Likert scale ranging from “not at all” (1) to “extremely” (5). Scores for each item were summed to calculate a scaled score. The Cronbach's alpha for parent depression was .85.

Analytic Strategy

This section covers several topics related to the analytic strategy, including clustering, weights, missing data, assumptions and diagnostics, and statistical power. In addition, this section provides a description of the statistical analyses for this study, including descriptive analyses and measured-variable path analyses. The descriptive analyses and the measured-variable path analyses was conducted (Mueller & Hancock, 2010; Wright, 1934) using Mplus 6.1 software (Muthén & Muthén, 2010).

Clustering

Initially, a multilevel modeling method was to be used for this study, due to the nested structure of the data. The data were collected from a variety of schools, each with a substantial number of students, creating the possibility of clustering effects. After running the fully unconditional model in HLM version 6.08 and

calculating the intraclass correlation coefficient (ICC), which measures the proportion of between-group variance in the outcome of interest (Raudenbush & Bryk, 2002) and helps determine whether the data are appropriate for multilevel modeling. Exploratory analyses revealed that the percent of variance in children's physical activity, healthy eating, and school belongingness attributable to the between-schools effect were all below five percent. Although the ICCs were low, the design effects still needed to be addressed in order to provide unbiased parameter estimates and standard errors. To account for the design effects, the statistical models took into account the stratification and clustering of the sample. The stratification identified the three sites, and the clusters identified the schools that were randomly selected within the stratifications.

Weights

Weights were created in three stages (Windle et al., 2004). The first stage involved creation of the design weight. The design weight, D , was defined as $1/\text{relative sampling rate } (Q)$, then standardized to the mean of one within sites. This was developed by the sampling algorithm specifying a relative sampling rate (Q) *that* was proportionate to the probability of a school being selected within a site. The second stage involved non-response weighting. A school-level non-response weight, S , was defined as the inverse of the school-level response rate. An intermediate weight, I , was defined as $D*S$, then standardized to mean of one within sites.

The third stage involved a combination of non-response weighting with respect to race-ethnicity and correcting for mismatches between race-ethnic information on the site-level frames from which schools were drawn and the actual

race-ethnicities of students in the classroom. These two adjustments happened simultaneously. Specifically, this involved first weighting the completes within a site by intermediate weight (I), then creating a weight, R , that matched weighted completes to the sampling frame within cells defined by combinations of race-ethnicity and sex. A final weight, F , was defined as $R \times I$ and then standardized to the mean of one within sites. Weights were determined by school, race-ethnicity, and sex.

In sum, design weights were constructed to reflect different school selection probabilities by racial/ethnic composition. Non-response weights were constructed to model non-response as a function of school, student sex, and student race-ethnicity. The two sets of weights were combined into a final probability response weight variable representing the population of fifth-grade students in public schools in each of the three geographic areas (Windle et al., 2004). Using this weight allowed for the generalization of the results of the analyses of the Healthy Passages data to the population of fifth-grade students in public schools in each of the three geographic areas.

Missing Data

The children and caregiver survey items underwent imputation in the Healthy Passages Wave I dataset. Missing values were imputed using the Markov Chain Monte Carlo method designed by Shafer (1997), which creates multiple imputations by drawing simulations from a Bayesian predictive distribution for normal data. Proc MI from SAS version 9.1 was used to perform the imputation to replace “Don’t know”, Refused” and “Blocked” responses with valid responses. Legitimately

skipped items were not imputed. Demographic variables and height and weight were also not imputed. Individual items used in scales were imputed prior to calculating the scale. The imputed values represent random numbers that were selected from the different distributions. Appendix D provides the breakdown of the missing cases in the dataset before imputation and after imputation for each of the variables included in the study.

As stated, some variables used in the current study were not imputed (such as family SES and all the school items). Therefore, listwise deletion was used for the remaining missing cases. To account for the missing data, a missing data analysis was conducted to identify the analytic sample, allowing for determination of which group of cases has data for the key variables in the study and how the analytic sample compares with the sample from which it was drawn. Missing data bias was assessed by computing a dummy variable reflecting the presence or absence of missing data for each variable in the model, following which this dummy variable was correlated with an array of variables, including child's body mass index percentile, family cohesion, and parent depression.

Assumption and Diagnostics

There are assumptions and diagnostics testing that must be considered for path analysis. The same assumptions need to be considered for path analysis as for multiple regression analysis. First, variables used in the study were screened for out of range values and plausible means and standard deviations. Second, the relations between the independent (exogenous) and dependent (endogenous) variables were assessed for linearity. To draw conclusions about the assumption of linearity,

scatterplots with residuals against the fitted values of the dependent variable were produced. The scatterplot of residuals indicated whether the relationship is linear or curvilinear. In addition, homogeneity of variance was assessed by creating a scatterplot with residuals against the fitted values and superimposed by a linear fit line. This showed whether or not the residuals were randomly scattered around the horizontal line at zero.

Furthermore, the variables should have normal distributions and should be assessed univariately and multivariately. For the univariate assessment, the indices of skewness and kurtosis was examined to determine if the absolute value of any of these indices was greater than ± 2.0 to ± 3.0 (Finney & Distefano, 2006). In addition, multivariate normality was corrected for using a robust estimation method based on the Huber-White estimator, as implemented in Mplus.

Finally, outlier analyses were conducted. The analyses were implemented for both non-model based and model based. For the non-model based analyses, multivariate outliers were identified by examining leverage indices for each individual and defining an outlier as a leverage score four times greater than the mean leverage. Leverage refers to how unusual the case is in terms of its values for the independent variables. If outliers were found, they were checked for coding errors and the analysis was conducted both with and without the outliers. If results differed across the two forms of analysis, the outliers were considered significant, and strategies to address these outliers were pursued (Wilcox, 1997, 2003).

In addition, model-based outliers were assessed through additional analyses. This involved selecting an indicator for each variable and then regressing the

indicator for each dependent variable onto the indicators for variables that the dependent variable is assumed to be a linear function of. This analysis used ordinary least squares regression in a limited information estimation framework. Standardized dfbetas were examined for each individual and each predictor as well as the intercept. An outlier was defined as any predictor with an absolute standardized dfbeta larger than 1.0. If outliers were observed, the analysis was conducted both with and without the outliers.

Statistical Power and Sample Size Considerations

The sample size for the current study ranged from 3,614 to 4,641, which should be adequate in terms of power. However, a power analysis was formally conducted. Because it is difficult to evaluate the power associated with specific path coefficients in complex path models because of the large number of assumptions that must be made regarding population parameters, a rough approximation of power was obtained by using a limited information approach with single indicators of the path models (Jaccard & Wan, 1996).

Data-Model Fit Indices

Several data-model indices are available to demonstrate the overall fit of the proposed models. There are three overarching types of indices: absolute, parsimonious, and incremental. Mueller and Hancock (2010) recommended that an index for each type be used. For this study, the indices chosen as indicators representative of a well-fitted model included the standardized root mean squared residual (SRMR), an absolute index that evaluates the overall discrepancy between

the observed and model-implied covariances and variances (Mueller & Hancock, 2010). In addition, the root mean square error of approximation (RMSEA), a parsimonious index, indicates a good data-model fit when the model is simpler (Mueller & Hancock, 2010). The comparative fit index (CFI) is the incremental index used to evaluate a model's fit relative to a baseline model. Models with CFI values close to .95, SRMR values of less than .09, and RMSEA values of less than .06 are normally considered an acceptable fit (Hu & Bentler, 1999). In addition, the overall chi square test of model fit (which should be statistically non-significant) will be implemented and examined. However, the chi square test is sensitive to large samples, so the other indices are more relevant for the current study.

Finally, R-squared is a commonly used statistic to evaluate model fit for regression models. However, for path models, R-squared is not typically used to evaluate the adequacy of the data-model fit, but it still serves as an indication of how much variance in the dependent variable was explained by the predictors in the model (Cohen, Cohen, West, & Aiken, 2003). Specifically, R-squared serves as an omnibus effect size, with values closer to one indicating a better fit and values closer to zero indicating a poor fit.

Descriptive Analyses

The means and standard deviations for all of the continuous variables used in the models were provided. In addition, mean differences and correlation analyses were conducted for the descriptive analyses. More specifically, one-way analysis of variance (ANOVA) were used to examine mean differences in healthy eating and physical activity according to gender and race, and correlations were provided for

family SES. Correlation analyses were conducted to provide initial support for the study predictions. The continuous variables were mean-centered for these analyses.

Path Analyses

Path analysis is considered an extension of the regression model. A path model is an exploration of a causal model. This technique allows researchers to study direct and indirect effects simultaneously using multiple independent and dependent variables (Mueller, 1996; Mueller & Hancock, 2010). In path analysis, the causal system of equations should be fully recursive. This means that there should be no reciprocal causality, no feedback loops, and no correlated errors. The analytic process is discussed in terms of the research questions related to the parent model, school model, and combined parent and school model. The two dependent variables (healthy eating and physical activity) are examined separately. Therefore, there is a total of six measured-path analyses implemented – two for the parent model, two for the school model, and two for the combined parent and school model. The models discussed here are considered statistical models.

Parent model. Figure 2 provides a predicted path model. The model suggests that children's healthy eating and physical activity behaviors can be explained by parenting practices, parent environment (measured by parental nurturance), and children's self-beliefs. There were three research questions of interest for the parent model.

How are parenting practices associated with children's healthy eating and physical activity behaviors? (Research Question (RQ) 1)

The first research question was interested in the direct path leading from parenting practices to children's health behaviors. It is considered to be a direct effect when the independent variable has an arrow directed toward the dependent variable. For example, for the healthy eating analysis, a structural equation was written indicating healthy eating as the dependent variable (endogenous) and the parenting practice(s) related to healthy eating as the predictor(s) (exogenous). In terms of the physical activity analysis, a structural equation was written indicating physical activity as the dependent variable and the parenting practice(s) related to physical activity as the predictor(s). For both the healthy eating and physical activity analyses, the following control variables were included: child's sex, child's race/ethnicity, and family SES. The purpose of including these control variables was to determine whether the key predictors impact the outcome over and above the covariates.

How does parental nurturance affect the association between parenting practices and children's healthy eating and physical activity behaviors? (RQ 2)

The second research question was interested in how the direct path from parenting practices to children's health behaviors varies as a function of parental nurturance. This is considered a moderation model. Therefore, two moderating variables were added to the structural equation for the path analysis: mother nurturance and father nurturance. These two variables were used to create interaction terms, through the multiplication of each moderating variable with each parenting

practice. The interaction terms were incorporated into the analyses for both healthy eating and physical activity. Before creating the interaction terms, all the continuous variables were mean-centered by subtracting the sample mean from all scores for each variable of interest to minimize the chance of multicollinearity among the variables. The same control variables were included.

To what extent do children's self-beliefs serve as a pathway between parenting influences (environment and practices) and children's healthy eating and physical activity behaviors?

(RQ 3)

The third research question was interested in the indirect path from parenting practices to children's health behaviors through the children's self-beliefs (physical appearance self-worth and self-efficacy). When an independent variable has an effect on the dependent variable through another variable, it is considered an indirect effect. This is considered a mediation model. In addition to the structural equation mentioned in the first research question, another structural equation was included in the path analysis indicating the children's self-beliefs (physical appearance self-worth for the analysis with healthy eating and physical self-efficacy for the analysis with physical activity) as the dependent variable and the parenting practices as the predictors. This model also was able to identify the total effect on the dependent variable from each predictor by adding the direct and indirect effects. The same control variables were included.

School model. According to Figure 3, this model suggests that children's healthy eating and physical activity behaviors can be explained by school practices,

school environment (measured by school belongingness), and children's self-beliefs. There were three research questions of interest for the school model that are parallel to the parent model, so the same analytic strategy (measured-variable path analysis) was used to answer these questions.

How are school practices associated with children's healthy eating and physical activity behaviors? (RQ 4)

The fourth research question was interested in the direct path from school practices to children's health behaviors. Structural equations were written to reflect children's health behaviors as dependent variables (endogenous) and school practices as the predictors (exogenous) in the model. The same control variables were used for the school model: child's sex, child's race/ethnicity, and family SES.

How does school belongingness affect the association between school practices and children's healthy eating and physical activity behaviors? (RQ 5)

The fifth research question was interested in how the direct path from school practices to children's health behaviors varies as a function of school belongingness. The moderating variable, school belongingness, was added to the structural equation for the path analysis. This moderating variable was used to create interaction terms with each of the school practice variables for healthy eating and physical activity. The continuous variables were mean-centered. The same control variables were included.

To what extent do children's beliefs serve as a pathway between school influences (environment and practices) and children's healthy eating and physical activity behaviors? (RQ 6)

The sixth research question was interested in the indirect path from school practices to children's health behaviors through the children's self-beliefs. In addition to the structural equation mentioned in the fourth research question, another structural equation was included in the path analysis indicating the children's self-beliefs (physical appearance self-worth for the analysis with healthy eating and physical self-efficacy for the analysis with physical activity) as the dependent variable and school practices as the predictors. This model was also able to identify the total effect on the dependent variable from each predictor by adding the direct and indirect effects. The same control variables were included.

Combined parent and school model. According to Figure 4, this model suggests that children's healthy eating and physical activity behaviors can be explained by both parent and school influences through children's self-beliefs. There was one research question of interest for the combined parent and school model:

To what greater extent does a model combining both parent and school contexts explain children's healthy eating and physical activity, as compared to one that uses just the parent model? (RQ 7)

The seventh research question was interested in the direct and indirect paths from parent and school characteristics (both environment and practices) to children's health behaviors through the children's self-beliefs. This model encompassed both the parent and school models; therefore, the structural equations included in research

questions one through six were run simultaneously in this combined model. This was considered an additive model of multiple effects. In running these equations simultaneously, the joint effects of parents and schools on children's health behaviors were more effectively explored.

Summary

The current study used Wave 1 of Healthy Passages to conduct a secondary analysis to explore the associations between parent and school influences and children's physical activity and healthy eating behaviors. The primary focus of this study was to assess whether the contextual environment (i.e., parent nurturance and school belongingness) affects the relation between parent/school practices (e.g., TV rules and availability of vending machines) and children's health behaviors. In addition, this study explored the indirect pathways between parent and school environment and practices on children's healthy eating and physical activity behaviors through children's self-worth.

Furthermore, the study was designed to examine the joint effects of parent and school influences on children's health behaviors. Most studies in the past have not explored the ways in which parent and school contexts jointly influence children's physical activity and healthy eating behaviors, nor have many researchers attempted to understand the relation between the environment in which children spend their time and specific content-related practices. This study attempted to address these gaps through the measures and analyses described in this section.

Chapter 4

Results

This study examined parental and school influences associated with children's healthy eating and physical activity behaviors. Three models were tested: parent, school, and combined parent and school. In the parent and school models, the direct association between specific practices and children's healthy eating and physical activity behaviors was examined, in conjunction with the moderating effects of the parent and school environments. Also explored was the indirect relation between parenting practices and children's health behaviors through children's self-beliefs, in particular, physical appearance self-worth and physical self-efficacy. Finally, the study investigated whether or not an added benefit could be determined from combining the parent and school models. The questions explored in this study are as follows:

1. How are parenting practices (in terms of the provision of structure and the provision of opportunities) associated with children's healthy eating and physical activity behaviors?
2. How does parental nurturance affect the association between parenting practices and children's healthy eating and physical activity behaviors?
3. To what extent do children's self-beliefs serve as a pathway between parental influences (environment and practices) and children's healthy eating and physical activity behaviors?

4. How are school practices (in terms of the provision of structure and the provision of opportunities) associated with children's healthy eating and physical activity behaviors?
5. How does school belongingness affect the association between school practices and children's healthy eating and physical activity behaviors?
6. To what extent do children's self-beliefs serve as a pathway between school influences (environment and practices) and children's healthy eating and physical activity behaviors?
7. To what greater extent does a model combining both parent and school contexts explain children's healthy eating and physical activity, as compared to one that uses just the parent model?

This chapter presents the results of the current study in four different sections. First, the results from the preliminary analyses are presented. The descriptive statistics are provided next and include tables highlighting the means and standard deviations, the mean differences of key variables, and the correlations of key pathways. The main analyses of the measured-variable path analyses are thereupon presented for each of the three models. Finally, the supplementary analyses, which investigate specification errors and power, are reported.

Preliminary Analyses

In this section, the findings for the missing data analyses are described. In addition, the results related to linearity, homogeneity of variance, normality, and outliers are presented.

Missing Data

A missing data analysis was conducted for each of the six path analyses described in Chapter 3 (see Appendix E for a detailed description). The missing data were minimal for most of the variables used in the parent model for both healthy eating and physical activity. However, there were more missing data for the variables used in the school and combined models compared to the parent model. Nevertheless, the findings of the missing data analyses demonstrated that the results for this current study could be generalized to the study population.

Tests of Assumptions and Diagnostics

Linearity and homogeneity of variance. The variables in the parent and school model for both healthy eating and physical activity were examined for linearity and homogeneity of variance. In order to test for linearity, four scatterplots (for the parent model for healthy eating, the parent model for physical activity, the school model for healthy eating, and the school model for physical activity) were produced, in which residuals were plotted against the fitted values and a lowess smooth line was superimposed (Cohen et al., 2003). All four scatterplots revealed that the patterns of the data points are random and not systematic, thus indicating linearity. In order to test for homogeneity of variance, the same four scatterplots were produced with residuals plotted against the fitted values, but in this case, a linear fit line was superimposed (Cohen et al., 2003). In all four scatterplots, the data points were scattered at random around the horizontal line at zero. Therefore, heteroscedasticity was not of concern.

Normality. Normality was assessed at the univariate and multivariate level. At the univariate level, all of the continuous variables had skewness and kurtosis values below ± 2 (Finney & Distefano, 2006), other than minutes of physical education and physical self-efficacy, which had a kurtosis score of 2.40 and 2.64, respectively. Nonetheless, these scores are still below a ± 3 and will thus be left as is. Skewness and kurtosis indices for each variable are presented in Appendix F. Traditional maximum likelihood methods of structural equation modeling, which include measured-variable path analysis, assume that the continuous variables in the model are multivariate normally distributed. Based on the large sample size, the presence of non-normality at the multivariate level is quite likely. Therefore, a robust estimator, namely the Huber-White sandwich estimator, was implemented using Mplus, which gives robustness in the presence of non-normality and non-independence of observations (Muthén & Muthén, 2010; White, 1980).

Outliers. Both model-based and non-model based outlier analyses were implemented. In order to assess for non-model based outliers, a leverage score was calculated for each respondent based on their multivariate profile for all of the variables included in the model analyses; an outlier was defined as any variable having a leverage score three times the value of the mean leverage score (Jaccard, Turrisi, & Wan, 2003). This number was then compared to the range provided for leverage scores. As the number was greater than the maximum in that range, no outliers were evident for the variables in each of the statistical models using this criterion.

Next, model-based outliers were examined using limited information regression analyses for each of the linear equations dictated by the various path models tested (Bollen, 1996). The df -beta values were examined for each individual relative to each path coefficient in order to isolate unusually influential individuals in the parameter estimation. An outlier was defined as those individuals having df -betas three times larger than the standard error of a coefficient. No outliers were evident in these analyses.

Summary. The assumptions for linearity, homogeneity of variance, and normality were met for the current study. The use of a robust estimator (the Huber-White sandwich estimator), which is a default in Mplus when dealing with complex data, corrected for multivariate non-normality and non-independence of observations. In addition, there was no indication of outliers that might bias the results.

Descriptive Analyses

Table 5 presents the means and standard deviations for all of the continuous variables used in the parent, school, and combined parent and school models. In addition, mean differences were determined and correlational analyses were conducted in order to provide initial support for the study predictions.

Table 5

Mean and Standard Deviation for Parent and School Measures

Variables	Mean	Standards Deviation	Range
Physical activity ^{abcd}	-.00	1.00	-1.84 - 2.44
Healthy eating (fruit and vegetable consumption) ^{abcd}	-.01	1.00	-2.13 - 2.77
Mother nurturance ^{ab}	21.75	4.03	7 - 28
Father nurturance ^{ab}	19.66	4.83	7 - 28
School belongingness ^{cd}	22.45	3.32	7 - 28
Child's physical appearance self-worth ^{ac}	17.99	3.95	6 - 24
Child's physical self-efficacy ^{bd}	84.43	13.57	0 - 100
Rules for watching television ^{ab}	1.89	1.00	0 - 3
Eating meals together ^a	4.17	1.15	1 - 5
Watching children be physically active ^b	2.67	1.14	1 - 4
Availability of physical activity facilities and equipment ^d	2.66	.82	1 - 4
Minutes per week of physical education ^d	123.47	61.07	0 - 300
Minutes per week of recess ^d	88.99	65.36	0 - 325
Availability of competitive foods ^c	3.05	.89	0 - 4
Family SES ^{abcd}	12.42	6.55	2 - 27

Note. n = 4641 for parent model for both healthy eating and physical activity and n = 3955 school model for healthy eating and n = 3638 for physical activity. The two dependent variable, physical activity and healthy eating, are factor scores, so their mean is 0 and standard deviation is 1.

^a represents a variable in parent model for healthy eating.

^b represents a variable in parent model for physical activity.

^c represents a variable in school model for healthy eating.

^d represents a variable in school model for physical activity.

Relations Between Demographic Variables and Outcome Variables

Mean differences in children's healthy eating and physical activity as a function of child's sex and race were examined using one-way analyses of variances (ANOVAs). The continuous variables were mean-centered for these analyses. Correlations were used to assess the relation between family SES and children's healthy eating and physical activity behaviors. As indicated in Table 6, children's healthy eating behavior differed significantly as a function of sex, with girls reporting the consumption of healthier food choices than boys. Children's healthy eating also differed as a function of race. A post-hoc Tukey test revealed that Black children reported consuming significantly less healthy food choices than Hispanic ($p < .001$) and White ($p < .001$) children. In addition, a significantly positive correlation was found between family SES and children's healthy eating ($r(4641) = .05, p \leq .01$).

Differences were also found for children's physical activity as a function of the child's sex and the child's race. As illustrated in Table 6, boys reported higher levels of physical activity than girls. A post-hoc Tukey test revealed that White children reported being significantly more physically active than Hispanic ($p < .001$), Black ($p < .001$), and "Other" ($p < .001$) children. In addition, a significant positive correlation was found between family SES and children's physical activity ($r(4641) = .11, p \leq .01$).

Table 6

Healthy Eating and Physical Activity as a Function of Children's Sex and Race

Variables	Healthy Eating				Physical Activity			
	Mean	Standard Deviation	F (df)	η	Mean	Standard Deviation	F (df)	η
Child's sex			23.20*** (1)	.01			14.44*** (1)	.003
Girls	.02	.99			-.07	.97		
Boys	-.12	1.00			.04	1.02		
Child's race***			15.36*** (3)	.01			26.10*** (3)	.02
Hispanic	.05	1.01			-.03	.97		
Black	-.17	1.00			-.11	1.02		
White	-.03	.93			.20	.99		
Other	-.07	.98			-.17	1.03		

Note. n = 4641.

Partial eta squared (η) is the effect size.

*** $p < .001$.

Correlational Analyses

Correlations were computed in order to examine the association between variables in the parent and school models. The results of the correlational analyses are presented in Tables 7 and 8. The continuous variables were mean-centered for these analyses.

Table 7 provides the Pearson correlations among the parent environment, parenting practices, children's self-beliefs, and children's healthy eating and physical activity behaviors. Of relevance for the predicted pathways, children's healthy eating was significantly and positively related to all of the variables in the parent model for healthy eating, which includes parent environment (perceived mother and father nurturance), children's parenting practices (TV rules and eating meals together), and physical appearance self-worth. In addition, children's physical appearance self-worth was significantly and positively related to parent environment (perceived mother and father nurturance) and one of the parenting practices (TV rules).

Similarly, children's physical activity was significantly and positively related to all of the variables in the parent model for physical activity, which includes parent environment (perceived mother and father nurturance), parenting practices (TV rules and eating meals together), and children's physical self-efficacy. Moreover, children's physical self-efficacy was significantly and positively related to parent environment (perceived mother and father nurturance) and parenting practices (TV rules and watching children be physically active).

Table 7

Correlations Among Parent Environment, Parenting Practices, Child's Self-Beliefs, Healthy Eating, and Physical Activity Variables

Variables	1	2	3	4	5	6	7	8
1. Mother nurturance	–							
2. Father nurturance	.55**	–						
3. Rules for TV	.23**	.18**	–					
4. Eating meals together	.06**	.07**	.04*	–				
5. Watching children be physically active	.28**	.29**	.13**	.03*	–			
6. Physical appearance self-worth	.14**	.15**	.07**	-.01	.15**	–		
7. Physical self-efficacy	.15**	.15**	.03*	.04**	.15**	.25**	–	
8. Healthy eating	.20**	.18**	.16**	.05**	.13**	.11**	.13**	–
9. Physical activity	.14**	.17**	.08**	.01	.17**	.10**	.16**	.31**

Note. n = 4641

* $p < .05$. ** $p < .01$.

Table 8 provides the Pearson correlations among the school environment, school practices, children's self-beliefs, and children's healthy eating and physical activity. Of relevance for the predicted pathways, children's healthy eating was significantly and positively related to children's school environment (school belongingness), school practices (education on nutrition, no vending machines, and no competitive foods), and physical appearance self-worth. Children's healthy eating was significantly and negatively related to the availability of national school breakfast and lunch programs. The other two school practices had non-significant correlations (no food service contracts and body mass index screening) with children's healthy eating. Furthermore, children's physical appearance self-worth was significantly and positively associated with school belongingness, while children's physical appearance self-worth was significantly and negatively related to the availability of national school breakfast and lunch programs. The other school practices, namely education on nutrition, no vending machines, no food service contracts, and body mass index screening, were non-significant.

Table 8

Correlations Among School Environment, School Practices, Child's Self-Beliefs, Healthy Eating, and Physical Activity Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. School belongingness	–													
2. Availability of physical activity facilities and equipment	.02	–												
3. Minutes per week of physical education	.02	.28**	–											
4. Minutes per week of recess	.02	-.22**	.04*	–										
5. Education on nutrition	.03	-.14**	.10**	-.05**	–									
6. Availability of national breakfast programs	-.08**	-.07**	-.24**	.04*	-.15**	–								
7. Availability of lunch programs	-.04**	-.20	-.18**	.15**	-.08**	.79**	–							
8. No vending machines	.07**	-.13**	.12**	.11**	.25**	-.31**	-.22**	–						

Continued on next page

Table 8 (continued)

Correlations Among School Environment, School Practices, Child's Self-Beliefs, Healthy Eating, and Physical Activity Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
9. No competitive foods	.03	-.41**	-.13**	-.01	.03	-.20**	-.13**	.50**	–					
10. No beverage and food service contracts	.05**	-.06**	.05**	.08**	-.21**	-.04*	-.10**	.36**	.44**	–				
11. Body mass index screening	.02	-.06**	.04*	-.08**	.04*	-.04**	.00	.05**	-.06**	-.02*	–			
12. Physical appearance self-worth	.20**	.01	.00	-.03	.02	-.11**	-.03**	-.07**	.02	-.07*	-.01	–		
13. Physical self-efficacy	.23**	.01	.03	-.03	.04*	-.10**	-.08**	.03	.03*	-.03	-.04*	.25**	–	
14. Healthy Eating	.18**	-.08**	-.02	.06**	.05**	-.08**	-.05**	.07**	.05**	-.02	-.01	.11**	.12**	–
15. Physical activity	.15**	.00	.09**	.01	.06**	-.09**	-.06**	.16**	.06**	.04**	-.05**	.08**	.16**	.32**

Note. n = 3955 (healthy eating) and n = 3638 (physical activity).
 $p < .05$. ** $p < .01$.

As for the school variables related to physical activity, which are also presented in Table 8, children's physical activity was significantly and positively related to school environment (school belongingness), one of the school practices (minutes per week of physical education), and children's physical self-efficacy. In addition, children's physical activity was significantly and positively related to body mass index screening, while the other two school practices, availability of physical activity facilities and equipment and minutes per week of recess, had non-significant correlations with children's physical activity. Children's physical self-efficacy was significantly and positively associated with school belongingness and negatively associated with body mass index screening. Children's physical self-efficacy had non-significant correlations with availability of physical activity facilities and minutes per week of physical education and recess.

Path Analyses

This section presents the results for the measured-variable path analyses. As discussed in Chapter 3, this study used a two-stage probability sampling procedure in each of the three sites (Alabama, California, and Texas). To account for this sampling strategy, these analyses were conducted with the complex survey data module within Mplus version 6.1, using a robust maximum likelihood algorithm (Muthén & Muthén, 2010). Analyses for each statistical model took the stratification, clustering, and weights of the sample into account. The stratification identified the three sites, and the clusters identified the schools that were randomly selected within the stratifications. Finally, the weights were included in order to take the

oversampling of schools with higher proportions of Hispanic and Black children into account.

The statistical models in this study are statistically overidentified, which means that the statistical models contained fewer parameters to be estimated than unique pieces of information in the variance/covariance matrices (observations). Furthermore, the degrees of freedom in these overidentified models were greater than zero, thereby enabling model-data fit indices to be estimated. Models with CFI values close to .95, SRMR values of less than .09, and RMSEA values of less than .06 are normally considered an acceptable fit (Hu & Bentler, 1999). In addition, the overall chi square test of model fit (which should be statistically non-significant) will be implemented and examined. However, the chi square test is sensitive to large samples, so the other indices are more relevant for the current study. Finally, the R-squared value falls somewhere between zero and one, with values closer to one indicating a better fit and values closer to zero indicating a poor fit.

The results for the statistical models (significant and non-significant) are shown in Tables 9 through 14. However, the path coefficients in Figures 5 through 13 (except Figures 7, 8, and 11) are for the trimmed statistical models, indicating that the path coefficients for these analyses were examined and that all of the paths from the model that were not statistically significant were deleted. In these figures, both unstandardized and standardized path coefficients are presented, with the unstandardized coefficients given in parentheses. All residual variances (reflected by the circles in the Figures) were assumed to be uncorrelated, and all exogenous (independent) variables were assumed to be correlated. All residuals values are in

standardized metrics. The same control variables were included in all six path analyses, namely the child's sex, the child's race, and the family SES. The results are organized by model (parent, school, and combined) and are then presented for the healthy eating analysis, followed by the physical activity analysis for that model. The models discussed here are considered statistical models.

Parent Model

The results are described in conjunction with Figures 5 and 6, which represent the statistical parent model for healthy eating and physical activity. Specifically, this model examined the direct relations between parent environment (as measured by perceived parental nurturance), specific parenting practices, children's self-worth, and children's healthy eating and physical activity (RQ 1: How are parenting practices associated with children's healthy eating and physical activity behaviors?).

Furthermore, this model examined whether the parent environment indirectly affected children's positive health behaviors through children's self-worth (RQ 2: How does parental nurturance affect the association between parenting practices and children's healthy eating and physical activity behaviors?). Path modeling also investigated the moderating effect of parent environment (as measured by parental nurturance) on the relation between specific parenting practices and children's healthy eating and physical activity (RQ 3: To what extent do children's self-beliefs serve as a pathway between parental influences (environment and practices) and children's healthy eating and physical activity behaviors?).

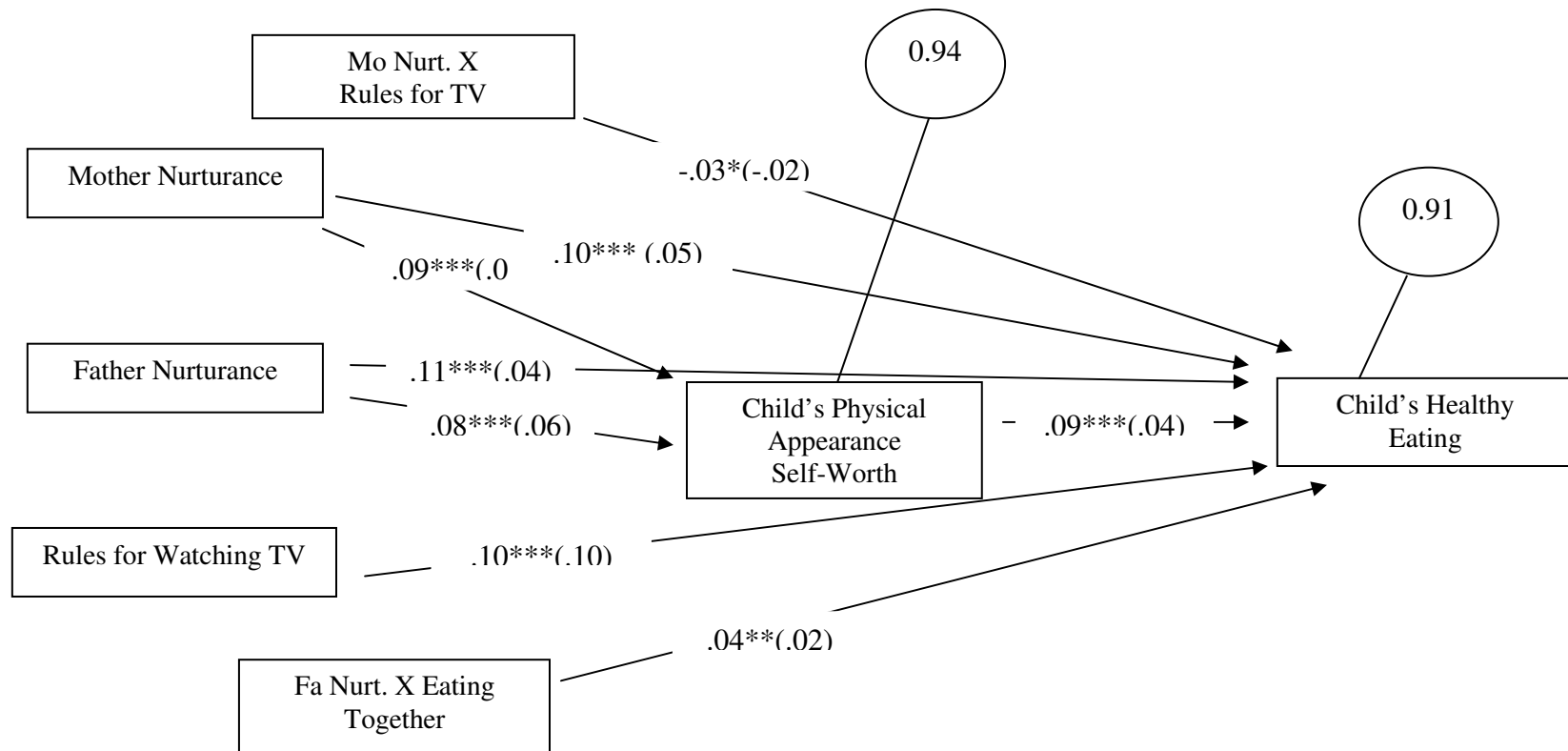


Figure 5. Statistical parent model for healthy eating. $n = 4641$. Only significant findings are presented in the table. The standardized and unstandardized (in parentheses) betas are shown. $*p \leq .05$. $**p \leq .01$. $***p \leq .001$.

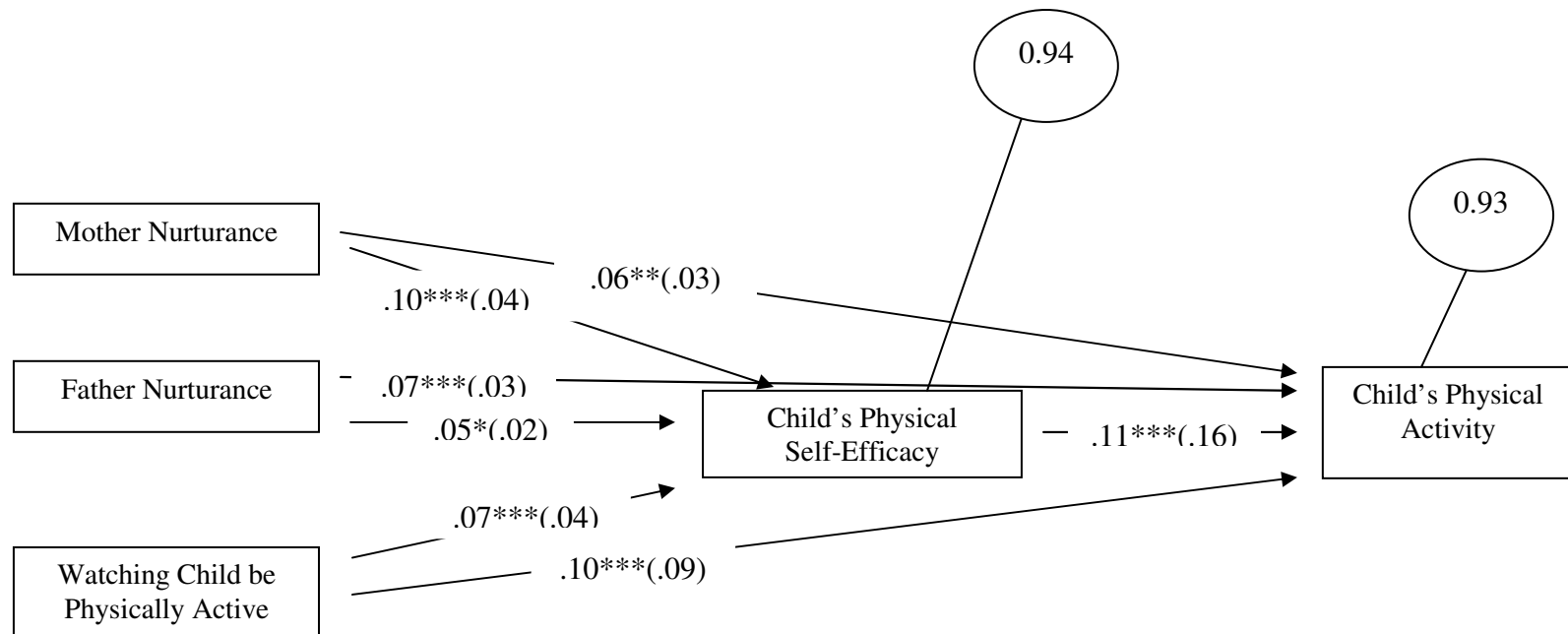


Figure 6. Statistical parent model for physical activity. $n = 4641$. Only significant findings are presented in the table. The standardized and unstandardized (in parentheses) betas are shown. $*p \leq .05$. $**p \leq .01$. $***p \leq .001$.

The parent model for healthy eating yielded the following fit indices: a CFI of .99, an SRMR of .00, an RMSEA of .01, and a chi-square value of $\chi^2(4,4,641)=6.94$, $p=.14$. The independent variables accounted for 9% of the variance in healthy eating and 6% of the variance in children's physical appearance self-worth. In terms of the parent model for physical activity, similar fit indices were found: a CFI of .98, an SRMR of .00, an RMSEA of .02, and a chi-square value of $\chi^2(4, 4,641)=3.54$, $p=0.47$. The independent variables accounted for 7% of the variance in physical activity and 6% of the variance in children's physical self-efficacy. In addition, more focused fit tests (such as examination of modification indices and standardized residuals) all suggested adequate model fit.

Direct, indirect, and total effects of the parent model. Tables 9 and 10 provide the standardized coefficients for the direct, indirect, and total effects of the statistical parent model for healthy eating and physical activity behaviors including the results for the control variables. The results for the parent model for healthy eating are presented first, followed by the results for physical activity.

Table 9

Direct, Indirect, and Total Effects for the Parent Model for Healthy Eating

Predictors	Outcomes				
	Physical Appearance Self-Worth		Healthy Eating		
	Direct	Total	Direct	Indirect	Total
Mother nurturance	.09***	.09***	.10***	.01***	.11***
Father nurturance	.08***	.08***	.11***	.01**	.11***
Rules for watching television	.02	.02	.10***	-.00	.10***
Eating meals together	-.02	-.02	.02	.00	.02
Child's sex ^a	.27***	.27***	-.14***	-	-.14***
Child's Hispanic ^a	-.35**	-.35**	.16*	-	.16*
Child's Black ^a	.11	.11	-.12*	-	-.12*
Child's Other ^a	-.13	-.13	.03	-	.03
Family SES	.11***	.11***	.02	-	.02
Physical appearance self-worth	-	-	.09***	-	.05***
Mo nurt. x rules for watching TV	-	-	-.03*	-	-.03*
Mo nurt. x eating together	-	-	-.03	-	-.03
Fa nurt. x rules for watching TV	-	-	.01	-	.01
Fa nurt. x eating together	-	-	.04**	-	.04**

Note. $n = 4641$. The standardized betas are shown, ^aexcept for the dichotomous variables, which are the unstandardized betas. Gender was coded such that 0 = females and 1 = males; scores for race reflect comparisons with White children such that Black, Hispanic, Other = 1 and Whites = 0. Physical appearance self-worth was the mediator. “-“ indicates variable not included in analysis.

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

Table 10

Direct, Indirect, and Total Effects for the Parent Model for Physical Activity

Predictors	Outcomes				
	Physical Self-Efficacy		Physical Activity		
	Direct	Total	Direct	Indirect	Total
Mother nurturance	.10***	.10***	.06**	.01***	.07**
Father nurturance	.05*	.05*	.07***	.01*	.08***
Rules for watching television	-.03	-.03	.02	-.00	.02
Watching child be physically active	.07***	.07***	.10***	.01**	.10***
Physical self-efficacy	-	-	.11***	-	.11***
Child's sex ^a	.06**	.06**	.11***	-	.11***
Child's Hispanic ^a	-.11**	-.11**	-.04	-	-.04
Child's Black ^a	-.04	-.04	-.18**	-	-.18**
Child's Other ^a	-.13**	-.13**	-.27***	-	-.27***
Family SES	.11***	.11***	.04	-	.04
Mo nurt. x rules for watching TV	-	-	-.02	-	-.02
Mo nurt. x watch be active	-	-	.01	-	.01
Fa nurt. x rules for watching TV	-	-	.00	-	.00
Fa nurt. x watch be active	-	-	-.00	-	-.00

Note. $n = 4641$. The standardized betas are shown, ^aexcept for the dichotomous variables, which are the unstandardized betas. Sex was coded such that 0 = females and 1 = males; scores for race reflect comparisons with White students such that African- American, Hispanic, Other = 1 and Whites = 0. Physical self-efficacy was the mediator. “-” indicates variable not included in analysis.

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

Healthy eating. One parenting practice, rules for watching television, was significantly predictive of children's healthy eating behavior, while the other parenting practice, eating meals together, was not significantly predictive of children's healthy eating behavior. Perceived mother nurturance, perceived father nurturance, and children's physical appearance self-worth were also significantly predictive of children's healthy eating behavior. In addition, the results showed that the mean of healthy eating was significantly lower for boys than it was for girls. The mean of healthy eating was also significantly lower for Black children compared to White children, whereas the mean of healthy eating for Hispanic children was significantly higher compared to White children.

Furthermore, perceived mother and father nurturance were associated with children's physical appearance self-worth, although the parenting practices were not significantly related to children's physical appearance self-worth. Other findings in this model showed that the mean of children's physical appearance self-worth was significantly higher for boys than it was for girls. Both Hispanic and Black children had significantly lower mean levels of physical appearance self-worth compared to White children. In addition, children from families reporting higher levels of SES had significantly higher physical appearance self-worth compared to children from families reporting lower levels of SES.

This model also examined whether parent influences indirectly affected children's healthy eating through their physical appearance self-worth. There were significant indirect pathways found, as shown in Table 9. Based on joint significant tests (Biesanza, Falka, & Savaleia, 2010; MacKinnon, Lockwood, Hoffman, West, &

Sheets, 2002), results indicated that children's healthy eating behavior was indirectly influenced by perceived mother and father nurturance through children's physical appearance self-worth. This was evident because physical appearance self-worth had a significant direct effect on children's healthy eating and perceived mother and father nurturance had a significant direct effect on children's physical appearance self-worth. The total effects on children's healthy eating were the same as the direct effects, except for a slight positive increase in the parameter estimates for perceived mother and father nurturance, due to the positive indirect effects of these variables.

Physical activity. For the physical activity analysis, there was one significant direct parental predictor. That is, the parenting practice of parents watching their children engage in physical activity was significantly predictive of children's physical activity. However, the parent practice of rules for watching television was not significantly associated with children's physical activity. There were also other significant direct pathways such as perceived mother nurturance, perceived father nurturance, and children's physical self-efficacy. In addition, the results showed that the mean of physical activity was significantly higher for boys than girls. Both Black and Other children had significantly lower mean levels of physical activity compared to White children.

Furthermore, perceived mother and father nurturance and parents watching their child engage in physical activity were significantly predictive of children's physical self-efficacy, although the rules for watching television were non-significant. Other findings showed that the mean of physical self-efficacy was significantly higher for boys than it was for girls. Both Hispanic and "Other" children had

significantly lower mean levels of physical self-efficacy compared to White children. In addition, children from families reporting higher SES had significantly higher physical self-efficacy compared to children from families reporting lower SES.

In addition, this model also examined whether parental influences indirectly affected children's physical activity behaviors through children's physical self-efficacy. There were significant indirect pathways found, as shown in Table 10. Based on joint significant tests (Biesanza et al., 2010; MacKinnon et al., 2002), the indirect effect of parental influences on children's physical activity was found for perceived mother and father nurturance. The parenting practice of watching the child engage in physical activity was also indirectly associated with children's physical activity. Therefore, children's physical self-efficacy partially mediated three relations (mother nurturance and children's physical activity, father nurturance and children's physical activity, and watching the child engage in physical activity and children's physical activity). The total effects on children's physical activity were the same as the direct effects, except for a slight positive increase in the parameter estimates for perceived mother nurturance, perceived father nurturance, and watching the child engage in physical activity, due to the positive indirect effects of these variables.

Moderating effects of the parent environment. The model also tested the moderating effects of parent environment (as measured by perceived parental nurturance) on the relation between specific parenting practices and children's healthy eating and physical activity. Traditional regression methods were used in conjunction with product terms to test for possible interaction effects within the measured-variable path analysis framework (Jaccard et al., 2003). Four interaction

terms were created for the parent model for healthy eating (mother nurturance x rules for watching television, mother nurturance x eating meals together, father nurturance x rules for watching television, father nurturance x eating meals together). Similarly, four interaction terms were created for the parent model for physical activity (mother nurturance x rules for watching television, mother nurturance x watching the child engage in physical activity, father nurturance x rules for watching television, father nurturance x watching the child engage in physical activity).

There were two significant interactions in the parent model for healthy eating. No significant interactions were found in the parent model for physical activity. The significant interactions included perceived mother nurturance x rules for watching television and perceived father nurturance x eating meals together. The slope for healthy eating and rules for watching television differed significantly for the different levels of perceived mother nurturance (low, medium, and high).

As shown in Figure 7, the results of the simple slope analysis revealed that rules for watching television was positively related to children's healthy eating behaviors with higher levels of perceived mother nurturance ($\beta=.07$, $t=3.66$, $p<.001$) and with lower levels of perceived mother nurturance ($\beta=.13$, $t=6.17$, $p<.001$). There was no significant relation for a medium level of perceived mother nurturance ($\beta=.10$, $t=.00$).

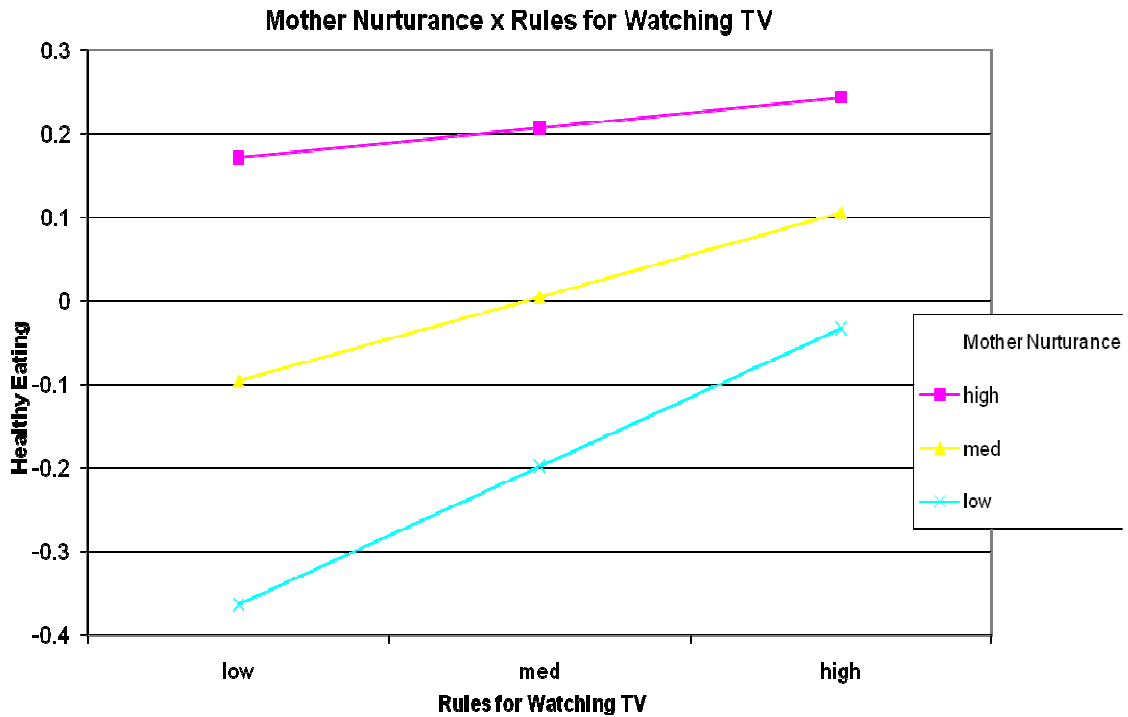


Figure 7. Interaction between mother nurturance and rules for watching television on children's healthy eating behaviors.

In addition, the slope for healthy eating and eating meals together differed significantly for the different levels of perceived father nurturance (low, medium, and high). As shown in Figure 8, the results of the simple slope analysis revealed that eating meals together was positively related to children's healthy eating with higher levels of perceived father nurturance ($\beta=.05$, $t=5.73$, $p<.001$) and with medium levels of perceived father nurturance ($\beta=.02$, $t=2.52$, $p\leq.01$). There was no significant relation for low levels of perceived father nurturance ($\beta=-.01$, $t=.00$).

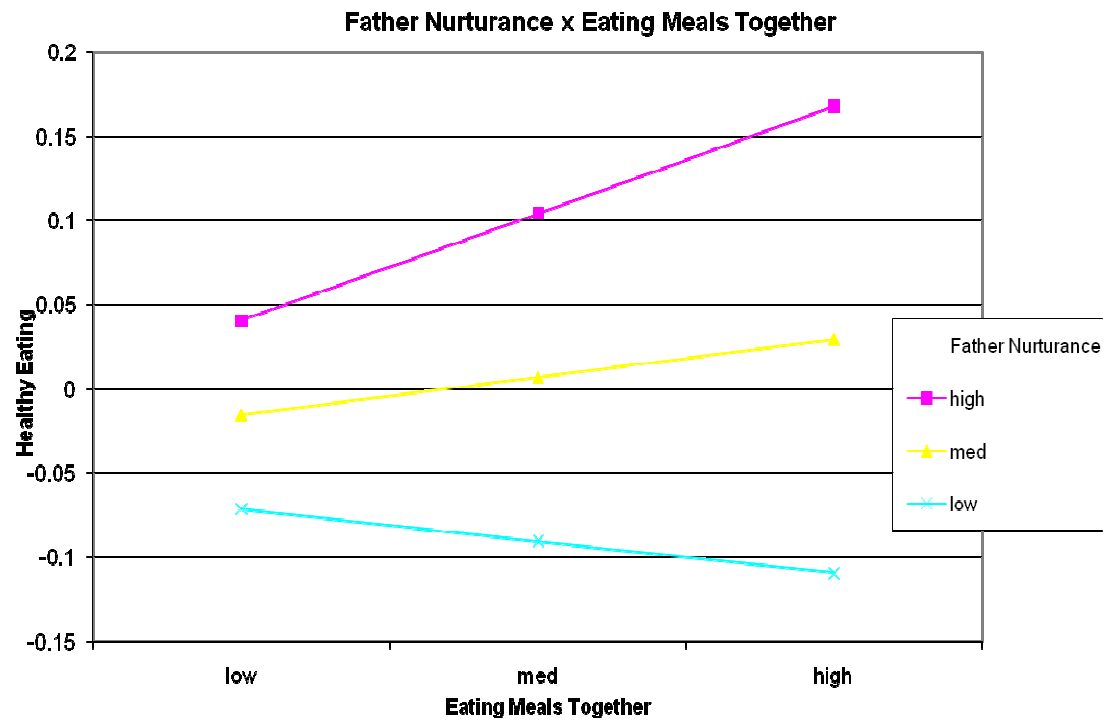


Figure 8. Interaction between father nurturance and eating meals together on children's healthy eating behaviors

School Model

The results can be described in conjunction with Figures 9 and 10, which represent the statistical school model for healthy eating and physical activity. The same three relations were examined as in the parent model: 1) the direct effect of school practices on children's health behaviors (RQ 4: How are school practices associated with children's healthy eating and physical activity behaviors?); 2) the indirect effect of parenting practices on children's behaviors (RQ 6: To what extent do children's self-beliefs serve as a pathway between school influences (environment and practices) and children's healthy eating and physical activity behaviors?); and 3) the moderating effect of the school environment on the association between parenting practices and children's behaviors (RQ 5: How does school belongingness affect the association between school practices and children's healthy eating and physical activity behaviors?).

The school model for healthy eating yielded the following fit indices: a CFI of 1.00, an SRMR of .00, an RMSEA of .00, and a chi-square value of $\chi^2(7, 3,955) = 6.37, p = .50$. The independent variables accounted for 6% of the variance in healthy eating and 8% of the variance in children's physical appearance self-worth. As for the school model for physical activity, similar fit indices were yielded: a CFI of .99, an SRMR of .01, an RMSEA of .02, and a chi-square value of $\chi^2(4, 3,638) = 8.13, p = .09$. The independent variables accounted for 7% of the variance in physical activity and 9% of the variance in children's self-efficacy. In addition, more focused fit tests (such as examination of modification indices and standardized residuals) all suggested adequate model fit.

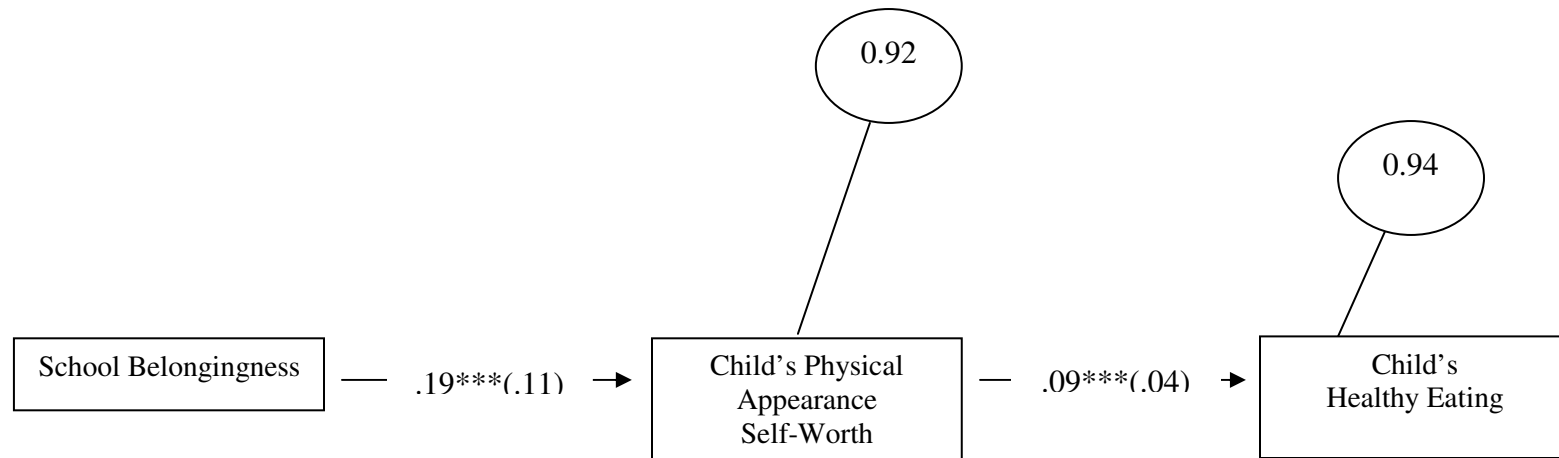


Figure 9. Statistical school model for healthy eating. $n = 3955$. Only significant findings are presented in the table. The standardized and unstandardized (in parentheses) betas are shown. *** $p \leq .001$.

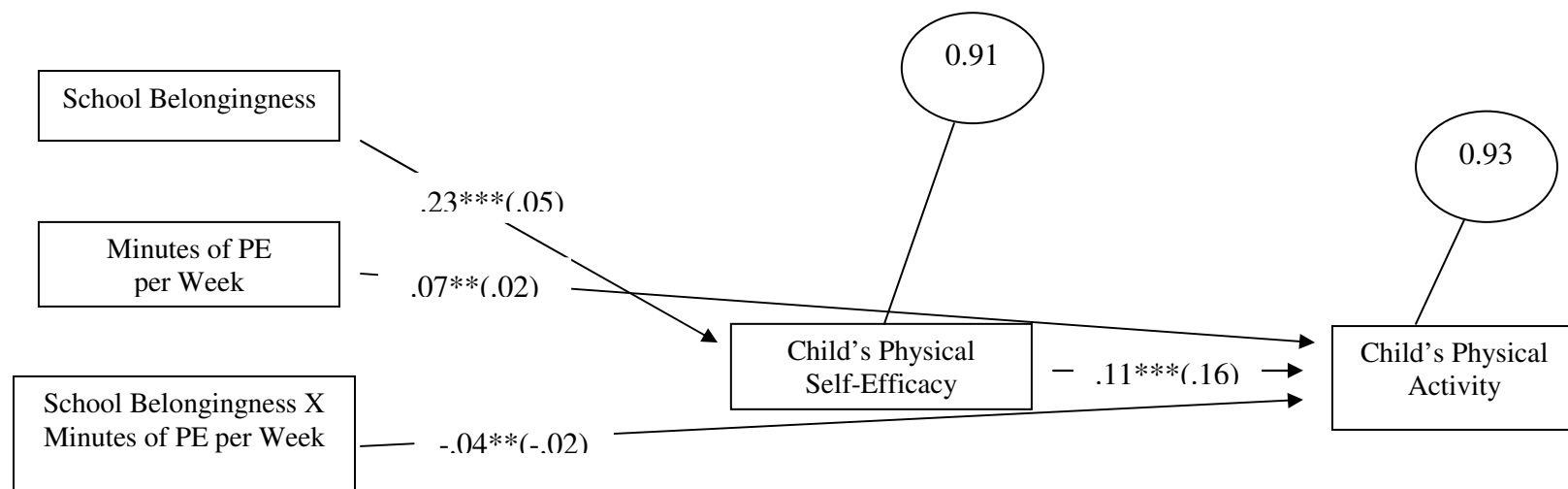


Figure 10. Statistical school model for physical activity. $n = 3638$. Only significant findings are presented in the table. The standardized and unstandardized (in parentheses) betas are shown.
 ** $p \leq .01$. *** $p \leq .001$.

Direct, indirect, and total effects of the school model. Tables 11 and 12 provide the standardized coefficients for the direct, indirect, and total effects of the statistical school model, including the results for the control variables. The results for the school model for healthy eating are presented first, followed by the results for physical activity.

Table 11

Direct, Indirect, and Total Effects for the School Model for Healthy Eating

Predictors	Outcomes				
	Physical Appearance Self-Worth		Healthy Eating		
	Direct	Total	Direct	Indirect	Total
School belongingness	.19***	.19***	.15	.02***	.16
Education on nutrition ^a	.06	.06	.12	.00	.12
Availability of national breakfast program ^a	-.22	-.22	-.08	.00	-.08
Availability of national lunch program ^a	.16	.16	-.01	-.00	-.01
No vending machines ^a	-.09	-.09	.08	-.00	.08
No competitive foods	.03	.03	.03	.00	.03
No beverage and food service contracts	-.03	-.03	-.02	.00	-.02
Body mass index screening ^a	-.03	-.03	-.03	.00	-.03
Child's sex ^a	.26***	.26***	-.16***	-	-.16***
Child's Hispanic ^a	-.40***	-.40***	.18**	-	.18**
Child's Black ^a	.20	.20	-.07	-	-.07
Child's Other ^a	-.19	-.19	.03	-	.03
Family SES	.11***	.11***	.04	-	.04
Physical appearance self- worth	-	-	.06***	-	-
School belongingness x edu. on nutrition	-	-	-.10	-	-.10
School belongingness x breakfast program	-	-	.08	-	.08
School belongingness x lunch program	-	-	-.02	-	-.02
School belongingness x no vending machines	-	-	-.02	-	-.02

Continued on next page

Table 11 (continued)

Direct, Indirect, and Total Effects for the School Model for Healthy Eating

Predictors	Outcomes				
	Physical Appearance Self-Worth		Healthy Eating		
	Direct	Total	Direct	Indirect	Total
School belongingness x no competitive foods	-	-	.06	-	.15
School belongingness x no contracts	-	-	-.05	-	.04
School belongingness x BMI screening	-	-	.02	-	-.03

Note. $n = 3955$. The standardized betas are shown,^a except for the dichotomous variables, which are the unstandardized betas. Sex was coded such that 0 = females and 1 = males; scores for race reflect comparisons with White students such that African- American, Hispanic, Other = 1 and Whites = 0. Physical appearance self-worth was the mediator. “-” indicates variable not included in analysis.

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

Table 12

Direct, Indirect, and Total Effects for the School Model for Physical Activity

Predictors	Outcomes				
	Physical Self-Efficacy		Physical Activity		
	Direct	Total	Direct	Indirect	Total
School belongingness	.23***	.23***	.07	.03***	.10**
Availability of physical activity facilities and equipment	-.03	-.03	-.04	-.00	-.04
Minutes per week of physical education	.02	.02	.07**	.00	.07**
Minutes per week of recess	.02	.02	-.00	-.00	-.00
Body mass index screening ^a	-.02	-.02	-.09	-.00	-.09
Physical self-efficacy	-	-	.11***	-	.11***
Child's sex ^a	.07**	.07**	.13***	-	.13***
Child's Hispanic ^a	-.13**	-.13**	-.04	-	-.04
Child's Black ^a	.00	.00	-.22**	-	-.22**
Child's Other ^a	-.12*	-.12*	-.32***	-	-.32***
Family SES	.12***	.12***	.08**	-	.08**
School belongingness x facilities & equipment	-	-	.04	-	-
School belongingness x physical education	-	-	-.04*	-	-
School belongingness x recess	-	-	.01	-	-
School belongingness x BMI screening	-	-	.01	-	-

Note. n = 3638. The standardized betas are shown, ^aexcept for the dichotomous variables, which are the unstandardized betas. Sex was coded such that 0 = females and 1 = males; scores for race reflect comparisons with White students such that African- American, Hispanic, Other = 1 and Whites = 0. Physical self-efficacy was the mediator. “-” indicates variable not included in analysis.

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

Healthy eating. None of the school practices for healthy eating had direct effects on children's healthy eating behaviors. However, children's physical appearance self-worth was significantly predictive of children's healthy eating. Furthermore, the results showed that the mean of healthy eating was significantly lower for boys than it was for girls. The mean of healthy eating was also significantly higher for Hispanic children compared to White children.

In addition, school belongingness was significantly predictive of children's physical appearance self-worth. None of the other variables were significant, except for a few of the demographic variables. Specifically, the mean of children's physical appearance self-worth was significantly higher for boys than it was for girls. In addition, Hispanic children had significantly lower mean levels of physical appearance self-worth compared to White children. Children from families reporting higher levels of SES had significantly higher physical appearance self-worth compared to children from families reporting lower levels of SES.

This statistical model also examined whether the school influences indirectly affected children's healthy eating through children's self-worth in terms of physical appearance. Based on joint significant tests (Biesanza et al., 2010; MacKinnon et al., 2002), children's healthy eating was indirectly influenced by school belongingness through children's self-worth in terms of physical appearance. That is, children's physical appearance self-worth fully mediated the relation between school belongingness and children's healthy eating. However, the total effect for school belongingness on children's healthy eating was non-significant. Therefore, the total

effects on children's healthy eating were the same as the direct effects for all predictors.

Physical activity. One school practice, minutes per week of physical education, was significantly predictive of children's physical activity. Children's physical self-efficacy was also significantly predictive of children's physical activity. In addition, the results showed that the mean of physical activity was significantly higher for boys than it was for girls. Both Black and "Other" children had significantly lower mean levels of physical activity compared to White children. Children that came from families reporting higher SES had significantly higher levels of physical activity compared to families reporting lower SES.

Furthermore, school belongingness was the only direct positive predictor of children's physical self-efficacy. Other significant findings include higher mean levels of physical self-efficacy for boys than for girls. Both Hispanic and "Other" children had significantly lower mean levels of physical self-efficacy compared to White children. In addition, Children from families reporting higher SES had significantly higher physical self-efficacy compared to children from families reporting lower SES.

The model also examined whether school influences indirectly affected children's physical activity behaviors through children's physical self-efficacy. Based on joint significant tests (Biesanza et al., 2010; MacKinnon et al., 2002), children's physical activity was indirectly influenced by school belongingness through children's physical self-efficacy. That is, children's physical self-efficacy fully mediated the relation between school belongingness and children's physical

activity. The total effects on children's physical activity were the same as the direct effects, except for a slight positive increase in the parameter estimates for school belongingness, due to the positive indirect effects of this variable.

Moderating effects of the school environment. The model also investigated the moderating effects of the school environment (as measured by school belongingness) on the association between parenting practices and children's positive health behaviors. To test for the predicted moderating effects, traditional regression methods were used in conjunction with product terms to test for possible interaction effects within the path analysis framework (Jaccard et al., 2003). Seven interaction terms were created for the school model for healthy eating (school belongingness x education on nutrition, school belongingness x breakfast program, school belongingness x lunch program, school belongingness x no vending machines, school belongingness x no competitive foods, school belongingness x no food service contracts, and school belongingness x no body mass index screening). There were four interaction terms created for the school model for physical activity (school belongingness x availability of physical activity facilities and equipment, school belongingness x minutes per week of physical education, school belongingness x minutes per week of recess, and school belongingness x no body mass index screening).

There was one significant interaction related to the school practice of minutes per week of physical education x school belongingness on children's physical activity. No significant interactions were found in the school model for healthy eating. As shown in Figure 11, the results of the simple slope analysis revealed that

minutes per week of physical education was negatively related to children's physical activity behavior with high levels of school belongingness ($\beta=-.04$, $t= -2.14$, $p<.05$) and was positively related to children's physical activity behavior with low levels of school belongingness ($\beta=.09$, $t=4.58$, $p<.001$). There was no significant relation for a medium level of school belongingness ($\beta=.02$, $t=.00$).

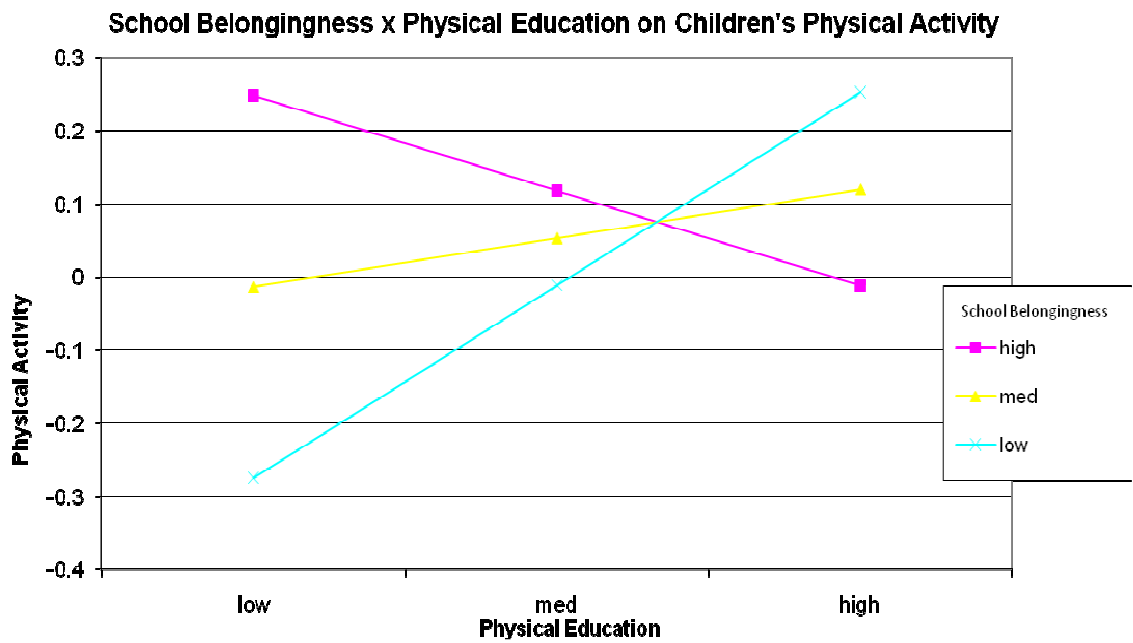


Figure 11. Interaction between school belongingness and minutes per week of physical education on children's physical activity behaviors.

Combined Parent and School Model

The model tested can be described in conjunction with Figures 12 and 13, which represent the statistical combined parent and school model for healthy eating and physical activity.

The combined parent and school model for healthy eating yielded the following fit indices: a CFI of 1.00, an SRMR of .00, an RMSEA of .00, and a chi-square value of $\chi^2(11, 3,928)=10.57, p=.48$. The independent variables accounted for 10% of the variance in healthy eating and 9% of the variance in children's physical appearance self-worth. As for the combined parent and school model for physical activity, similar fit indices were yielded: a CFI of .98, an SRMR of .01, an RMSEA of .02, and a chi-square value of $\chi^2(8, 3,614)=18.51, p=.02$. The independent variables accounted for 10% of the variance in physical activity and 10% of the variance in children's physical self-efficacy. In addition, more focused fit tests (such as examination of modification indices and standardized residuals) all suggested adequate model fit.

Direct, indirect, and total effects of the combined parent and school model. Tables 13 and 14 provide the standardized coefficients for the direct, indirect, and total effects of the model, including the results for the control variables. These results address the direct effects of parent and school practices on children's health behaviors. In addition, the results are presented for the indirect effects – that is, the effect parent and school influences had on children's self-beliefs, which, in turn, affected their healthy eating and physical activity behaviors.

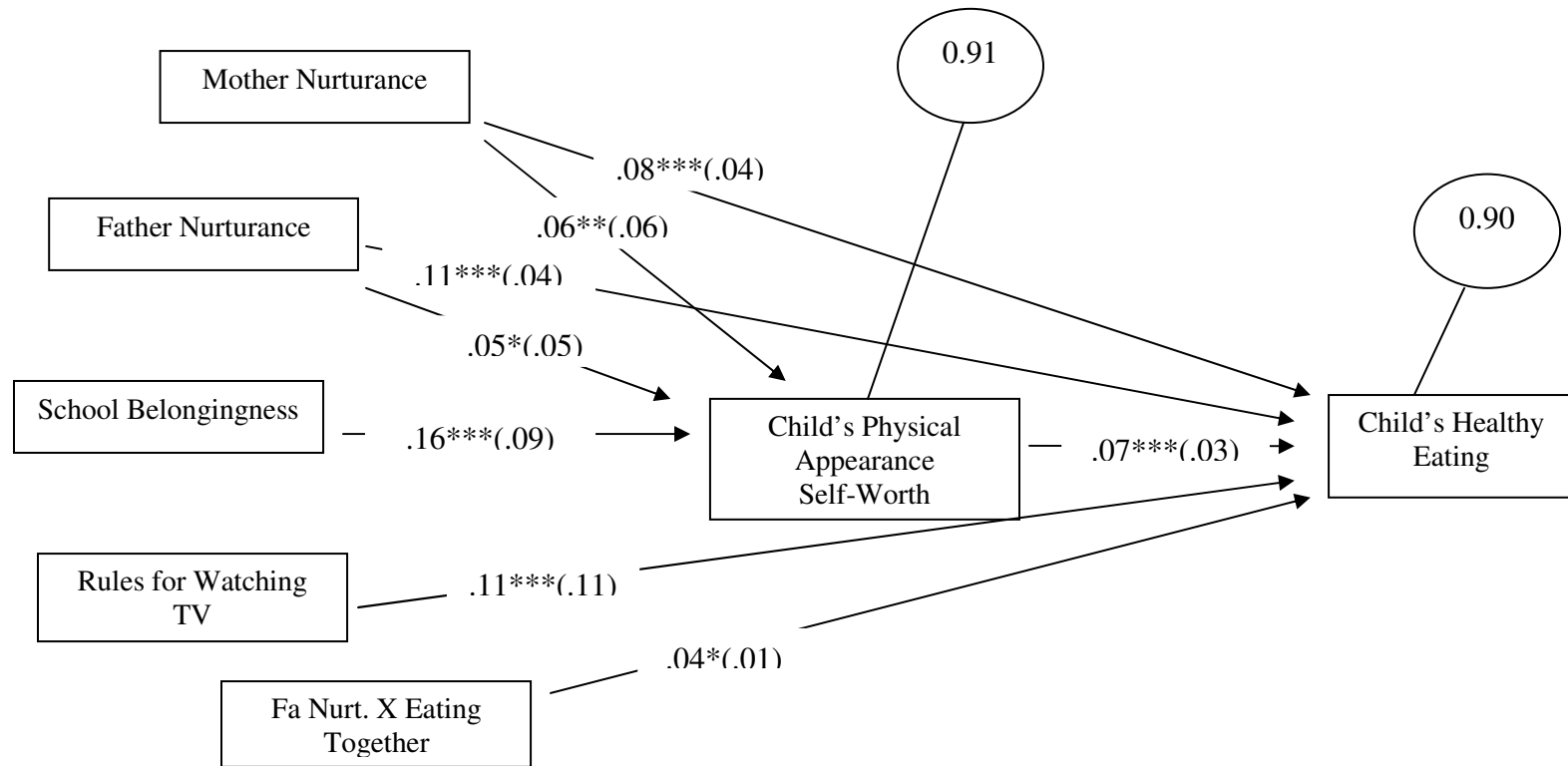


Figure 12. Statistical combined parent and school model for healthy eating. $n = 3928$. Only significant findings are presented in the table. The standardized and unstandardized (in parentheses) betas are shown. $*p \leq .05$. $**p \leq .01$. $***p \leq .001$.

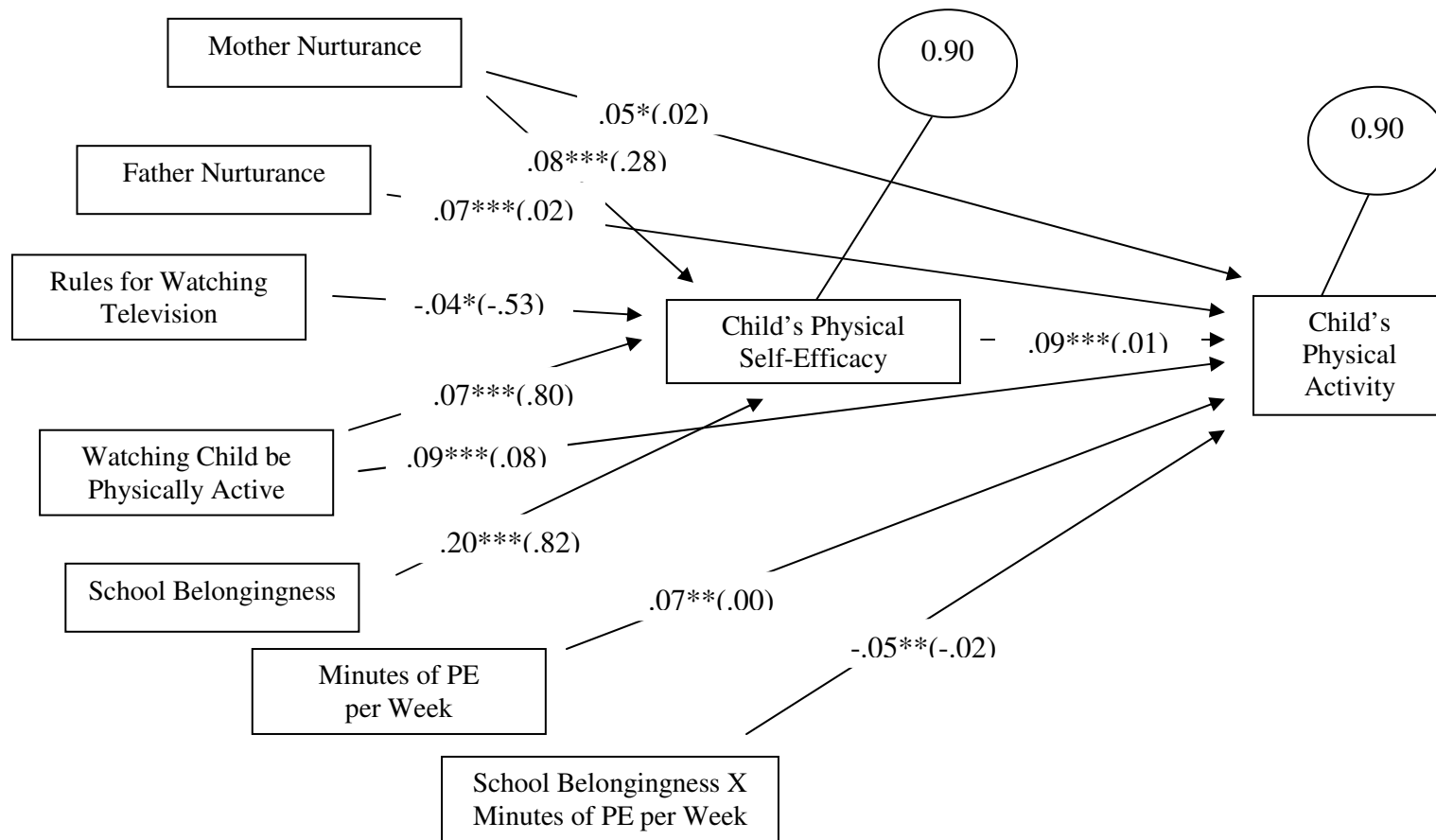


Figure 13. Statistical combined parent and school model for physical activity. $n = 3614$. Only significant findings are presented in the table. The standardized and unstandardized (in parentheses) betas are shown.
 $*p \leq .05$. $**p \leq .01$. $***p \leq .001$.

Healthy eating. As in the separate parent and school models, no school practices were related to healthy eating and only one parenting practice (rules for watching television) had a significant direct affect on children's healthy eating. Perceived mother nurturance, perceived father nurturance, and children's physical appearance self-worth was significantly predictive of children's healthy eating. In addition, the results showed that the mean of healthy eating was significantly lower for boys than it was for girls, whereas the mean of healthy eating was significantly higher for Hispanic children compared to White children.

Furthermore, perceived mother nurturance, perceived father nurturance, and school belongingness were significantly predictive of children's physical appearance self-worth. There were also a few significant demographic variables. Specifically, the mean of physical appearance self-worth was significantly higher for boys than it was for girls. Hispanic children had significantly lower mean levels of physical appearance self-worth compared to White children. In addition, children that came from families reporting higher SES had significantly higher physical appearance self-worth compared to children from families reporting lower SES.

Table 13

Direct, Indirect, and Total Effects for the Combined Parent and School Model for Healthy Eating

Predictors	Outcomes				
	Physical Appearance Self-Worth		Healthy Eating		
	Direct	Total	Direct	Indirect	Total
Mother nurturance	.06**	.06**	.08***	.01*	.08***
Father nurturance	.05*	.05*	.11***	.00	.11***
Rules for watching television	.03	.03	.11***	.00	.11***
Eating meals together	-.01	-.01	.02	-.00	.02
Mo nurt. x rules for watching TV	-	-	-.02	-	-.02
Mo nurt. x eating together	-	-	-.02	-	-.02
Fa nurt. x rules for watching TV	-	-	.00	-	.00
Fa nurt. x eating together	-	-	.04*	-	.04*
School belongingness	.16***	.16***	.05	.01***	.06
Education on nutrition ^a	.04	.04	.11	.00	.11
Availability of national breakfast program ^a	-.23	-.23	-.09	-.00	-.09
Availability of national lunch program ^a	.16	.16	-.00	.00	-.00
No vending machines ^a	-.08	-.08	.08	-.00	.08
No competitive foods	.03	.03	.03	.00	.03
No beverage and food service contracts	-.02	-.02	-.02	.00	-.02
No body mass index screening ^a	-.03	-.03	-.03	.00	-.03
School belongingness x edu. on nutrition	-	-	-.08	-	-.08

Continued on next page

Table 13 (continued)

Direct, Indirect, and Total Effects for the Combined Parent and School Model for Healthy Eating

Predictors	Outcomes				
	Physical Appearance Self-Worth		Healthy Eating		
	Direct	Total	Direct	Indirect	Total
School belongingness x breakfast program	-	-	.09	-	.09
School belongingness x lunch program	-	-	-.03	-	-.03
School belongingness x no vending machines	-	-	-.01	-	-.01
School belongingness x no competitive foods	-	-	.07	-	.07
School belongingness x no contracts	-	-	-.04	-	-.04
School belongingness x BMI screening	-	-	.02	-	.02
Physical appearance self-worth	-	-	.07***	-	.07***
Child's sex ^a	.28***	.28***	-.14***	-	-.14***
Child's Hispanic ^a	-.39**	-.39**	.20**	-	.20**
Child's Black ^a	.17	.17	-.08	-	-.08
Child's Other ^a	-.14	-.14	.08	-	.08
Family SES	.09***	.09***	.01	-	.01

Note. n = 3928. The standardized betas are shown,^a except for the dichotomous variables, which are the unstandardized betas. Sex was coded such that 0 = females and 1 = males; scores for race reflect comparisons with White students such that African- American, Hispanic, Other = 1 and Whites = 0. Physical appearance self-worth was the mediator. “-” indicates variable not included in analysis.

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

Table 14

Direct, Indirect, and Total Effects for the Combined Parent and School Model for Physical Activity

Predictors	Outcomes				
	Physical Self-Efficacy		Physical Activity		
	Direct	Total	Direct	Indirect	Total
Mother nurturance	.08***	.08***	.05*	.01**	.06*
Father nurturance	.02	.02	.07***	.00	.07***
Rules for watching television	-.04*	-.04*	.02	-.004*	.02
Watching child be physically active	.07***	.07***	.09***	.01**	.10***
Mo nurt. x rules for watching TV	-	-	-.02	-	-.02
Mo nurt. x watch be active	-	-	.02	-	.02
Fa nurt. x rules for watching TV	-	-	.00	-	.00
Fa nurt. x watch be active	-	-	-.01	-	-.01
School belongingness	.20***	.20***	.03	.02***	.05
Availability of physical activity facilities and equipment	-.03	-.03	-.04	-.00	-.04
Minutes per week of physical education	.02	.02	.07**	.00	.07**
Minutes per week of recess	.02	.02	.01	-.00	.01
Body mass index screening ^a	-.25	-.25	-.08	-.00	-.08
School belongingness x facilities & equipment	-	-	.01	-	-.04
School belongingness x physical education	-	-	-.05*	-	.05*
School belongingness x recess	-	-	.01	-	.01
School belongingness x BMI screening	-	-	.04	-	.04

Continued on next page

Table 14 (continued)

Direct, Indirect, and Total Effects for the Combined Parent and School Model for Physical Activity

Predictors	Outcomes				
	Physical Self-Efficacy		Physical Activity		
	Direct	Total	Direct	Indirect	Total
Physical self-efficacy	-	-	.09***	-	.09***
Child's sex ^a	1.42***	1.42***	.12***	-	.12***
Child's Hispanic ^a	-2.18**	-2.18**	-.01	-	-.01
Child's Black ^a	-.22	-.22	-.23***	-	-.23***
Child's Other ^a	-1.82	-1.82	-.26**	-	-.26**
Family SES	.10***	.10***	.05	-	.05

Note. n = 3614. The standardized betas are shown, ^aexcept for the dichotomous variables, which are the unstandardized betas. Sex was coded such that 0 = females and 1 = males; scores for race reflect comparisons with White students such that African- American, Hispanic, Other = 1 and Whites = 0. Physical appearance self-worth was the mediator. "--" indicates variable not included in analysis.

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

Based on joint significant tests (Biesanza et al., 2010; MacKinnon et al., 2002), children's healthy eating was indirectly influenced by perceived mother nurturance, perceived father nurturance, and school belongingness through children's physical appearance self-worth. The total effects on children's healthy eating were the same as the direct effects, except for a slight positive increase in the parameter estimates for perceived mother and father nurturance, due to the positive indirect effects of these variables, although the total effect for school belongingness on children's healthy eating was non-significant.

Physical activity. The parenting practice of watching the child engage in physical activity and the school practice of minutes per week of physical education were significantly predictive of children's physical activity. The other significant

direct pathways included perceived mother nurturance, perceived father nurturance, and children's physical self-efficacy. In terms of demographic variables, the mean of physical activity was significantly higher for boys than it was for girls. Both Black and Other children had significantly lower mean levels of physical activity compared to White children.

In addition, both parenting practices (rules for watching television and watching the child engage in physical activity) were significantly predictive of children's physical self-efficacy. Perceived mother nurturance and school belongingness were also positive predictors of children's physical self-efficacy. Other findings in this statistical model showed that the mean of physical self-efficacy was significantly higher for boys than it was for girls. In addition, both Hispanic and "Other" children had significantly lower mean levels of children's physical self-efficacy compared to White children. Children that came from families reporting higher SES had significantly higher physical self-efficacy compared to children from families reporting lower SES.

Based on joint significant tests (Biesanza et al., 2010; MacKinnon et al., 2002), children's physical activity was indirectly influenced by both of the parenting practices (rules for watching television and watching the child engage in physical activity), perceived mother nurturance, and school belongingness through children's physical self-efficacy. The total effects on children's physical activity were the same as the direct effects, except for a slight positive increase in the parameter estimates for perceived mother nurturance and watching the child engage in physical activity, due to the positive indirect effects of these variables. However, the total effect for

school belongingness and rules for watching television on children's physical activity was non-significant.

Moderating effects of parent environment. The same methods described in the separate statistical parent and school model were used in the statistical combined parent and school model (Jaccard et al., 2003). In addition, the same interactions terms were used, so for the statistical combined parent and school model for healthy eating, all of the interaction terms used in the separate statistical parent (four interactions) and school (seven interactions) models were included. This is also the case for the statistical combined parent and school model for physical activity.

There was a significant interaction in the healthy eating analysis: perceived father nurturance x eating meals together. The same relations were found as were in the separate models (see Figure 8). In addition, there was one significant interaction related to the school practice of minutes of physical education x school belongingness, in terms of children's physical activity. The same relations were found as were in the separate models (see Figure 11).

Supplemental Analyses

In this section, supplemental issues are addressed, including specification error and power. Specifically, some perspective on specification error and statistical power is provided to assess the appropriateness of the models and the possibility of a Type II error for statistically non-significant path coefficients.

Specification Error

The models seemed to be appropriately specified. For example, all six statistical models were able to converge with the default number of iterations. In addition, all the parameters were able to be estimated with Mplus; however, a few of the standardized residuals (z-scores) were unable to be computed due to the complex sampling. Therefore, for those parameters, the normalized residual estimates were used and shown to be adequate for model fit. No offending estimates (such as negative error variances) were found. However, Muthén and Muthén (2010) recommend that the variances of the measures used be less than 10, when running a path analysis; therefore, in Mplus, the variances were rescaled via the define command.

Power Analyses

Power analyses for path models are complicated and often rely on assumptions that are impractical or not viable (Jackson, 2003). According to the recommendations of Jaccard et al. (2003), a rough sense of statistical power can be determined by applying power analytic methods for ordinary least squares regression as applied to selected linear equations from the set of linear equations implied by the model in question. Power analyses examining the parameter estimates for the model paths and model-data fit were conducted for each model (parent, school, and combined), and separately for healthy eating and physical activity. The power for the parameter estimates for the model paths and model-data fit was greater than .99 for each of the six path analyses implemented in this study, indicating that there was

sufficient power. The process by which the power analyses were conducted is discussed in detail in Appendix G.

Chapter 5

Discussion

The present study examined the parental and school influences associated with fifth graders' healthy eating and physical activity behaviors. Most of the research conducted to date has used simple models to explore the associations between parental and school influences and children's healthy eating and physical activity behaviors, ignoring the possible mediators and moderators that might explain additional mechanisms in these contexts. The present study includes these additional processes, thereby elucidating some of the interesting and relevant dynamics related to how parents and schools impact children's positive health behaviors.

Specifically, this study examined three relations within the parent model. These include: 1) a direct relation between parenting practices and children's positive health behaviors; 2) whether the parent environment moderates the relation between parenting practices and children's positive health behaviors; and 3) an indirect relation between parenting practices and children's positive health behaviors. In the school model, these same three relations were examined. Lastly, a final model explored whether or not the same pathways and effects exist when the parent and school models are combined into one model.

This chapter begins with a discussion of the findings for the parent model, the school model, and the combined parent and school model. Specifically, the discussion addresses the main findings for each model, the key gaps in the research, the ways in which the current findings address those gaps, and how the findings replicate and extend previous work related to the research questions. Finally, the

strengths and limitations of the study are discussed, along with thoughts regarding possible future directions for research.

Findings and Implications for Parental and School Influences

Parent Model

The parent model was designed to address three questions: How are parenting practices associated with children's healthy eating and physical activity behaviors? How does parental nurturance affect the association between parenting practices and children's healthy eating and physical activity behaviors? To what extent do children's self-beliefs serve as a pathway between parental influences (environment and practices) and children's healthy eating and physical activity behaviors? Results and implications are presented for each of the three research questions.

In general, parental influences played a role in affecting children's positive health behaviors. The results are consistent with previous studies demonstrating that specific parenting practices are directly predictive of children's healthy eating and physical activity behaviors (see, for example, Beets et al., 2006; Larson et al., 2006; Trost et al., 2003; Young et al., 2004). In addition, the findings confirm the few studies that have suggested that children's self-beliefs mediate the relation between parenting practices and children's physical activity behaviors (Shields et al., 2008; Trost et al., 2003); this indirect effect, however, was not supported in the parent model for healthy eating.

Only a few studies have examined the direct, indirect, and moderating effects of parental influences on children's healthy eating and physical activity behaviors, and none (to my knowledge) have explored all three types of relations simultaneously

in an exploratory causal model. Thus, the current study extends the literature pertaining to parental influences on children's positive health behaviors in several ways, including an evaluation of an exploratory causal parent model for healthy eating and physical activity, direct and indirect effects of parental influences, moderating effects of parental nurturance, and unique contributions of mothers and fathers.

Overall, the parent model for both healthy eating and physical activity (as shown in Figure 2) had adequate model-data fit indices. These findings suggest that parental influences on children's health behaviors are not simply direct associations; rather, there are other indirect and moderating pathways to consider. Researchers have found that a generally supportive parental attitude positively affects the behaviors of children (such as Baldwin, 1948; Baumrind, 1967; Symonds, 1939); however, single dimensions of parenting, such as parent nurturance, and health-related behaviors (including healthy eating and physical activity) have been rarely examined.

As discussed earlier, parental nurturance in the current study represents the context within which the parenting practices occur, rather than a specific practice or set of practices. Specifically, parental nurturance is the expression of love, responsiveness, and involvement on the part of the mother and/or father (Barnes & Windle, 1987; Baumrind, 1967). The results demonstrated that both perceived mother and father nurturance are direct predictors of children's healthy eating and physical activity behaviors. These findings underscore the importance of understanding children's perceptions of global parenting attitudes, in conjunction

with specific parenting practices, in predicting children's positive health behaviors. There were two aspects of parental nurturance assessed in this study: emotional expressions (e.g., hugs, verbal statements of love, and communication of acceptance) and instrumental acts (e.g., playing together, doing favors, and helping) (Baumrind, 1967; Locke & Prinz, 2002). Of note is that parents can learn these two aspects of nurturance to help promote healthy behaviors among their children.

Furthermore, few studies have assessed mediators of parental influence on children's healthy eating and physical activity behaviors. Specifically, previous studies have only examined the mediating effects of children's self-beliefs between specific parenting practices and children's positive health behaviors (Shields et al., 2008; Trost et al., 2003). The current study examined the indirect effects of both parental nurturance and parenting practices. As expected, the results of the path analyses demonstrated that perceived mother and father nurturance indirectly influence children's healthy eating and physical activity behaviors through their associations with children's physical appearance self-worth and physical self-efficacy, respectively. These findings revealed that the emotional climate created by parents in the home have a stronger effect on behavior through the impact it has on children's self-beliefs than through a direct effect on children's behavior. In addition, these findings are consistent with the theoretical underpinnings of a learning theory framework that predicts specific parenting practices will have an impact on children's behavior by way of modeling (Sears, Maccoby, & Levin, 1957), and a social cognitive perspective, that emphasizes that the environment has the potential to

influence children's behavior through the impact it has on their self-beliefs (Bandura, 1986).

Interestingly, the type of belief used to assess the indirect effects of specific parenting practices on children's health behaviors seemed to matter. For example, in the analysis for healthy eating, physical appearance self-worth was significantly associated with the global parent environment (parental nurturance), but was not significantly associated with any of the specific parenting practices for healthy eating. In the analysis for physical activity, however, physical self-efficacy served as a significant mediator between both parental nurturance and specific parenting practices and children's physical activity behaviors. Bandura (1986) has suggested that self-worth and self-efficacy represent different phenomena. For example, self-efficacy focuses on children's beliefs in terms of their abilities or capabilities regarding specific tasks and activities, while self-worth is a more general belief about their abilities and competence. These definitions support the findings in that physical self-efficacy and physical appearance self-worth do not function in the same way.

In general, studies have shown that self-efficacy is a stronger predictor of children's behaviors than self-worth (Pajares & Miller, 1994; Zimmerman & Cleary, 2006). Specifically, Bandura's (1997) research has demonstrated that there are specific things that can be done to influence self-efficacy. For instance, children's self-efficacy for healthy behaviors can increase by learning from their previous experiences of eating healthy foods or being physically active, watching others eat healthy foods or be physically active, receiving encouragement to engage in healthy behaviors from parents or school staff, and experiencing a positive emotional state

when engaging in healthy behaviors. All of these strategies can be implemented by parents and directly affect children's health behaviors. The research has not been clear on how specific parenting practices increase self-worth, which might explain why the parenting practices assessed in this study did not influence children's physical appearance self-worth.

One last pathway examined how the effectiveness of specific parenting practices related to healthy eating and physical activity varies as a function of parental nurturance. Two previous studies have examined this moderating effect (see Chapter 2 for a complete discussion); the current study, however, is the first to use a diverse sample from the United States and examine this moderating effect for physical activity. Two significant interactions were found in the parent model for healthy eating. Specifically, in homes with high and medium levels of father nurturance, there was a positive relation between the eating of meals together and children's healthy eating compared to low levels of father nurturance. This finding is consistent with the theoretical predictions of Darling and Steinberg (1993), which suggests that the emotional environments parent establish will predict how effective parenting practices are in terms of influencing children's behaviors.

Furthermore, the interpretation was similar for the association between mother nurturance and rules regulating the watching of television on children's healthy eating. That is, in homes with high levels of mother nurturance, there was a positive relation between perceived mother nurturance and rules for watching television. However, there was also a significant positive relation between rules for watching television and children's healthy eating in homes with low levels of mother

nurturance. This latter finding suggests that the presence of rules is important regardless of nurturance, along with the notion that relations between high levels of nurturance and healthy eating imply legitimacy of parent authority for setting rules for watching television.

Based on the results of the current study, it was unclear whether parental nurturance alone serves as an appropriate indicator of the parent environment. Previous studies examining the effects of parenting on children's healthy eating and physical activity behaviors used parenting styles (e.g., authoritative, authoritarian) rather than individual parenting dimensions, such as parental nurturance, as a means by which to define the parent environment (e.g., Lohaus et al., 2009; Lytle et al., 2003; Schmitz et al., 2002). By including additional dimensions such as parental control or the granting of psychological autonomy, a more comprehensive profile of the parent environment might be captured.

To the best of my knowledge, this is the first study to demonstrate that nurturance from both mothers and fathers directly and positively affects children's healthy eating and physical activity behaviors, with the exception of a single study by Kim et al. (2008). The importance of documenting perceived nurturance of both mothers and fathers was supported by the findings in that perceived father and mother nurturance differentially affect children's self-beliefs and health behaviors as well as the association between parenting practices and children's health behaviors. For example, perceived mother and father nurturance directly affected children's healthy eating and physical activity behaviors, with the relation being slightly stronger for fathers. In contrast, the relation between children's self-beliefs (physical appearance

self-worth and physical self-efficacy) and perceived parental nurturance was stronger for mothers. Additionally, the parenting practice that perceived mother nurturance moderated had to do with setting rules and providing guidance (the provision of structure), whereas the parenting practice that perceived father nurturance moderated had to do with engaging in activities together (the provision of opportunities). These findings are consistent with previous studies demonstrating that mothers tend to have stronger relations to children's self-beliefs as they are generally the original attachment figure in a child's life and more involved in everyday relationships of support (Bowlby, 1969) compared to fathers, who tend to have a stronger effect on children's behaviors because of their powerful and more salient presence in the home compared to mothers (Wentzel & Feldman, 1996).

It is also important to note that children might perceive mother and father nurturance differently. In the current study, the questions for mother and father nurturance were the same and pilot tested for cognitive understanding. Most of the children in this study lived with their biological father (59%), saw or spoke regularly with their father (27%), or had someone that acted as their father (6%), while only 8% of children did not have their father or any type of father figure in their lives. Although this might be an issue of concern, the findings for father nurturance behaved as expected and seemed to be reliable.

In general, small effect sizes were found for the pathways in the parent model, which might result from measurement issues. For example, in the current study, two types of practices are discussed: the provision of structure and the provision of opportunities. However, due to the paucity of available measures in the dataset used

for the current study, composites for the provision of structure and the provision of opportunities could not be developed. Therefore, it was necessary to use single items for the parenting practices. Another concern was that the parenting practice, parents watching their children be physically active and children's physical activity were measuring the same phenomenon; however, the correlation ($r=.17$) between the two suggested this is not the case.

In addition, the measures for physical activity and healthy eating could be improved. For instance, researchers might use more rigorous measures for measuring physical activity, such as heart rate monitors or accelerometry procedures (such as pedometers) rather than relying on self-reported data (Beets, Patton, & Edwards, 2005). In terms of healthy eating, food diaries or an adapted version of the Healthy Eating Index (HEI) for children, which is a measure of the overall quality of an individual's diet developed by the U.S. Department of Agriculture (USDA) to assess how well American diets comply with the *2000 Dietary Guidelines for Americans* and the *Food Guide Pyramid* (Basiotis, 2002), could be used.

Additionally, studies have shown that a parent's weight is a predictor of his or her children's weight, and overweight parents and children are less likely to engage in healthy eating and physical activity (American Academy of Pediatrics, 2003). In general, genetics, behaviors, and the environment seem to contribute to the health behaviors children engage in and whether or not they become overweight. However, more research is needed to delineate how these three aspects uniquely contribute to children's behaviors and weight, as well as how they influence one another. It is possible that a measurement of parent's body mass index should have been included

in the parent model, because it might have provided some insight into the practices parents model and implement related to healthy eating and physical activity.

School Model

Similar to the parent model, the school model was designed to address three parallel questions: How are school practices associated with children's healthy eating and physical activity behaviors? How does school belongingness affect the association between school practices and children's healthy eating and physical activity behaviors? To what extent do children's self-beliefs serve as a pathway between school influences (environment and practices) and children's healthy eating and physical activity behaviors? Results and implications are presented related to each of the three research questions.

Although there have been some studies examining the direct associations between school practices and children's healthy eating and physical activity behaviors (see, for example, Donnelly et al., 2009; Dunton et al., 2009; Gordon-Larsen et al., 2000), none of them have investigated the possible direct, indirect, and moderating pathways guided by a conceptual model. This is the first study to apply the theoretical underpinnings of the model proposed by Darling and Steinberg (1993) to a school context. Therefore, the current study extends the literature of school influences on children's positive health behaviors in several ways, including evaluation of an exploratory causal school model for healthy eating and physical activity, inclusion of direct and indirect effects of school influences, and the moderating effects of school belongingness.

Similar to the parent model, the school model for both healthy eating and physical activity (as shown in Figure 3) had adequate model-data fit indices. Although these findings support the direct, indirect, and moderating effects included in this model as a whole, there were very few significant pathways. These findings also suggest that school influences on children's health behaviors are not simply direct associations; rather, there are other indirect and moderating pathways to consider.

In contrast to parental influences, school influences played a limited role in affecting children's healthy eating and physical activity behaviors. Specifically, there was only one school practice for physical activity (minutes per week of physical education) associated with children's physical activity. Although previous studies confirm the relation between physical education and physical activity (e.g., Dunton et al., 2009), the findings were inconsistent with previous findings in that none of the school practices for healthy eating were shown to significantly influence children's healthy eating behaviors. One explanation for this finding might be a result of the school practices used in the current study. For instance, school practices had to with school policies and structural features of the school not the quality of interactions between the students and school staff or peers. This was in contrast to the parent model, which included parenting practices that reflected interactions between the parent and child.

While the school practices included in this study were specific to healthy eating and physical activity, it is possible that there are other, more proximal, practices that would affect children's beliefs about healthy eating and physical

activity and their behaviors. These practices include activities occurring in a classroom or the modeling of healthy behaviors by teachers and peers. Another explanation might be the type of measures used for the school practices. Several of the measures were single dichotomous items, which might limit the validity and interpretability of the results. Furthermore, none of these variables accounted for the quality of the practice. For example, the item for nutrition education only asked whether or not children received nutritional education, but there were no follow up questions that asked about the pedagogical strategies implemented.

In addition, few studies have assessed mediators of school influence on children's healthy eating and physical activity. Consistent with the parent model, the results demonstrated that school belongingness indirectly affects children's healthy eating and physical activity behaviors via their self-beliefs. The strength of the indirect effect was similar regardless of the type of self-belief (physical self-worth or physical self-efficacy); although it is important to note that these findings were slightly weaker for the analysis of healthy eating. These findings suggest that although school belongingness does not directly affect children's healthy eating and physical activity behaviors, it does play a salient role in influencing children's individual beliefs about their overall value in terms of their physical appearance and perceived physical abilities. This finding also supports the distinction Darling and Steinberg made about the emotional climate (environment) and specific practices. Specifically, the emotional climate is independent of content and influences children's self-beliefs rather than their behaviors.

It was surprising that none of the school practices indirectly affected children's positive health behaviors. While only a few intervention studies have examined the indirect effects of school health education programs on children's physical activity levels (e.g., Dishman et al., 2004; Dzewaltowski et al., 2009), none of them investigated the more global school level policies and practices. A potential reason for the lack of significant findings is that the self-beliefs used in the school models might not capture how school practices are affecting children's decision-making processes. For example, from a social cognitive perspective, self-efficacy is part of a reciprocal process with self-regulatory mechanisms (such as goal setting and self-monitoring). These mechanisms also contribute to children's confidence levels in performing a particular behavior. Therefore, school practices might have a stronger effect on these specific self-regulatory mechanisms than the self-beliefs (self-efficacy and self-worth) used in the current study. In addition, some of the school practices, such as having vending machines or selling competitive foods, were not healthy practices, which might explain the lack of significant associations between school practices and children's self-beliefs.

The school model also examined how the effectiveness of specific school practices related to healthy eating and physical activity varies as a function of school belongingness. There was only one significant interaction found in the school model for physical activity. The significant interaction revealed that the relation between minutes per week of physical education and children's physical activity was positive in schools with low levels of school belongingness, and there was a negative association between minutes per week of physical education and children's physical

activity in schools with high levels of school belongingness. This interaction did not support the processes identified by Darling and Steinberg; in fact, the opposite was found. Specifically, the interaction between school belongingness and physical education did not support the notion that children in schools at which they feel accepted and respected by peers and teachers might be more willing to engage in and/or follow the healthy eating and physical activity related practices promoted by their schools. This could imply that the processes linking the school environment and specific school practices operate in another way within a school context compared to the parent context.

However, as discussed above, perhaps school practices that are more proximal, such as classroom-level practices (including quality physical education and classroom or homework assignments that incorporate healthy eating and physical activity) or peer interactions related to healthy eating and physical activity, would be more applicable. Conversely, the findings might be a result of not using a more proximal measure of school belongingness such as belongingness within the physical education classroom.

Finally, as discussed in terms of parental nurturance, it was unclear whether school belongingness served as an adequate indicator of the nurturing qualities of a school environment, which might also explain the lack of significant findings. School belongingness referred to students' perceptions of being accepted and respected at school (Finn, 1989; Goodenow, 1993). Although the current study was designed in a parallel way, the items for parental nurturance were more concrete (e.g., How often does {your mother} give you praise or encouragement?, How often does

{your mother} give you a hug or kiss?, How often do you and {your mother} do things together that you both enjoy?), whereas the items for school belongingness were more general (e.g., How much do you feel that your teachers care about you?, You feel close to people at your school, You feel like you are part of your school, You like going to school). The two aspects of parental nurturance, emotional expressions (e.g., communication of acceptance) and instrumental acts (e.g., helping), might serve as examples of how to develop more concrete items to assess a nurturing school environment (e.g., “How often do you receive encouragement from a peer/teacher? or “How often does someone in the school help you with something?”).

Combined Parent and School Model

The combined parent and school model was designed to address one specific research question: To what greater extent does a model combining both parent and school contexts explain children’s healthy eating and physical activity behaviors, as compared to one that uses just the parent model? In general, the combined parent and school model for both healthy eating and physical activity (as shown in Figure 3) had adequate model-data fit indices. These findings support combining the singular parent and school models into one model; however, the additive model demonstrated that the individual context models are not misleading and are, for the most part, an adequate representation of the relations between environment, practices, and children’s positive health behaviors.

As expected, the combined model provided a greater explanation of children’s healthy eating and physical activity behaviors in comparison to an examination of a singular parent model. These results support the notion that children grow up in

multiple contexts, each of which uniquely and jointly influence development. With the current model, however, it was difficult to determine whether the school policies and practices implemented to encourage healthy eating and physical activity affect children's positive health behaviors above and beyond parental and individual influences.

Another issue that remains unclear is how these different contexts (home and school) affect the decision-making and self-regulating processes of individual children, which subsequently determine their health behaviors. Incorporating variables that capture children's knowledge, autonomous beliefs, and beliefs about decision-making (such as ability to choose healthy options from all available options and understand the consequences for not choosing a healthy option) would be a useful contribution to the field. In addition, using a multiplicative approach over an additive approach might have demonstrated that the interaction effects of the two contexts (parents and schools) surpass the sum of the individual context effects. The approach also might have helped determine whether parents or schools have a greater influence on children's health behaviors under certain conditions.

In general, this study focused on a narrow aspect of the context found in the person-process-context model presented by Bronfenbrenner (1989). In addition, this study did not examine the interaction between macro-level contexts; however, it examined how two aspects of the parent-child context (environment and practices) interact with the child to affect children's health behaviors. Furthermore, this study was interested in the more proximal influences (such as processes and mechanisms in homes and schools) that directly affect children through interpersonal relationships

and influence their development of healthy eating and physical activity behaviors (Bronfenbrenner, 1989).

However, one important proximal context that was not examined in this study was the peer group. Schools provide opportunities for peer group socialization that could affect the parent-adolescent relationship and children's positive health behaviors (e.g., lunchtime, health and physical education classes, and recess). Peer groups can either reinforce or negate the health messages established by parents. In general, studies that have examined how the peer group influences food choices are rare. Salvy, Kieffer, & Epstein (2008) found that peers support adolescents in selecting high-calorie, low-nutrient foods but the associations are weak. Another study found that peers mostly influence the snack choices of adolescents (French et al., 1999). More research is needed to understand the ways in which peers influence children's fruit and vegetable consumption as well as other healthy food choices. Similarly, for physical activity, only a few research studies have examined the association between peer influences and children's physical activity (Anderssen & Wold, 1992; Salvy et al., 2009). Future research should replicate the existing findings and examine peer influence with respect to organized sports.

Furthermore, a more distal context that should be explored, and which can impact the children's health behaviors of children, is the neighborhoods where they live. Neighborhood characteristics are important factors that contribute to safety or lack thereof, social networks, and the formal and informal supervision of children. In general, the term "neighborhood" refers to the area of a town or city in which families reside. Families generally choose their neighborhoods based on two factors: family

socioeconomic status and race/ethnicity (Leventhal & Brooks-Gunn, 2000). It is possible that parental behavior might be the primary mechanism through which neighborhood influences operate. For example, parents access neighborhood resources such as schools, develop relationships with other families in their neighborhood, and develop supervision and monitoring systems based on the physical environment of the neighborhood in which they reside. However, neighborhoods that are safe and are supervised and monitored by neighbors also tend to foster healthy behaviors, particularly physical activity (Weir, Etelson, & Brand, 2006). In addition, the proximity of grocery stores that sell healthy foods is also predictive of children consuming healthier foods (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008).

Sex, Race, and Family SES

Although sex, race, and family SES were included in this study as control variables, there were some interesting findings relating to these factors worth discussing. The results found that boys, in general, engaged in higher levels of physical activity, while girls, in general, consumed healthier food choices. These results were inconsistent with the recent National Youth Risk Surveillance Study (YRBS) (Centers for Disease Control and Prevention, 2010), which indicated that boys consumed more fruits and vegetables than girls. The contrast in findings might be explained by the measures used for healthy eating and physical activity. Specifically, the YRBS used single items for each of the health behaviors, whereas the current study created factor scores using more than one item.

In addition, Hispanic children consumed healthier foods than White children, which has been demonstrated previously (e.g., Delva et al., 2007; Centers for Disease Control and Prevention, 2010). As expected, Black, Hispanic, and “Other” children were less physically active than White children. This finding is supported by the YRBS (Centers for Disease Control and Prevention, 2010) and other previous research (e.g., Gordon-Larson et al. 2000). This finding might be due to the fact that White children had higher levels of physical self-efficacy in this sample than Hispanic, Black, and “Other” children. Studies have shown higher levels of self-efficacy are associated with higher levels of physical activity (e.g., Shields et al., 2008).

Lastly, children from families with higher SES were more physically active and had higher levels of physical appearance self-worth and physical self-efficacy, when compared to children from families with lower SES. The results are consistent with previous studies (e.g., Ball et al., 2009; Giskes et al., 2002; Taylor et al., 2005). However, it might be more important for researchers to focus their efforts towards understanding the mechanisms by which SES influences parenting practices. For example, some researchers have argued that SES might help to better explain and predict which practices parents engage in (including access to healthy foods, cooking with children, engaging in physical activity with kids) and the type of environment created in the home (nurturing vs. controlling) (e.g., Birch & Fisher, 1997). Furthermore, in the school model, the relation between family SES and physical activity was non-significant. This finding suggests that children who come from families with a low SES, but who attend a school that provides adequate school

practices related to physical activity, might reduce the potential differences in children's physical activity among varying levels of family SES.

Strengths, Limitations, and Future Directions

Strengths

The findings of this study contribute to the literature in several important ways. The models developed and examined in this study had their theoretical basis in years of parenting research (e.g., Baumrind & Black, 1967; Baumrind, 1967). In particular, they were based on Darling and Steinberg's (1993) contextual model of parenting. This is the first time that this model has been adapted and used to examine positive health behaviors (such as healthy eating and physical activity). Most of the research using this model has examined educational outcomes (e.g., Steinberg et al., 1994) and risky health behaviors such as alcohol use and violence (e.g., Bronte-Tinkew et al., 2006; Radziszewska et al., 1996).

Furthermore, not only was the model applied to a parental context, a parallel model was also applied to a school context. The main reason for creating these parallel models was to assess whether or not the global environment and specific practices that occur within each context are distinct. In addition, using parallel models allowed for an exploration of the ways in which the global environment and practices of the different contexts jointly influence the positive health behaviors of children.

Another strength of this study is that mediating and moderating processes were included to explain further the positive health behaviors of children. For example, the models included children's self-beliefs as a mediator between parent and

school environments and practices, and children's healthy eating and physical activity behaviors. Furthermore, this study included individual parenting dimensions (such as nurturance) rather than using parenting styles (such as authoritative). The benefit of using individual parenting dimensions is that it eliminates certain key flaws inherent in a typology methodology, including, for example, the fact that not all parents can be adequately classified as fitting into one of the four parenting styles, and parents might have multiple parenting styles. Differences might also exist between mothers and fathers, although few studies have assessed both mothers and fathers. For this reason, in this study, both mother and father nurturance were included.

This study also included a more complex exploratory causal framework compared to simple association models. Specifically, this model examined the pathway from parental and school influences to children's positive health behaviors. In addition, this model examined the pathway from the interaction terms (between the environment and practices) to children's positive health behaviors. Finally, this causal framework examined the pathway from parental and school influences to children's self-beliefs, and then from children's self-beliefs to children's positive health behaviors.

Limitations

The results of this study must be interpreted in the context of the study limitations. One such limitation is that the study was unable to examine the relevant bidirectional pathways, due to its correlational design. More specifically, the model specified ways in which parents and schools affect children's beliefs and behaviors. However, the study was not able to determine the ways in which children's self-

beliefs and behaviors affect parent and school practices and environments. In addition, the analytic approach was path modeling, which provides a causal framework. In terms of the model, therefore, these paths are considered causal; however, in essence, this remains a correlational study design and the individual associations do not identify or distinguish between cause and effect.

Another limitation is that the models used for this study assume that the environment and practices of parents and schools are stable. However, the ways in which parents interact with their children concerning healthy eating and physical activity are dependent upon their ages, and generally change slowly over time. For example, parents of fifth graders have more influence over the foods their children eat than do parents of children in middle school or high school (Cullen & Zakeri, 2004). In addition, most of the changes in school practices occur as a result of the transitions that take place during the progression from elementary school to middle school to high school. Therefore, this conceptual model needs to be applied to and tested with various ages and school grades.

Darling and Steinberg (1993) alluded to the importance of parent characteristics in developing an explanation for the reasons behind different parenting styles and why different parents implement certain practices. Parent characteristics, here, refer to selected demographic factors such as marital status, education, occupation, income, race, and health behavior practices (Goodson, Evans, & Edmundson, 1997). However, this study did not assess the antecedents that affect the parent environment and practices, although some of these characteristics were controlled for. There are also antecedents that affect a school's environment and

practices, including the school's location (urban, rural, or suburban, for example), type (public vs. private), financial resources, political climate of the community it is located in, and minority ratio. These antecedents were not examined in this study.

Several of the measures used for this study have been used in other studies, such as the National Longitudinal Study of Adolescent Health, which was conducted on an older group of students (7th – 12th graders) (Harris, 2009). This might cause some concern about whether or not the questions were appropriate for the students' ages. For example, students might have had difficulty accurately recalling the amount of time they spend exercising or the types of foods they ate. In addition, the students' ages ranged from 10 to 14 years, ensuring that some of the students were already experiencing puberty, while others were not. These differences might have had effects on children's self-beliefs and their health behaviors; research has shown that as children mature, their sense of ability and their perceptions of themselves become more apparent and accurate (Dweck & Elliott, 1983; Wigfield, Byrnes, & Eccles, 2006). Additionally, older children frequently compare themselves to others (Thompson & Goodvin, 2005), a practice which has an effect on their self-beliefs.

In addition, because the current study used an existing dataset, the measures were limited and might not entirely represent the conceptual definitions. For example, there are limited items for parenting practices related to healthy eating and physical activity, so some of the constructs were measured with single items. The study also lacked specific measures. For instance, instead of only including rules for watching television, a more comprehensive measure might be screen time, which includes watching television, being on the computer, and playing video games. In

addition, the measures describing parents were based on the perceptions of the children. Therefore, the measures are subject to some degree of measurement error, potentially resulting in biased parameter estimates. Also, due to the limited and single measures used in the current study, the reliability paradox, which implies that good model-data fit might be the result of poor quality of the measures, should be considered (Hancock & Mueller, 2011). One last limitation is that, in general, the effect sizes were too small to make any recommendations for policy. Despite these limitations, there were many intriguing results that enhance the current knowledge regarding children's healthy eating and physical activity behaviors and warrant discussion in the context of future research.

Future Directions

The current study was designed to serve as a preliminary cross-sectional exploration of the complex relations between parental and school influences and children's healthy eating and physical activity behaviors. Based on the results, several future directions seem promising. First, researchers might consider using a multi-level approach. This statistical technique addresses nested data (examining students within schools, for example) by accounting for the interdependence of students within the same school and modeling both school level and individual level variances on the outcome variables (healthy eating and physical activity behaviors) (Raudenbush & Bryk, 2002). More specifically, this method can model the between- and within-school variances simultaneously, thereby producing more accurate estimates of student outcomes. The current study examined the effects of parent and school environments from an additive perspective. Using a multilevel approach,

however, multiplicative effects (i.e., cross-level interactions) between the two levels can be explored. For example, researchers can more accurately investigate whether school-level influences (environment and practices) affect the effectiveness of the relation between parenting practices and children's healthy eating and physical activity behaviors.

In addition, cross sectional studies are useful in establishing associations between social influences and health behaviors; however, it would also be worthwhile to pursue longitudinal investigations (Windle et al., 2004). Future researchers might consider using the current study's findings to design additional studies examining ways in which these contexts affect children through the transitions that occur from childhood through adolescence, especially through the transitions from elementary school to middle school and from middle school to high school. Specifically, future research can use the conceptual framework developed in the current study in conjunction with longitudinal data to examine the long-term implications of parental and school influences on children's positive health behaviors. Research indicates that students in fifth grade are less likely to engage in unhealthy behaviors, and are therefore able to serve as a good baseline age group with regard to health behaviors (Windle et al., 2004). In addition, most health behaviors are shaped over time by social environments. It is appropriate, therefore, to begin this work with fifth grade students in elementary schools, enabling future studies to compare school practices across elementary, middle, and high schools. It would also be appropriate to include additional contexts, such as peer relationships and neighborhoods.

Most importantly, additional studies examining race and SES differences in parental and school influences on children's healthy eating and physical activity behaviors are necessary. It would be extremely useful for a future study to take this research a step further by using multiple-group comparison techniques to examine differences among Hispanic, Black, and White children (Hancock & Mueller, 2011; Thompson & Green, 2006). This would allow us to acknowledge whether or not the models proposed in this study are applicable to children of different race/ethnic groups. In addition, individual paths in the model can also be examined for equivalency across groups. This same approach should be used to examine various levels of SES. Although research has indicated that minority and low SES children are less likely to engage in healthy behaviors compared to White children (e.g., Delva et al. 2007; Taylor et al., 2005), the processes of parent and school influences are still unclear; examining these demographics as variables in their own right would allow researchers to investigate these characteristics for possible interactions with contexts of influence.

Conclusion

This study makes an important contribution to the field of parenting and health, despite its acknowledged weaknesses. In particular, this study builds upon the existing literature and fills in several knowledge gaps, including an examination of the processes by which the school and parental environment and practices impact children's healthy eating and physical activity behaviors. Furthermore, this study investigates the joint effects of parents and schools on children's self-beliefs and behaviors. This study also builds a conceptual foundation for future studies.

In general, the effect sizes for this study are small. However, the pathways identified in the models are promising. Therefore, future research to support these relations might help inform policies, practices, and programs that more effectively promote physical activity and healthy eating behaviors among children and their parents.

Appendices

Appendix A: Measures Used in the Dissertation Study

Dependent Variables

Physical activity:

- On how many of the past 7 days did you exercise or take part in any kind of exercise or physical activity in which you were moving for at least 60 or more minutes? Some examples of these activities include basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities.

_____days/week

Enter number of days/week <0.7>

- On how many of the past 7 days did you exercise or take part in physical activity that made your heart beat fast or made you breathe hard for at least 20 minutes? Some examples of these activities include basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities.

_____days/week

Enter number of days/week<0.7>

- On how many of the past 7 days did you take part in physical activity that did not make your heart beat fast or make you breathe hard for at least 30 minutes? Some examples of these activities include fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors. Interviewer Instructions: If the child says what about _____ and it is similar, say Yes. If the child says something sedentary like reading or watching TV, say No.

_____days/week

Enter number of days/week <0.7>

Healthy eating (fruit and vegetable consumption):

- During the past 7 days, how many days did you eat a serving of vegetables such as broccoli, green beans, squash, tomatoes, or other vegetables? Do not count green salad, potatoes, or carrots.

_____days/week

Enter number of days/week <0.7>

- During the past 7 days, how many days did you drink a cup, box, bottle or can of 100% fruit juices such as orange juice, apple juice, or grape juice? Do not count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks.

_____days/week Enter number of days/week <0.7>

- During the past 7 days, how many days did you drink a cup, box, bottle or can of 100% fruit juices such as orange juice, apple juice, or grape juice? Do not count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks.
_____days/week Enter number of days/week <0..7>
- During the past week, how often did you eat a serving of green salad? A green salad is made with lettuce, spinach, or other leafy green vegetables.
Never, or less than once per week,1
1 to 3 times per week,2
4-6 times per week,3
1 time per day, or4
- During the past week, how often did you eat carrots? [Would you say...]
Never, or less than once per week,1
1 to 3 times per week,2
4-6 times per week,3
1 time per day, or4
2 or more times per day?.....5

Independent Variables for Parent Model

Child's physical appearance self-worth:

- Which one of these statements best describes you?
- Some kids are happy with the way they look,1
other kids are not happy with the way they look
.....2
- Is that description...
Sort of true for you, or.....1
really true for you?2
- Which one of these statements best describes you?
Some kids are happy with their height and weight,.....1
other kids wish their height or weight were different2
- Is that description...
Sort of true for you, or.....1
really true for you?2
- Which one of these statements best describes you?
Some kids wish their body was different,.....1
other kids like their body the way it is2
- Is that description...

Sort of true for you, or.....1
really true for you?2

- Which one of these statements best describes you?
Some kids wish their physical appearance,
how they look, was different,.....1
other kids like their physical appearance the way it is.....2
- Is that description...
Sort of true for you, or.....1
really true for you?2
- Which one of these statements best describes you?
Some kids wish something about their face or hair looked different,
.....1
other kids like their face and hair the way they
are.....2
- Is that description...
Sort of true for you, or.....1
really true for you?2
- Which one of these statements best describes you?
Some kids think that they are good looking,
.....1
other kids think that they are not very good looking
.....2
- Is that description...
Sort of true for you, or.....1
really true for you?2

Child's physical self-efficacy:

- It is hard for you to walk more than one block. Would you say...
never,.....1
almost never,2
sometimes,3
often, or.....4
almost always?5
- [In the past one month, how much of a problem has this been for you?]

- It is hard for you to run. [Would you say...]
- | | |
|----------------------|---|
| never,..... | 1 |
| almost never, | 2 |
| sometimes, | 3 |
| often, or..... | 4 |
| almost always? | 5 |
- [In the past one month, how much of a problem has this been for you?]
It is hard for you to do sports activity or exercise. [Would you say...]
- | | |
|----------------------|---|
| never,..... | 1 |
| almost never, | 2 |
| sometimes, | 3 |
| often, or | 4 |
| almost always? | 5 |
- [In the past one month, how much of a problem has this been for you?]
It is hard for you to lift something heavy. [Would you say...]
- | | |
|----------------------|---|
| never,..... | 1 |
| almost never, | 2 |
| sometimes, | 3 |
| often, or | 4 |
| almost always? | 5 |
- [In the past one month, how much of a problem has this been for you?]
It is hard for you to take a bath or shower by yourself. [Would you say...]
- | | |
|----------------------|---|
| never,..... | 1 |
| almost never, | 2 |
| sometimes, | 3 |
| often, or | 4 |
| almost always? | 5 |
- [In the past one month, how much of a problem has this been for you?] It is
hard for you to do chores around the house. [Would you say...]
- | | |
|----------------------|---|
| never,..... | 1 |
| almost never, | 2 |
| sometimes, | 3 |
| often, or | 4 |
| almost always? | 5 |

- [In the past one month, how much of a problem has this been for you?] You hurt or ache. [Would you say...]
never,.....1
almost never,2
sometimes,3
often, or4
almost always?5
- [In the past one month, how much of a problem has this been for you?] You have low energy. [Would you say...]
never,.....1
almost never,2
sometimes,3
often, or.....4
almost always?5

Mother nurturance:

- How often does {your mother} give you praise or encouragement? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often do you rely on {your mother} for advice and guidance? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often does {your mother} give you a hug or kiss? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often do you and {your mother} do things together that you both enjoy? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4

- How often do you discuss personal problems with {your mother}? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often do you discuss your future plans with {your mother}? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often do you know what {your mother} expects of you? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4

Father nurturance:

- How often does {your father} give you praise or encouragement? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often do you rely on {your father} for advice and guidance? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often does {your father} give you a hug or kiss? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4

- How often do you and {your father} do things together that you both enjoy? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often do you discuss personal problems with {your father}? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often do you discuss your future plans with {your father}? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4
- How often do you know what {your father} expects of you? [Would you say...]
almost never,.....1
sometimes,2
often, or.....3
almost always?4

Parenting practices:

- Provision of structure
 - *TV rules*

Do you have rules in your house about how much TV you can watch?
YES1
NO.....2

Do you have rules in your house about when you can watch TV?
YES1
NO.....2

Do you have rules in your house about what kinds of shows you can watch on TV?
YES1
NO.....2

- Provision of opportunities
 - How often do {your parents} watch you participate in physical activities or sports?
 - almost never,.....1
 - sometimes,2
 - often, or,.....3
 - almost always?4
 - During the past week, that is since {insert date}, how many times did you and your child eat a meal together?
 - not at all,1
 - 1 to 2 times,2
 - 3 to 4 times,3
 - 5 to 6 times, or4
 - 7 or more times?5

Independent Variables for School Model

School belongingness:

- How much do you feel that your teachers care about you? Would you say...]
 - not at all,.....1
 - a little, or2
 - very much?.....3
- You are happy to be at your school. Do you...
 - strongly agree,1
 - agree,.....2
 - disagree, or3
 - strongly disagree?4
- The teachers at your school treat students fairly. [Do you...]
 - strongly agree,1
 - agree,.....2
 - disagree, or3
 - strongly disagree?4
- You feel safe in your school. [Do you...]
 - strongly agree,1
 - agree,.....2
 - disagree, or3
 - strongly disagree?4

- You feel close to people at your school. [Do you...]
 - strongly agree,1
 - agree,.....2
 - disagree, or3
 - strongly disagree?4

- You feel like you are part of your school. [Do you...]
 - strongly agree,1
 - agree,.....2
 - disagree, or3
 - strongly disagree?4

- You like going to school. [Do you...]
 - strongly agree,1
 - agree,.....2
 - disagree, or3
 - strongly disagree?4

School Practices:

- Provision of structure
 - Which of the following topics are taught in health education to fifth-graders at this school? (By taught, we mean some advanced planning was involved; the subject was not just brought up in class.)
 - Nutrition and dietary behavior (yes/no)
 - Which of the following topics are taught in health education to fifth-graders at this school? (By taught, we mean some advanced planning was involved; the subject was not just brought up in class.)
 - Physical activity and fitness (yes/no)

- Provision of opportunities
 - Availability of physical activity facilities and equipment (please circle YES or NO for each item):
 - Gym or indoor sports facilities available (may be multi-purpose rooms)
 - Playground equipment available
 - Outdoor sports facilities or playing fields available (soccer, softball, football, etc.) (yes/no)
 - Track available (include track lanes painted onto asphalt or playground areas)

- Number of minutes of physical education per week
 - On average, how many days per week are the fifth-graders scheduled to take PE? (Choose one) (If fifth-graders at your school do not receive required PE, please check N/A.)
 - ☐ N/A
 - ☐ 1 day
 - ☐ 2 days
 - ☐ 3 days
 - ☐ 4 days
 - ☐ 5 days
 - ☐ Other: _____
 - On average, how many minutes is each session of PE class scheduled to last? (If fifth-graders at this school do not receive required PE, please check N/A.) _____ min. ☐ N/A
- Number of minutes of recess per week
 - On average, how many days per week do the fifth-graders have recess? (Choose one) (If fifth graders do not participate in recess, please check N/A)
 - ☐ N/A
 - ☐ 1 day
 - ☐ 2 days
 - ☐ 3 days
 - ☐ 4 days
 - ☐ 5 days
 - ☐ Other: _____
 - On average how many minutes is each session of recess scheduled to last? (If fifth-graders at this school do not participate in regularly scheduled recess, please check N/A.) _____ min. ☐ N/A
- Availability breakfast programs
 - Does this school participate in the USDA reimbursable National School Breakfast Program? (If this school does not offer breakfast, please check N/A.)
 - ☐ Yes ☐ No ☐ N/A
- Availability lunch programs
 - Does this school participate in the USDA reimbursable National School Lunch Program? (If this school does not offer lunch, please check N/A.)
 - ☐ Yes ☐ No ☐ N/A

- Availability of vending machines (recoded to no vending machines)
 - Vending machines in areas with student access (can specify # of machines) ☐ Yes ☐ No
- Availability of competitive foods (recoded to no competitive foods)
 - Please identify when students can purchase drinks and snack items that are not meals, such as: chocolate, other candy, cookies, crackers, salty snacks (e.g., regular potato chips), ice cream or frozen yogurt, soft drinks, sport drinks, or fruit drinks (not 100% juice).
 - Before classes begin in the morning (yes/no)
 - During any school hours when meals are not being served (yes/no)
 - During school lunch periods (yes/no)
 - After school (yes/no)
- School food contracts
 - Does this school offer brand-name fast foods from companies such as Pizza Hut, Taco Bell, or Subway? ☐ Yes ☐ No (SS1fsv18)
 - Does this school have a contract with a soft drink company, such as Coca-Cola, Pepsi-Cola, or Dr. Pepper, that makes beverages available to students? ☐ Yes ☐ No
- BMI screening
 - Are most students from this school screened at the school for height and weight or body mass? ☐ Yes ☐ No

Control Variables

Child's sex:

- Please indicate whether child is a boy or a girl. If necessary, ask the following:
 - a. boy
 - b. girl

Child's race/ethnicity:

- How would you describe {your child}? Please choose all that apply. Would you say {he/she} is...

American Indian or Alaska Native ,.....1
Asian,2
Black or African American,.....3
Hispanic or Latino,4
Native Hawaiian or Other Pacific Islander,5
White, or6
Other? Specify:_____.7

Family SES: See description in Chapter 3.

Appendix B: Factor Loadings for Dependent Variables

Variables	Loadings
<i>Physical activity</i>	
On how many of the past 7 days did you exercise or take part in physical activity that made your heart beat fast or made you breathe hard for at least 20 minutes?	0.75
On how many of the past 7 days did you take part in physical activity that did not make your heart beat fast or make you breathe hard for at least 30 minutes?	0.60
On how many of the past 7 days did you exercise or take part in any kind of exercise or physical activity in which you were moving for at least 60 or more minutes?	0.80
<i>Healthy Eating</i>	
During the past 7 days, how many days did you eat a serving of vegetables such as broccoli, green beans, squash, tomatoes, or other vegetables?	0.71
During the past 7 days, how many days did you eat a serving of fruit? Do not count fruit juice.	0.65
During the past 7 days, how many days did you drink a cup, box, bottle or can of 100% fruit juices such as orange juice, apple juice, or grape juice?	0.54
During the past week, how often did you eat a serving of green salad?	0.60
During the past week, how often did you eat carrots?	0.57
<i>Note.</i> These are the factor loadings for a principle component analysis.	

Appendix C: Exploration of Mother and Father Nurturance

The decision to use mother and father nurturance separately and without interaction terms was based on a set of exploratory analyses using simple multiple regression in SPSS. An interaction term was created with mother and father nurturance. This term was then included in the regression analyses along with the main effect of mother and father nurturance. As shown in Table A below, mother and father nurturance were each significantly associated with children's healthy eating and physical activity. However, the interaction term was not significant. Therefore, this suggests that there is not a multiplicative effect between mother and father nurturance and that the interaction term should not be used.

In addition, instead of creating interaction terms, the two items, mother and father nurturance, were summed. Although the summed nurturance variable was predictive of healthy eating and physical activity, mother and father nurturance still seem to have an independent contribution on the children's healthy eating and physical activity behavior as indicated by the strength of their individual association with healthy eating and physical activity and different correlational relations with other variables in the parent model. In sum, mother and father nurturance were included as separate measures for the parent environment in the parent model.

Table A:

Mother and Father Nurturance

Variables	Outcomes	
	Healthy Eating	Physical Activity
	B	B
Interaction results		
Step 1		
Mother nurturance	.16***	.07***
Father nurturance	.11***	.12***
Step 2		
Mo nurt. x fa nurt.	.00	-.00
ΔR^2	.00	.00
Summed results		
Mo nurt. + fa nurt.	.23***	.17***

Notes. The standardized betas (β) are shown. n = 5145.

*** $p \leq .001$

Appendix D: Number of Cases Missing for Non-Imputed dataset, Cases
Missing for Imputed Dataset, and Total Cases Imputed

Variables	Cases missing in non-imputed dataset	Cases missing in imputed dataset	Total Cases imputed
Physical activity	5	1	4
Healthy eating (fruit and vegetable consumption)	5	1	4
Mother nurturance	28	1	27
Father nurturance	438	1	437
School belongingness	3	1	2
Child's physical appearance self-worth	6	1	5
Child's physical self-efficacy	7	1	6
Rules for watching television	34	32	2
Eating meals together	36	28	8
Watching children be physically active	5	1	4

Appendix E: Overview of Missing Data Analyses

A missing data analysis was conducted for each of the three models described in Chapter 3. The following steps were used to examine the missing data (Croninger & Douglas, 2005). First, all of the dependent and independent variables included for each analysis were identified (there was a total of six analyses). Dummy variables were then created for each of the dependent and independent variables in a particular analysis, designating whether or not cases were missing. Next, the newly created dummy variables were summed and recoded into one variable, which identified non-missing cases as zero and missing cases as one. This new missing variable was then used to examine missing data across all of the variables in the analysis of interest.

When utilizing the listwise procedure, Croninger and Douglas (2005) recommended that another set of variables, specifically related variables that are not used in the analysis, be identified in order to examine the potential consequences of dropping cases from the analysis. Therefore, child's body mass index percentile, family cohesion, and parent depression were selected to be used to examine differences in cases to be included and excluded in the study (see Chapter 3 for a description of the measures). Finally, if there were significant differences found for any of the three variables (child's body mass index percentile, family cohesion, and parent depression) as a function of missingness. The mean values of child's body mass index percentile, family cohesion, and parent depression in the baseline sample were compared to the mean values of these variables in the analytic sample in order to determine the implications of the missing cases.

Parent Model

Of the 5,147 participants (baseline sample), 10% (506) of the cases were missing, yielding an analytic sample of 4,641. The same number of cases was missing for both the healthy eating and physical activity behavior analyses. Small amounts of data were missing for several variables, amounting to no more than a few cases for any given variable, other than family SES. Although no coherent pattern was discernible for the missing data, independent t-tests were used to assess whether the number of missing cases would cause issues of concern associated with estimation.

For the healthy eating analysis, the results revealed a statistically significant difference in mean parent depression between cases with missing data for all of the variables used in the parent model and cases with non-missing data ($t(5007) = -2.98, p \leq .01$). The same results were found in the physical activity analysis. Significant differences were found in mean parent depression between cases with missing data for all of the variables used in the parent model and cases with non-missing data ($t(5007) = -2.98, p \leq .01$). However, the mean value for parent depression in the sample that included all of the cases and the sample with the restricted cases were comparable. This means children eliminated from this study tended to have parents with higher levels of depression compared to those eliminated, although the analytic sample remained representative of the fifth grade students who participated in this study.

School Model

The school model for healthy eating had 1,192 missing cases, meaning that 23% of the 5,147 available cases were missing and leaving an analytic sample of

3,955. As for physical activity, 1,509 cases, or 29% of the cases, were missing, thus leaving an analytic sample of 3,638. Independent t-tests were used to assess whether the number of missing cases would cause any issues of concern associated with estimation.

For the healthy eating analysis, a statistically significant difference in mean family cohesion ($t(3994) = 2.24, p \leq 0.05$) and parent depression ($t(3994) = -2.03, p \leq 0.05$) was found between cases with missing data for all of the variables used in the school model and cases with non-missing data. In the physical activity analysis, the results revealed a statistically significant difference in mean child's body mass index percentile ($t(3615) = -2.65, p \leq .01$), family cohesion ($t(3615) = 3.15, p \leq .01$), and parent depression ($t(3615) = -2.49, p \leq .01$) between cases with missing data for all of the variables used in the school model and cases with non-missing data.

However, the mean value for family cohesion and parent depression in the sample that included all of the cases and the sample with the restricted number of cases were comparable (for both healthy eating and physical activity analyses). Consequently, the analytic sample for the school model for healthy eating was still representative of the fifth grade students who participated in this study.

Combined Parent and School Model

The combined parent and school model for healthy eating had 1,219 missing cases, meaning that 24% of the 5,147 available cases were missing and leaving an analytic sample of 3,928. For physical activity, there were 1,533 missing cases, which indicates that 30% of the cases were missing and that the analytic sample amounted to 3,614. Independent t-tests were also conducted in order to assess whether the number

of missing cases would cause any issues of concern associated with estimation. Thus, the findings for the combined parent and school model for healthy eating and physical activity behaviors were consistent with the results from the school model for healthy eating and physical activity behaviors.

In the healthy eating analysis, a statistically significant difference in mean family cohesion ($t(3972) = 2.24, p \leq 0.05$) and parent depression ($t(3972) = -1.99, p \leq 0.05$) was found between cases with missing data for all of the variables used in the combined model and cases with non-missing data. In the physical activity analysis, the results revealed a statistically significant difference in the mean for child's body mass index percentile ($t(3358) = -2.47, p \leq .01$), family cohesion ($t(3596) = 3.07, p \leq .01$), and parent depression ($t(3596) = -2.39, p \leq .01$) between cases with missing data for all of the variables used in the combined model and cases with non-missing data.

The mean values for family cohesion and parent depression in the sample that included all of the cases and the sample with the restricted number of cases were comparable (for both healthy eating and physical activity analyses). Therefore, the analytic sample for the combined parent and school was still representative of the fifth grade students who participated in this study.

Appendix F: Skewness and Kurtosis Scores for All Continuous Variables

Variables	Skewness	Kurtosis
Physical activity	.34	-.37
Healthy eating (fruit and vegetable consumption)	.11	-.53
Mother nurturance	-.45	-.35
Father nurturance	-.38	-.43
School belongingness	-.71	.51
Child's physical appearance self-worth	-.33	-.45
Child's physical self-efficacy	-1.38	2.64
Rules for watching television	-.39	-.98
Eating meals together	-1.12	.23
Watching children be physically active	-.11	-1.43
Availability of physical activity facilities and equipment	-.24	-.54
Minutes per week of physical education	.62	.92
Minutes per week of recess	.99	2.40
Availability of competitive foods	1.13	1.32
Family SES	.38	-.88

Appendix G: Overview of Power Analyses for Models

Parent Model

Given a sample size of 4,641 (for both analyses with healthy eating and physical activity) and a two-tailed alpha level of .05, post hoc statistical power analyses of the model parameters were conducted using G*Power 3.1 (Erdfelder, Faul, & Buchner, 1996). In the parent model for both healthy eating and physical activity, the maximum number of predictors for a multiple regression analysis was 15. Squared multiple correlations of .07 (for physical activity) and .08 (for healthy eating) were used as a basis for these power analyses, since these were the lowest squared correlations observed in these analyses. The sample size of 4,641 yielded a power coefficient greater than .99 for linear models having 15 predictors, indicating satisfactory power for the analyses for healthy eating and physical activity.

In addition to testing the power for the parameters in the model, Hancock (2006) recommended that a post hoc power analysis be used to examine the power for data-model fit. To be able to do this, the sample size and the degrees of freedom for the particular model were needed. The degrees of freedom were calculated by the number of total parameters minus the number of unique parameters. The two numbers (sample size and degrees of freedom) were then used to determine the power of the model from the tables provided by Hancock and Freeman (2001). For the parent model (both healthy eating and physical activity analyses), the sample size was 4,641 and the degrees of freedom were 4, which yielded a power greater than .99 using $\epsilon=.02$ (ϵ is an index to characterize the degree of discrepancy between model implied and observed moments and is based on the root mean squares error of

approximation (RMSEA)). Therefore, there was enough power to detect data-model fit in the parent model for healthy eating and physical activity.

School Model

Given a sample size of 3,955 for the healthy eating analysis and 3,638 for the physical activity analysis and a two-tailed alpha level of .05, post hoc statistical power analyses of the model parameters were conducted using G*Power 3.1 (Erdfelder et al., 1996). In the school model, the maximum number of predictors for a multiple regression analysis was 21 for healthy eating and 15 for physical activity. A squared multiple correlation of .06 for healthy eating and physical activity was used as a basis for these power analyses, since this was the lowest squared correlation observed in these analyses. The analysis for both healthy eating and physical activity yielded a power coefficient greater than .99 for linear models having 21 and 15 predictors, respectively, and thus, indicating satisfactory power.

In addition, the power for data-model fit was examined using the same method described in the parent model (Hancock, 2006). The school model for healthy eating had a sample size of 3,955 and 7 degrees of freedom, which yielded a power greater than .99 using a $\epsilon=.02$. Further, the school model for physical activity had a sample size of 3,638 and 4 degrees of freedom, which also yielded a power greater than .99 using $\epsilon=.02$. Therefore, there was sufficient power to detect data-model fit in the school model for healthy eating and physical activity.

Combined Parent and School Model

Given a sample size of 3,928 for the healthy eating analysis and 3,614 for the physical activity analysis and a two-tailed alpha level of 0.05, post hoc statistical

power analyses of the model parameters was conducted using G*Power 3.1 (Erdfelder et al., 1996). In the combined model, the maximum number of predictors for a multiple regression analysis was 29 for healthy eating and 23 for physical activity. Squared multiple correlations of 0.10 (for healthy eating) and 0.09 (for physical activity) were used as a basis for these power analyses, since these were the lowest squared correlations observed in these analyses. The analysis for both healthy eating and physical activity yielded a power coefficient greater than .99 for linear models having 21 and 15 predictors, respectively, and thus, indicating satisfactory power.

In addition, the power for data-model fit was examined using the same method described in the parent and school models (Hancock, 2006). The combined model for healthy eating had a sample size of 3,928 and 11 degrees of freedom, which yielded a power greater than .99 using a $\epsilon=.02$. Further, the combined model for physical activity had a sample size of 3,614 and 8 degrees of freedom, which yielded a power greater than 0.99 using $\epsilon=0.02$. Therefore, there was sufficient power to detect data-model fit in the combined model for healthy eating and physical activity.

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