

Understanding Obesity Development: Investigating the Influence of Mental Health, Self-efficacy, and Self-regulation on Children's Health Behaviors

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BOSTON COLLEGE
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Counseling Psychology

UNDERSTANDING OBESITY DEVELOPMENT: INVESTIGATING THE
INFLUENCE OF MENTAL HEALTH, SELF-EFFICACY, AND SELF-REGULATION
ON CHILDREN'S HEALTH BEHAVIORS.

Dissertation
by

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Abstract

Understanding obesity development: Investigating the influence of mental health, self-efficacy, and self-regulation on children's health behaviors.

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Childhood obesity is one of the most significant threats to the health development of children in the United States. A relationship has been found between mental health conditions, such as depression, and obesity development. One possible mechanism for this relationship is the connection between mental health factors and health behaviors in children. Obesity prevention initiatives frequently target children's health behaviors due to their important role in the development of childhood obesity. Yet despite their importance, relatively little is known about the association between mental health factors and children's health behaviors. In addition, self-efficacy and self-regulation, cognitive factors which have been found to have a prominent role in behavior change, may also be correlated with children's health behaviors. These cognitive factors may also interact with mental health factors to predict children's health behaviors .

The current study sought to investigate whether or not internalizing behaviors, self-efficacy, and self-regulation significantly predicted healthy eating behavior, unhealthy eating behavior, and physical activity behavior in preadolescent children. The study was a secondary data analysis of the Study of Early Child Care and Youth Development (SECCYD) Phase II-III data. Internalizing behaviors were found to have a

significant relationship with unhealthy eating behaviors for both boys and girls, however, the relationship was positive for girls and negative for boys. Among the cognitive factors, sports self-efficacy and self-regulation, sports self-efficacy was found to be a significant predictor of physical activity behavior for both boys and girls. In addition, the moderating relationship between internalizing behaviors and self-regulation as a predictor of physical activity behavior was supported for boys. Findings from the study indicate individual psychological factors, such as mental health and self-efficacy may have a significant influence on children's health behaviors. Results also suggest factors at the psychological level may be interacting with one another, along with factors at the biological and social levels of development, to influence health behaviors. The current study highlights that investigating the psychological factors influencing health behaviors may yield an important contribution towards understanding obesity development. These findings have implications both for identifying children at risk for developing obesity, as well as, the design and implementation of obesity prevention initiatives.

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Chapter One (Introduction)

Childhood obesity has garnered attention in both the popular press and academic arena in the past several years. This attention is warranted given the significant increases in obesity over the past decade in children and adolescents, as well as adults (Eneli, 2008). It is a problem that is experienced in developed nations worldwide (Malecka-Tendera & Mazur, 2006). In the United States, the period from 1999-2004 saw a significant increase in the rate of obesity in both male and female children according to the statistics obtained by the National Health and Nutrition Examination Survey (NHANES) (Ogden et al., 2006). From 2003-2006, rates of childhood and adolescent obesity remained high, with 11.3% of children and adolescents at or above the 97th percentile for the 2000 BMI growth chart, 16.3% at or above the 95th percentile, and 31.9% at or above the 85th percentile (Ogden, Carroll, & Flegal, 2008). From 2007-2008, no significant increases in the rates of obesity were found, however, rates of obesity in children and adolescents remained at the rates found in previous years (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010).

There are several health risks associated with childhood obesity, which can emerge in adulthood or earlier in childhood and adolescence. These health risks have serious implications for quality and longevity of life. Hypertension, Type II Diabetes, non-alcoholic fatty liver disease, and sleep apnea are medical conditions emerging in childhood and adolescence, which are associated with childhood obesity (Daniels, 2006; Reilly, 2007). In addition, there are conditions in adulthood that have been associated with adulthood obesity and can be exacerbated by the preexisting condition of childhood

obesity. These include cardiovascular conditions, such as hypertension, left ventricular hypertrophy, and atherosclerosis; metabolic conditions such as, Type II Diabetes, Metabolic Syndrome, and insulin resistance; pulmonary conditions such as asthma and sleep apnea; and skeletal conditions characterized by growth abnormalities in the legs and hips (Daniels, 2006; Ebbeling, 2002). These medical concerns can seriously impair quality of life and have the potential to reduce lifespan. There are some who believe the obesity epidemic will shorten the life span of today's children to be less than the current life expectancy (Olshansky et al., 2005). Although this prediction is controversial, it draws attention to the dangerous implications of the epidemic of childhood obesity.

Given the prevalence of childhood obesity and the severity of risks associated with it, implementing effective interventions that address the prevention and treatment of childhood obesity are of utmost importance. Obesity prevention efforts have received more attention than obesity treatment in the past several years. One reason obesity prevention is being targeted as opposed to obesity treatment is that once a person is engaged in unhealthy habits it is more difficult to change these habits, than it is to establish healthy habits initially in childhood (MacKenzie, 2000; Philippas & Lo, 2005; Wofford, 2008). Obesity prevention programs are recognized as an important and valuable forum to address the epidemic of childhood obesity.

Many reviews have been conducted to understand the success of obesity prevention efforts (Baranowski, Anderson, & Carmack, 1998; Bautista Castano, Doreste, & Serra Majem, 2004; Bluford, Sherry, & Scanlon, 2007; Campbell, 2001; Conroy, Ellis, Murray, & Chaw Kant, 2007; DeMattia, Lemont, & Meurer, 2007; DeMattia & Denney,

2008; Devi, 2008; Doak, Visscher, Renders, & Seidell, 2006; Flodmark, Marcus, & Britton, 2006; Institute of Medicine, 2005; Pratt, Stevens, & Daniels, 2008; Pyle, 2007; Stice, Shaw, & Marti, 2006; Wofford, 2008). The overall message from these reviews is that prevention efforts have had inconsistent results. In order to understand this inconsistency, identifying factors that influence health behaviors has become a priority research area (Reynolds & Spruijt-Metz, 2006). There has also been a call for research by the National Heart, Lung, and Blood Institute, which focuses on identifying populations who are at risk for developing obesity (Pratt et al., 2008). In addition, researchers have not only emphasized the importance of identifying factors that impact health behaviors, but also understanding the mechanisms for modifying these factors (Baranowski, Klesges, Cullen, & Himes, 2004; Rodebaugh & Heimberg, 2008). Exploring the intraindividual factors that impact health behaviors is one way to address the current calls for research in the obesity prevention literature. Investigating intraindividual factors may identify salient internal factors that influence health behaviors and subsequently, increase the risk of developing obesity. Eventually, work in this area may also yield information about the causal psychological processes that influence health behaviors.

Intraindividual Factors

Some intraindividual factors that influence health behaviors and put an individual at risk for developing obesity may be related to mental health. Psychopathology, more specifically depression, and obesity are shown to be related in both the child and adult literature (Averina et al., 2005; Braet, 1997; Guerdjikova, McElroy, Kotwal, Stanford, &

Keck, 2007; Strauss, Smith, Frame, & Forehand, 1985a). The demonstrated relationship between obesity and depression suggests that issues and problems associated with depression may influence health behaviors. However, the relationship between depression and obesity, particularly in the childhood literature, is nuanced and controversial. The relationship is not consistently demonstrated and the direction of prediction is still not determined (Bradley et al., 2008; Braet, 1997; Davison, 2001; Goodman, 2002; Pine, 2001). An explanation of these research findings may be that the relationship between depression and obesity exists, but other factors may be involved which strengthen or lessen this relationship.

Hot Cognition

There may be additional intraindividual factors that interact with issues associated with depression to impact health behaviors. Two cognitive factors, which have been associated with internalizing behaviors and health behaviors, are hot cognition and self-efficacy. Hot cognition is a cognitive processing style, which operates based on immediate affective stimulation as opposed to strategic, planned processes. This style is part of a dual processing system responsible for self-regulation of behaviors. It has been found that individuals who are more affectively stimulated, particularly individuals who are anxious, operate more frequently from the hot cognitive side of their self-regulation system than those who do not experience as much affective stimulation (Baumeister & Baumeister, 1996; Fishbach & Ferguson, 2007). This over activation of hot cognition has been found to have an impact on a child's ability to delay gratification for a longer term goal (Mischel, Cantor, & Feldman, 1996). The ability to self regulate is vital to the

establishment and maintenance of health behaviors in children. Exploring the interaction between affective issues associated with anxiety and depression and hot cognition may help to understand how intraindividual affective factors impact children's health behaviors.

Self-efficacy

Self-efficacy is another intraindividual factor that may interact with affective processes to impact health behaviors. Self-efficacy is the belief that individuals believe they are capable of any given action. Self-efficacy has been found to have a powerful influence over many realms of behaviors, including health behaviors (Bandura, 1997). Work has been done exploring the relationship between mood states, mood disorders, negative affect, and self-efficacy belief systems (Bandura, 1997). Self-efficacy beliefs have been found to engage in a reciprocally influencing relationship with affective processes (Bandura, 1997). Investigating how self-efficacy beliefs interact with affective processes to impact health behavior may help to understand the inconsistent relationship between affective processes and obesity.

Internalizing behaviors are associated with mood and anxiety disorders and can serve as an indicator that a child is likely to struggle with issues of mood and anxiety. Exploring the moderating role of hot cognition and self-efficacy on the link between affective processes and health behaviors may be an initial step in ascertaining the causal psychological processes related to obesity development. This study seeks to investigate whether hot cognition and self-efficacy predict health behaviors and whether these constructs interact with internalizing behaviors to predict children's health behaviors.

The results of this study will provide a valuable contribution to understanding factors associated with childhood obesity. First, it will assess the extent to which mood and anxiety issues should be considered an at risk category for childhood obesity. Second, this study will assess whether self-efficacy and hot cognition are significant predictors of health behaviors. Third, the present study will assess whether self-efficacy and hot cognition interact with internalizing behaviors to contribute to the risk for obesity. Determining whether cognitive factors, such as hot cognition and self-efficacy, moderate the relationship between internalizing behaviors and health behaviors would provide more information about the complicated relationship between affective processes and health behaviors, as well as, aid in the design and implementation of obesity prevention programs.

Chapter Two (Literature Review)

The rise in childhood obesity is a complex issue that has many contributing factors and causes. There are many different factors that interact with one another over time to produce obesity. In addition, there is no singular pathway or risk profile for developing obesity. There are many different trajectories for developing the condition. This picture is further complicated by the fact that some factors put an individual at risk for obesity, while other factors protect an individual from developing obesity. Studies are needed that explore influential factors in depth in order to understand how these factors interact with one another to contribute to the development of obesity.

In order to understand the various issues and causes surrounding the childhood obesity epidemic, tenets from developmental psychopathology will be used. Developmental psychopathologists emphasize the importance of a biopsychosocial model when understanding disorders (Rutter, 2000). The biopsychosocial model states that biological, psychological and social influences all contribute to human behavior as it relates to disease and illness. Applied to the context of obesity, this means there are biological, psychological and social influences that contribute to health behaviors, which result in obesity.

Biological Factors

There are several biological factors that have been found to influence an individual's risk for developing obesity. Certain genetic, hormonal, metabolic, and neuronal factors affect the balance of energy intake and expenditure (Markward, Markward, & Peterson, 2009). Biological influences have been found to affect an

individual's likelihood of developing obesity. However, biological influences are not the sole etiological influence on obesity, psychological and social influences have also been found to contribute.

Psychological Factors

Research findings suggest that psychological influences have the ability to impact health behaviors and consequently obesity. Exploring individual, internal, cognitive processes and their influence on health behaviors has a fairly well established literature. There are many factors that have been investigated in relation to children's health behaviors and childhood obesity. Studies have found relationships between attitudes (Craeynest et al., 2005; Downs, DiNallo, Savage, & Davison, 2007; Dutta-Bergman, 2004; Tinsley, 1992), self esteem (Davison & Birch, 2002; French, 1995; Manus, 1995; Schmalz, Deane, Birch, & Davison, 2007; Sheslow, Hassink, Wallace, & DeLancey, 1993; Strauss, 2000), motivation (Bornholt & Piccolo, 2005; Derryberry & Tucker, 2006; Kelly, Zyzanski, & Alemagno, 1991; Moorman, & Matulich, 1993; Schwartz et al., 2007; Strobel, 2002) and health behaviors.

Self-regulation is a psychological process that is considered essential to adopting a healthy lifestyle and, therefore, has been studied extensively in the realm of healthy eating and exercise (Baumeister & Baumeister, 1996; Cameron, 2003; Derryberry & Tucker, 2006; Fishbach & Ferguson, 2007; Miller, 2010; Mischel & Ayduk, 2004; Muraven, 2003; Ridder & Wit, 2006; Stotland et al., 2006; Stotland, Larocque, & Kronick, 2006). In addition, due to the relationship found between self-regulation and health behaviors, interventions have been designed that target self-regulation in order to

improve health behaviors (Israel, Guile, Baker, & Silverman, 1994; Riggs, Sakuma, & Pentz, 2007). Self-regulation appears to be a prominent psychological influence on health behaviors and the development of obesity.

Affective processes have also been found to influence the developmental trajectory of obesity in individuals (Davison & Birch, 2004; Goldschmidt et al., 2008). Depression and obesity have been shown to be related in both the child and adult literature. In the adult literature, it has been found that obesity is significantly related to mood disorders (Averina et al., 2005; Guerdjikova et al., 2007). In the children's literature, a relationship between obesity and mood symptoms has also been found (Braet, 1997; Strauss, Smith, Frame, & Forehand, 1985b). The relationship between affective processes and health behaviors appears to be established. However, the relationship between psychological disorders and obesity in children seems to have an inconsistent pattern (Braet, 1997; McElroy, 2004; Mustillo, 2003). More research needs to be done to understand the influence of affective processes on health behaviors.

Social Factors

Social factors also contribute to the development of obesity in individuals. One factor that has been found to influence a child's eating habits is parental attitudes. Parents' attitudes towards eating and health were found to have an impact on children's eating and health attitudes (O'Dea, 2005). In addition, parental influence has been found to have influence on intervention efforts. Studies suggest that school interventions are more successful if parents are involved (Bautista Castano et al., 2004; Caballero, 2004).

Parental influence and attitudes appear to be an important factor on children's health habits, as well as, on interventions that target children's health.

Community and School Influences

Developmental psychopathological theorists emphasize the importance of context beyond the family influencing each level of the biopsychosocial model (Lerner, 1989). The context of community has been explored in obesity prevention research. In urban communities, several factors have been identified as significant barriers to physical activity such as, urban sprawl, neighborhood safety, and the availability of affordable fruits and vegetables (Reynolds & Spruijt-Metz, 2006). In response to these identified risks, there has been a nationwide increase in the amount of legislation introduced and adopted from 2003 to 2005 to support action at the community level (Boehmer, Brownson, Haire Joshu, & Dreisinger, 2007). This has resulted in community change such as establishing walking paths and farmers markets (Boehmer et al., 2007). An example of a community intervention, which has had success addressing community barriers, is the Shape up Somerville Program (Economos et al., 2007). This program has improved nutrition behavior and physical activity behavior through community intervention, physical infrastructure improvements, and policy work. The community context contains environmental factors, which influence obesity development and represent possible targets for intervention efforts.

Another important context in the fight against childhood obesity are the schools. The schools represent an ideal context in which to intervene with many children at the same time. At the school level, efforts have been focused on physical education and

school nutrition standards (Boehmer et al., 2007). In the realm of nutrition behavior, school initiatives have focused on improving the quality of school lunches, and restricting food allowed in vending machines (Harper, 2006). In the realm of physical activity, school initiatives have focused on mandated gym time and school wide physical activity events (Harper, 2006). In addition, to institutional structural changes the schools have been a popular forum to deliver nutrition and health education curriculums (Hoelschler, 2004).

Interestingly, it has been found that school interventions, which target cafeteria offerings, are not effective (Bautista Castano et al., 2004). It appears that cafeteria interventions that institute contextual change, such as the food offerings, are not sufficient. Perhaps, interventions that combine contextual change and change at the psychological or social level may have more success. For example, an intervention that changes the food offering in the cafeteria, as well as, addresses issues of individual characteristics associated with nutrition behavior, such as self-regulation, may be more effective.

Contextual variables are important to consider when conceptualizing the myriad of factors contributing to the obesity epidemic. The dramatic increase in the population rate of obesity suggests that contextual variables associated with obesity development may have become more salient in recent years. However, it is important to note that factors at any one level may not be the sole contributor to the development of obesity. Research needs to explore influential factors at all levels, in order to understand their contribution to the development of obesity in children. In addition, relationships between

influential factors need to be explored to obtain a more comprehensive picture of the salient factors threatening children's health.

Developmental Psychopathological Perspective

Principles of Developmental Psychopathology will be used in order to understand how factors within the biopsychosocial model impact obesity development.

Developmental psychopathologists place an emphasis on risk and protective factors.

Factors that contribute to the development of obesity are risk factors. Factors that protect an individual from developing obesity are protective factors. These factors, whether they are risk factors or protective factors, can alter the course of obesity development.

To understand how these influential factors impact obesity development, the principles of equifinality and multifinality will be explained. Equifinality means that a similar outcome can be reached by multiple pathways. Individuals who have different risk and protective profiles may reach the same outcome of developing obesity. For example, a child who is depressed may have difficulty self-regulating behavior, which contributes to poor food choices and obesity. Conversely, a child who has no issues with depression, but lives in a poor urban environment, where it is difficult to obtain healthy foods and find safe places to exercise, may also develop obesity. Multifinality states that individuals who start with similar factors or situations may not have the same endpoint (Sameroff, 2000). For example, it has been found that some children who struggle with mood issues develop obesity, whereas, other children who also struggle with mood issues do not develop obesity (Braet, 1997). These examples of equifinality and multifinality suggest that no single factor or pathway is responsible for the onset of obesity. Research

needs to be conducted to understand how significant factors interact with one another over time to influence obesity development.

Success of Obesity Prevention Efforts

Many reviews have been conducted to determine the success of obesity prevention efforts (Baranowski et al., 1998; Bautista Castano et al., 2004; Bluford et al., 2007; Campbell, 2001; Conroy et al., 2007; DeMattia et al., 2007; DeMattia & Denney, 2008; Devi, 2008; Doak et al., 2006; Flodmark et al., 2006; Gittelsohn & Kumar, 2007; Institute of Medicine, 2005; Livingstone, McCaffrey, & Rennie, 2006; Pratt et al., 2008; Pyle, 2007; Reilly, 2007; Stice et al., 2006; Wofford, 2008). The success rates of these interventions have ranged from 40%-79% (Campbell, 2001; Doak et al., 2006; Flodmark et al., 2006; Gittelsohn & Kumar, 2007; Livingstone et al., 2006; Reilly, 2007). One review done by Stice (2006) examined the effect sizes associated with obesity prevention programs. Results from this meta analysis reveal that 79% of interventions do not have a significant effect size. The overall conclusion is that prevention efforts have been inconsistently effective.

Furthermore, the literature suggests that inconsistent results of obesity prevention programs may be partially attributed to diversity in outcome measures across studies. Some studies use measures of health behaviors as their outcome, while others use measures of obesity, such as Body Mass Index (BMI), tricep skinfolds, or waist circumference. There is even variability within the category of health behaviors, as programs vary in which behavior and how many behaviors they target (Doak et al., 2006). Different outcome measures limit the generalizability of results and the ability to

compare interventions to one another. This lack of uniform methodology complicates the task of assessing the progress of obesity prevention efforts.

In addition, the choice of outcome measure can impact the success rate reported by an intervention. For example, studies that measure BMI have a lower success rate than studies that measure tricep skinfolds and waist circumference (Danielzik, Pust, & Müller, 2007). Other reviews reveal interventions that achieve significant change in nutrition behavior and physical activity did not achieve significant change in BMI (Stice et al., 2006). It is impossible to determine whether or not the inconsistent success rate of prevention programs is due to some interventions being more effective than others or the different outcome measures used.

The inconsistent success rates across obesity prevention programs may extend beyond methodological issues. The myriad influences affecting obesity, and their interactions with one another, may be modifying the level of success obesity prevention efforts have been able to achieve. Risk and protective factors at all levels of the biopsychosocial model may be interacting with prevention efforts and influencing the results of these programs. These factors need to be identified in order to understand their influence on obesity prevention programs, as well as, obesity development.

Importance of Children's Health Behaviors

Identifying and understanding factors that influence health behaviors are important to understanding the development of obesity. Health behaviors are behaviors that have a direct effect on energy intake and expenditure. Health behaviors are also modifiable, which makes them an ideal target for obesity prevention programs. Two

health behaviors that have been frequently targeted in children's obesity prevention are physical activity and nutrition behavior. Physical activity behavior and nutrition behavior are seen as the key to establishing and maintaining healthy habits (MacKenzie, 2000; Philippas & Lo, 2005). Nutrition behavior and physical activity behavior impact the balance of energy intake and expenditure, which affects an individual's weight and the chance of developing obesity (Dietz & Gortmaker, 2001).

Physical activity behavior, in particular, has been identified as an important health behavior in the fight against obesity (Sothorn & Gordon, 2003). There are many reasons why physical activity is an important health behavior to target. First, lack of physical activity behavior plays a significant role in maintaining obesity (Brownell, 1982). In addition, physical activity behavior has the ability to affect bodily processes associated with obesity, such as reducing blood pressure, increasing basal metabolism, suppressing appetite, and minimizing loss of lean tissue (Brownell, 1982). Further, physical activity behavior has the ability to counteract the psychological effects associated with obesity such as depression and self esteem (Brownell, 1982). In addition to paths of direct influence, physical activity behavior has been found to influence other biological and psychological factors associated with obesity. These reasons make physical activity behavior a prime behavior to target in the treatment and prevention of obesity.

Nutrition behavior has also been found to have an impact on the development of obesity. There are several aspects of nutrition behavior that have been investigated in childhood obesity literature. One approach for studying nutrition behavior has been to categorize foods based on their nutritional value. Researchers have divided food

consumption into healthy and unhealthy foods based on nutritional content. The predictors for eating healthy food do not predict unhealthy food choices (Edmundson et al., 1996; Hoelscher et al., 2004). These findings suggest there may be different mechanisms that impact decisions to choose healthy foods and to avoid unhealthy foods. Considering nutrition behavior in this manner has valuable implications for the design and implementation of obesity prevention programs.

Current Calls for Research

Given the potential importance of health behaviors, many obesity prevention programs have focused on changing children's health behaviors. However, as stated before, obesity prevention programs have had inconsistent results. Using a developmental psychopathological frame, it becomes apparent that obesity prevention efforts may yield inconsistent results because of a variety of biological, psychological, and social factors that limit the effectiveness of prevention programs and influence the development of obesity. These factors need to be identified and explored.

Current literature in obesity prevention emphasizes the need for research to identify and explore influences on children's health behaviors (Reynolds & Spruijt-Metz, 2006; Thomas, 2006; Thompson et al., 2006). Identifying factors that influence health behaviors can provide a greater understanding of obesity development. In addition, this information could have two important implications for the applied aspect of obesity prevention interventions. First, identifying factors that influence health behaviors could provide information about at risk groups that would benefit most from intervention. Second, knowledge of factors that impact health behaviors may inform the design and

implementation of prevention programs.

Some research has been conducted to understand how factors that influence obesity development impact prevention efforts. Results from these studies suggest there is still work to be done. For example, a meta-analysis of obesity prevention literature revealed that predictors that would have been expected to be significant based on past literature, such as parent involvement, screen time, and mandates on nutrition behavior and physical activity, were not found to be significant predictors of nutrition and physical activity behavior (Stice et al., 2006). Based on his findings, Stice (2006) calls for studies of the intraindividual barriers to health behavior change. One possible interpretation of these findings is that other significant factors interact with these identified factors to alter their influence on the development of obesity. For example, it is possible that nutrition behavior mandates are only influential predictors of nutrition behavior when interacting with an internal factor, such as motivation. Stice's review indicates that more research needs to be conducted to understand influences on health behaviors, and possibly the interaction among influential factors impacting children's health behaviors.

Researchers have emphasized the importance of not only identifying factors that impact health behaviors and but also understanding the mechanisms of change (Baranowski et al., 1998; Levy & Petty, 2008; Thomas, 2006; Thompson et al., 2006). There has been a call for obesity prevention research to focus not only on the success of the intervention, but also on how interventions achieve their success or failure. In essence, research should focus more on the process or mechanisms of behavior change as

opposed to showing pre and post test change on a single realm of behavior (Susman, Feagans, & Ray, 1992).

Reynolds (2006) advocates for a translational approach to obesity research. In this model understanding mechanisms of change and causal processes associated with behavior change are crucial to successful interventions. Reynolds (2006) states that understanding these mechanisms and causal processes is central to understanding the current inconsistency in success rates for prevention programs. Identifying causal processes that influence health behaviors is consistent with current calls for in obesity prevention and would be a valuable contribution to current research in childhood obesity.

Developmental Rationale

According to Developmental Psychopathological principles it is also important to consider development across the lifespan (Rutter, 2000). Influences of obesity development may become more or less salient over the course of the lifespan. For example, Gyurcsik (2006) found that college age students had more barriers to a healthy lifestyle than grade school students. Results indicated that the average number of barriers increased as grade level increased. In addition, the barriers college students reported were also found in different arenas than those experienced by grade school students. The barriers at the college level were found in the interpersonal and physical environment, whereas, the barriers for grade school children were found mostly at the intrapersonal level. These results suggest that factors influencing obesity development may become more or less salient throughout the lifespan.

Consequently, it is important to consider the developmental period proposed to study. Preadolescence is an important developmental time period for obesity development. At this time, children are starting to become more autonomous and gain more control over their health behaviors. Children of this age have also developed in areas considered to be salient factors influencing health behaviors such as, self-efficacy and self-regulation. Therefore, it would be ideal to understand how these factors influence one another and interact with health behaviors. The second relevant finding from the Gyurcsik (2006) study is that intrapersonal barriers to health behaviors appear to be more salient than interpersonal or environmental factors during preadolescence. Therefore, studying interpersonal influences on obesity development in preadolescents would be an important contribution in learning more about the development of obesity.

Importance of Intrapersonal Factors

Bandura's Social Cognitive Theory can be utilized to conceptualize intrapersonal influences on health behaviors. Social Cognitive Theory has many elements consistent with Developmental Psychopathology tenets. In Bandura's Social Cognitive Theory, a triadic reciprocal causation between behaviors, personal factors, and environmental factors is posited. Causation in this context implies that these three categories of factors are functionally dependent on one another. This premise highlights that various personal and social factors influence children's health behaviors. This is consistent with Developmental Psychopathology's use of the biopsychosocial model to identify risk and protective factors of behavior. Social Cognitive Theory places slightly more emphasis on internal factors of change and therefore, is a useful framework to conceptualize

intrapersonal factors influencing obesity development. In addition, Social Cognitive Theory has been a popular choice as the theoretical framework for obesity prevention programs (Bean, Melanie Kerr Van Ogtrop, 2006; Martin & McCaughtry, 2008; Murnan, Sharma, & Lin, 2006; Resnicow, 1997; Rinderknecht & Smith, 2004; Sharma, 2005; Sharma, Wagner, & Wilkerson, 2005-2006; Strachan, 2006). Therefore, much of the current literature is conceptualized through this theoretical frame.

Social Cognitive Theory advocates for a transactional view of self and the environment (Bandura, 2001). Many theorists have conceptualized the self as having two roles or a dual identity, the self as agent and self as object. Social Cognitive Theory believes both these roles exist but argues that the self is simultaneously agent and object and rejects a dualistic conceptualization of self.

“In this transactional view of self and society, internal personal factors in the form of cognitive, affective, and biological events; behavior; and environmental events all operate as interacting determinants that influence one another bidirectionally”. (A. Bandura, 1997) P.6

These determinants have varying influence over one another based on the event and circumstances. This reciprocally influential relationship between behaviors, personal factors, and the environment is called reciprocal determinism. The transactional view of influence is in line with the transactional risk model put forth by Developmental Psychopathologists (Rutter, 2000) and consistent with Lerner’s Theory of Developmental Contextualism (Lerner, 1989).

Social Cognitive Theory moves beyond the idea of reciprocal determinism to draw attention to the relationship between self and the world. Social influences flow through self-processes to produce the actions. The self is not a mere filter but rather an integral part of the process and contributes and takes ownership of the actions it produces. In fact, self-processes not only react to the environment but may also prompt and produce action.

“ Human behavior can not be fully understood solely in terms of social structural factors or psychological factors. A full understanding requires an integrated causal perspective in which social influences operate through self-processes that produce the actions. The self system is not merely a conduit for external influences as structural reductionists might claim. The self is socially constituted but by exercising self-influence individuals are partial contributors to what they become and do. More over, human agency operates generatively and proactively rather than just reactively.”
(Bandura, 1997, p. 6)

In this way, the self is thought of as central to human activity. Social and environmental influences flow through the self and interact with self-processes and personal factors. In addition to this role, the self has processes that instigate or prompt action. This view emphasizes the importance of understanding intrapersonal influences or personal factors on health behaviors. Personal factors impact behaviors directly, as well as, interact with environmental factors to impact behavior. Social Cognitive Theory’s conceptualization of the role of the self and the importance of self-processes highlights the value of investigating personal factors that influence health behaviors.

Investigating personal factors of health behaviors may also have value for interventions at the environmental level. For example, motivation, a personal factor, has been found to be a significant predictor of health behavior in children and adults (Bornholt & Piccolo, 2005; Derryberry & Tucker, 2006; Kelly et al., 1991; Moorman, & Matulich, 1993; Schwartz et al., 2007; Strobel, 2002). Motivation may influence the impact of interventions targeted at the community level. For example, a community may invest in a new park or found a town sports league, however, if the children's motivation for physical activity is low, the children may not utilize the environmental intervention. Others have recognized the importance of studying personal factors associated with interventions aimed at levels beyond the individual. Using Prochaska's Transtheoretical Model of Change, a study conducted by Mauriello (2006) and colleagues assessed a personal factor, the level of readiness for change, in children before implementing a computer intervention in the schools. Environmental factors interact with self-processes and personal factors to influence behavior. Investigating personal factors would aid in understanding the intrapersonal influences on health behaviors, as well as, help to identify which internal factors may influence factors and interventions at the environmental level.

Research needs to be conducted to study all factors influencing health behaviors, both personal and environmental. The current study seeks to focus on personal factors that influence health behaviors for two reasons. First, personal factors have been shown to be significant for the proposed study population, preadolescence. Second, according to Social Cognitive Theory, personal factors have a prominent role in behavior change, as

part of the self-processes that interact with all influential factors to impact behavior. The central role of personal factors in behavior change means that investigating personal factors will have implications for interventions at the individual and environmental level. The current study seeks to identify and understand influential personal factors that impact pre-adolescent children's health behaviors.

Relationship between Depression and Obesity

Psychopathology, more specifically depression, and obesity are shown to be related in both the child and adult literature. In the adult literature, it has been found that poor nutrition and obesity are significantly related to depression (Averina et al., 2005; Guerdjikova et al., 2007). In addition, it has been found that chronic obesity, which persists throughout the lifespan, is more strongly associated with psychopathology than obesity that emerges in childhood and disappears by adolescence (Guerdjikova et al., 2007). The National Institutes of Health, Heart Lung and Blood Institute have called for research that focuses on at-risk populations (Pratt et al., 2008). A diagnosis of depression may serve to identify individuals who are at risk for obesity.

Although, a relationship between obesity and depression is widely documented, the interpretation of findings among children has been more nuanced and controversial than the adult studies (Braet, 1997; Strauss, Smith, Frame, & Forehand, 1985). Two issues have dominated the discourse. First, many studies have attempted to discern the directionality between obesity and depression (Bradley et al., 2008; Goodman, 2002; McElroy, 2004; Mustillo, 2003; Pine, 2001; Tanofsky-Kraff et al., 2006; Zimetkin, Zoon, Klein, & Munson, 2004). Second, other studies have attempted to discern if either

condition, obesity or depression, significantly predicts the risk for the other condition (Braet, 1997; Davison, 2001; Pine, 2001).

The question of directionality in the relationship between depression and obesity has been controversial and results have been inconsistent. One prevalent view, which has been argued theoretically and demonstrated empirically, is that depression is a psychological consequence of obesity. The theoretical rationale is that children who are obese, become stigmatized, develop low self-esteem and poor body image, which results in depression (Bradley et al., 2008). There has been some empirical evidence to support this sequence as well (Mills & Andrianopoulos, 1993). Bradley et al. (2008) investigated the relationship between internalizing problems and obesity in a longitudinal population based study. The relationship was not found to be significant until the children reached age 7, at which point, obesity longitudinally predicted internalizing problems. This finding suggests internalizing problems may follow the development of obesity. Internalizing problems are frequently associated with individuals who struggle with issues of depression and anxiety.

However, there is other evidence that challenges the notion that obesity predisposes children to depression. One challenge is the long established finding that most children who are obese are not depressed (Braet, 1997; McElroy, 2004; Sheslow et al., 1993). Another challenge is from studies that have found that depression precedes obesity (Goodman, 2002; Pine, 2001; Washington, 2008). For example, Goodman (2002) found that depression longitudinally predicted obesity in an adolescent population sample. A collective review of these studies may seem contradictory at first glance,

however, theoretical underpinnings from Social Cognitive Theory and Developmental Psychopathology can help to explain this complex and nuanced relationship.

The Social Cognitive Theory concept of reciprocal determinism, for example, can be used to understand the relationship between depression and obesity and explain the seemingly inconsistent findings in the literature around this area. Bandura (2001) emphasizes a reciprocal transactional relationship between personal factors and behaviors. Cognitive, affective, and biological processes associated with depression and obesity are most likely reciprocally influencing one another.

Principles of Developmental Psychopathology also give meaning to the seemingly contradictory findings in the child literature concerning the relationship between obesity and depression. The following principles of Developmental Psychopathology, continuity and discontinuity, risk and protective factors, and equifinality and multifinality, will help to interpret the findings.

The current research examining the relationship between depression and obesity is best explained when it is realized that both obesity and depression are continuous concepts. Obesity is a condition which gradually onsets. An individual at some point on the continuum is considered overweight and at some point on the continuum is considered obese. A developmental continuum exists with depression as well. An individual, at a certain point on the continuum is considered to have sub clinical depression, and at some point on the continuum an individual meets criteria for a clinical diagnosis of major depressive disorder. Thus, at certain points in development children may manifest different levels of obesity and mood disorders. It is also important to

understand that this continuum does not have a specific timeline or developmental trajectory. The continuum is not linear with the endpoint being a full clinical diagnosis that remains present throughout the individual's lifetime. These conditions may worsen or abate several times throughout an individual's lifetime. A continuous developmental conceptualization of depression and obesity highlights that these two conditions may be reciprocally influencing one another, while also following their own individual developmental trajectories.

Risk and protective factors as conceptualized in Developmental Psychopathological Theory explains how an array of personal and environmental factors may interact to alter the course of a disorder. Individuals who meet criteria for Major Depressive Disorder or obesity are influenced by biological, psychological, and social factors, which alter the manifestation of clinical symptoms, causing vacillation between a full clinical diagnosis and a sub clinical symptom profile. For example in adolescence, the incidence of depression increases in females compared to males (Seiffge-Krenke, 2002). Hypotheses, pertaining to the gender disparity in adolescent depression, propose personal factors in the biological and social realms to be influencing the continuum of depression. Factors, such as changing hormone levels or a greater interest in peers and sensitivity to social rejection, are personal factors that are typically salient in the developmental time period of adolescence. During pre-adolescence, these personal factors interact with a depressive disposition to culminate in a clinical diagnosis of depression in adolescence (Silberg, 2001). Throughout the lifespan, personal and

environmental factors have the ability to serve as risk and protective factors and alter the development of depression and obesity.

Finally, the principles of equifinality and multifinality articulate how risk and protective factors alter the developmental continuum of conditions, such as obesity and depression. Equifinality means that a similar outcome can be reached by multiple pathways. Conversely, multifinality states that individuals who start with similar factors or situations may not have the same endpoint (Sameroff, 2000). Indeed the concept of multifinality can be used to understand that not all children who are obese develop depression (Braet, 1997). Risk and protective factors may be interacting across the developmental continuum of depression creating different outcomes of obesity for different individuals. Through equifinality and multifinality, it becomes clear that personal and environmental factors, serving as risk and protective factors, interact with the developmental continuum of obesity to either exacerbate or prevent the condition. In order to understand the development of obesity, it appears essential to study the personal and environmental factors that may impact the developmental continuum of obesity.

The demonstrated relationship between depression and obesity in the adult literature, suggests there may be certain circumstances when the presence of depression predisposes a child to develop obesity. There are many possible mechanisms for this. For example, depression may have biological features, such as neurotransmitter levels, which also influence obesity development. Another avenue by which depression may affect obesity is through health behaviors. Cognitive factors associated with depression, such as low motivation and low self-efficacy, may negatively influence a child's ability to engage

in healthy behaviors. Health behaviors are modifiable and thus hold the potential to reduce the chance of developing obesity. For this reason, exploring the relationship between depression and health behaviors may have valuable applied implications for obesity prevention work.

There is evidence that a relationship exists between depression and obesity. However, there are still questions that remain about this relationship. The factors by which depression and obesity are associated are not fully clear. In particular, it is unclear to what extent depression issues may be a significant predictor of children's health behaviors. The present study seeks to examine this question in preadolescent children. In addition, the inconsistent findings regarding the relationship between depression and obesity prompts the question of whether or not there are additional factors interacting with depression to influence health behaviors. This study will also examine possible moderators of the relationship between depression and obesity.

Self-Regulation: Link between Anxiety and Obesity

A number of factors are needed in order for children to establish a healthy lifestyle. One of these is the ability to engage in healthy behaviors, such as nutritious eating and exercise. The second component to establishing and maintaining a healthy lifestyle is self-regulation. In order to establish a healthy lifestyle, children need to be able to engage in healthy behaviors consistently in the face of varying obstacles. Self-regulation entails the goals individuals set for themselves and the strategies they use to accomplish these goals (Mischel et al., 1996). Self-regulation also entails delay of gratification for a longer term goal. It has been found that children and adults who are

able to delay gratification for a longer term goal have a better ability to self regulate in various realms of behavior, including health behaviors (Mischel, Shoda, & Rodriguez, 1992).

Both theorists and researchers have explored the influence of affect on self-regulation. Managing emotional processes related to setting and achieving goals is a component of self-regulation that can be influenced by an individual's affective processes (Ridder & Wit, 2006). Affect has been shown to significantly influence both goal pursuit and feedback about goal pursuit performance (Fishbach & Ferguson, 2007). Negative affect, in particular, compromises the ability to self-regulate. It has been found that individuals who are distressed exhibit less self-control or will power (Baumeister & Baumeister, 1996). Individuals who have difficulty managing their affect may also have difficulty self-regulating their behavior.

Much of the empirical evidence demonstrating the influence of affect on self-regulation has focused on the affective processes associated with anxiety in relation to health behaviors (Ridder & Wit, 2006). For example, in adults it has been found that anxiety exacerbates negative health behaviors, such as smoking and overeating (Strine, Chapman, Kobau, & Balluz, 2005). The influence of anxiety over health behaviors has also been shown to be long term. Personality traits associated with anxiety found in childhood have been found to predict health behaviors in adults (Caspi et al., 1997; Hampson, Goldberg, Vogt, & Dubanoski, 2006). Interestingly, although many have examined the relationship between affective processes and health behaviors (Hayman, Mahon, & Turner, 2002; Hwang et al., 2006; Kiess, Marcus, & Wabitsch, 2004; Mayne,

1999; Susman et al., 1992; B. J. Tinsley, 2003), no studies to date have examined the relationship of anxiety to children's health behaviors.

The influence of anxiety on self-regulation suggests that depression may not be the only affective processes associated with health behaviors in children. Obesity development in children may be influenced by the impact of anxiety on self-regulatory capabilities, which in turn influence health behaviors. This hypothesis can be tested by empirically investigating the relationship between anxiety and health behaviors in children. In addition, the underlying mechanism in the proposed relationship between anxiety and health behaviors might be clarified by examining the role of factors associated with self-regulation on health behavior.

Importance of Internalizing Problems

Since both anxiety and depression have been implicated in obesity development, research attention to both constructs is warranted. Both anxiety and depression are classified as internalizing disorders, particularly pertaining to children. In childhood, the differentiation of diagnoses of childhood depression and anxiety has been a long standing issue (Doerfler, Felner, Rowlison, Raley, & Evans, 1988; Epkins & Meyers, 1994; Eschmann, 2008; Kazdin & Petti, 1982; Seligman, Ollendick, Langley, & Baldacci, 2004; Stark & Laurent, 2001). Although many researchers have proposed factors that differentiate childhood depression and anxiety, the current instruments available to measure these constructs do not demonstrate sufficient discriminant construct validity.

Clark and Watson (1991) constructed a theoretical model to account for the difficulty of differentiating between childhood depression and anxiety. The tripartite

model contains three dimensions, one dimension shared by both depression and anxiety (negative affectivity), one dimension specific to anxiety (hyperarousal), and one dimension specific to depression (anhedonia). Clark and Watson have demonstrated that the negative affectivity trait accounts for the significant overlap between depression and anxiety in childhood (Clark & Watson, 1991).

Due to the lack of discriminant validity between childhood depression and obesity, using a common factor for anxiety and depression may prove to be more accurate and valid for researching children's health behaviors. The internalizing problems subscale of the Child Behavior Checklist (CBCL) is a scale that comprises aspects of both depression and anxiety. The Internalizing problems subscale combines symptoms from three different clinical syndrome scales of the CBCL, anxious/depressed, withdrawn depressed, and somatic complaints (Achenbach, 2001). Factor analyses suggest that the anxious/depressed and withdrawn/ depressed scales represent two different aspects of the negative affectivity trait (Achenbach, 2001).

In addition, using internalizing problems to represent issues associated with depression and anxiety in childhood allows for a continuous conceptualization of depression and anxiety. Scores on the internalizing problems index are continuous as opposed to a clinical diagnosis, which is dichotomous. This continuous trajectory aligns with the Developmental Psychopathological principle of continuity and discontinuity. The internalizing problems index also identifies children who meet criteria for clinical diagnosis, children who meet sub clinical criteria, and children who may not meet criteria for a mood or anxiety disorder but have difficulty with negative affectivity. This is

important since the population to be studied is preadolescence and it is known that in adolescence there is an increase in the rate of depression in females (Seiffge-Krenke, 2001). Therefore, investigating clinical diagnoses of depression and anxiety in preadolescence may not capture the entire population of individuals who will meet criteria for anxiety and depression in adolescence. The internalizing problems index of the CBCL allows for a valid continuous representation of mood and anxiety issues, which extends below the threshold of clinical diagnosis.

Cognitive Moderators influencing Health Behaviors

This study also seeks to examine possible moderators of the relationship between internalizing problems and health behaviors in children. The inconsistent relationship between depression and health behaviors suggests there may be other factors moderating this relationship. Broadening the scope of this investigation to explore relationships between influential factors of obesity development is consistent with principles of Developmental Psychopathology and Social Cognitive Theory. This line of research is also consistent with the call in obesity prevention research for identifying causal psychological processes that relate to obesity development. The current study will be exploring two cognitive factors, hot cognition and self-efficacy, and their ability to moderate the relationship between internalizing problems and health behaviors in pre-adolescent children.

Hot Cognition

Mischel's Cognitive Affective Personality System (CAPS) Theory can be used to understand how affective processes interact with cognitive processes to impact health

behaviors. The CAPS Theory conceptualizes personality as an interactive dynamic process related to affect, cognition, behaviors and situations. (Mischel, 1999). Mischel's CAPS Theory is consistent with premises used in both Developmental Psychopathology Theory and Social Cognitive Theory, which posit a reciprocal relationship between internal processes, behaviors, and environmental influences (Rutter, 2000; Bandura, 2001).

The CAPS theory provides two unique contributions. First, empirical work using the CAPS Theory has focused on issues of self-regulation in children. Self-regulation is a major component of the establishment and maintenance of health behaviors in children. Second, the CAPS Theory provides a theoretical model for understanding the interaction between cognitive and affective processes within the realm of personal factors. These contributions of the CAPS Theory make it an ideal framework for understanding the cognitive and affective processes that may contribute to the relationship between internalizing problems and health behaviors.

In Mischel's work, individual differences in self-regulation have been found in children as young as four years old (Mischel, Shoda, & Rodriguez, 1989; Mischel et al., 1992). One of the major tenets of self-regulation is being able to delay gratification from a short-term behavior for a longer term goal. Mischel created a delay of gratification task, which measures a child's ability to delay gratification for a longer term goal. The delay of gratification task has been found to predict a child's ability to self regulate in many areas including health (Mischel & Mischel, 1983; Mischel et al., 1989; Mischel et al., 1992).

There are dispositional and organic factors that can cause individual difference in self-regulation. Dispositional factors include affective processes (Metcalf & Mischel, 1999).

In the CAPS Theory, an internal, dual processing subsystem exists to process stimuli from the environment and influence behavior. This system is called the hot/cool processing system. The hot system is the response that is affectively driven and automatic. The cool system, which is more cognitively driven, is the more emotionally neutral, flexible, and strategic system of response (Mischel, 1999). Together the hot/cool system comprises what is called the cognitive affective unit (CAU). The hot/cool system is one concept used to understand the internal processes of personality. Individuals differ in which aspect of the hot/cool system becomes activated in order to interpret stimuli from the environment, which results in different responses and behaviors (Mischel, 1999).

Metcalf and Mischel have conceptualized a detailed theoretical description of the hot/cool system (Metcalf & Mischel, 1999). In this conceptualization, the hot and cool systems contain nodes. The hot system is comprised of nodes that are not connected and are considered to be affective fragments. The hot system nodes are activated by environmental stimuli and cause the individual to respond to the stimuli with an automatic, affectively driven response. In the cool system, the nodes are connected to one another. The connections in the cool system prevent the cool node from responding singularly, as in the hot system nodes. These connections serve to diffuse an automatic response and allow the node to draw upon the strategic abilities of the cool system. The cool system is essential in the regulation of behaviors.

Developmentally, the hot system is thought to emerge early in life and dominate through the early years. Then gradually, the cool system is developed as the individual matures. Evidence has shown that, typically, in sixth grade, children start to understand the value of a cool system (Mischel & Mischel, 1983). Given this finding, investigating hot cognition in preadolescence, the proposed population for the present study, is an ideal developmental time period to explore hot cognition's influence on health behaviors.

The hot/cool system described by Mischel (1996) outlines the influence affect can have on self-regulation. According to the CAPS Theory, affective stimulation influences the CAU's of the individual's internal processing dynamics. The affectively-laden environmental stimuli operates by heightening the hot side or affective side of internal processing. In order to self-regulate, an individual needs to also have a response from the cool cognitive side. Hyperactivation of the hot part of the system or lack of activation of the cool system can impede an individual from being able to self-regulate their behaviors. This model provides a theoretical framework to conceptualize how affect and cognition interact in issues of self-regulation.

An individual who is more prone to operate from the hot side of the CAU may have difficulty delaying gratification for a longer term goal and, hence self-regulating their behavior. Children who endorse internalizing behaviors may have more affective stimulation, and therefore, operate more frequently from the hot system. For example, anxiety has been found to have a profound effect on self-regulation, particularly in the realm of health (Cameron & Leventhal, 2003; Mischel et al., 1996). In addition, negative affect, which is associated with both anxiety and depression, has been found to have an

impact on self-regulation. Individuals who are distressed exhibit less self-control or will power than individuals who are less distressed (Baumeister & Baumeister, 1996). These findings support the idea that internalizing problems may stimulate an individual's hot side, which makes it more difficult for an individual to self-regulate. Difficulties in self-regulation would include the realm of health behaviors.

This study seeks to investigate the extent to which hot cognition predicts children's health behaviors, as well as the extent to which hot cognition interacts with internalizing problems to predict children's health behaviors. Exploring hot cognition as a moderator for the relationship between internalizing problems and health behaviors may provide preliminary information about the mechanism of action between internalizing problems and health behaviors, which would be an important contribution towards understanding the influences of personal factors on childhood obesity. In addition, testing these hypotheses has valuable implications for the design and implementation of obesity prevention programs. If hot cognition is found to be a salient factor for children's health behaviors, interventions can include techniques Mischel has found to be helpful in fostering cool cognition for self regulation, such as blunting and monitoring (Mischel et al., 1992). Identifying and understanding the interaction between significant personal factors of health behaviors would make a worthwhile contribution to the fight against childhood obesity.

Self Efficacy

Self-efficacy is another concept that may clarify the relationship between internalizing problems and health behaviors in children. Self-efficacy, which is defined as

a judgment of personal capability or the extent to which people believe they are capable of any given action, is central to Social Cognitive Theory. Self-efficacy is not an intention but rather a capability. Bandura considers self-efficacy to be one of the most important concepts of understanding and improving behavior change (Bandura, 1997). Self-efficacy encompasses “a multifaceted causal structure that addresses both the development of competencies and the regulation of action” (Bandura, 1997, p.34). These two aspects of self-efficacy, development of competencies and regulation of action, have an intuitive relationship with the establishment and maintenance of health behaviors in children. The development of competencies includes establishing skills and knowledge necessary to initially adopt healthy behaviors. The regulation of action contributes to the ability to persist with healthy behaviors over time in the face of varying obstacles. Because self-efficacy appears to have influence over the qualities that characterize healthy living, self-efficacy is a meaningful personal construct to consider as a factor influencing children’s health behaviors.

Self-efficacy is not a universal trait, applicable to all behaviors. Rather, self-efficacy is considered to be domain specific and influenced by changing circumstances, both internal and external to the individual (Bandura, 1997). For example, a child may decide how well they believe they will play in a baseball game based on how much they practice, the formidability of the opposing team, and their mood. This outlook on self-efficacy places context in a prominent role. Global measures of self-efficacy do not yield relevant or useful information. According to Bandura, a domain specific measure of self-efficacy is necessary in order to have clinical and statistical significance (Bandura, 1997).

Self-efficacy has been studied in various realms of behaviors such as academics (Caprara et al., 2008; Pajares & Valiante, 1997; Stuart, 2007; Zimmerman, Bandura, & Martinez-Pons, 1992) and career (Argyropoulou, Sidiropoulou-Dimakakou, & Besevegis, 2007; Bandura, Barbaranelli, Vittorio Caprara, & Pastorelli, 2001; Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003). Self-efficacy has also been studied in the realm of health behaviors in both children and adults (Hausenblas, Nigg, Downs, Fleming, & Connaughton, 2002; Kelly et al., 1991; Landaas, 2006; Shields et al., 2008; Tapler, 1996). The studies examining the role of self-efficacy in health behaviors have found self-efficacy to have a significant relationship in the prediction of health behaviors.

According to Social Cognitive Theory, affective processes are an aspect of the self that interacts with personal factors, such as self-efficacy. Existing literature suggests a relationship between affect, specifically anxiety and depression, and self-efficacy beliefs. Communian (1989) found that general self-efficacy had a significant negative relationship to depression and anxiety in high school students. Specific types of self-efficacy, such as social efficacy and academic efficacy, have been found to have links to depression in childhood (Bandura, 1999). It has also been found that exercise self-efficacy has a significant inverse relationship to depression in a study of participants in middle childhood (Annesi, 2004). In adolescence, general, academic, physical, and social efficacy are significantly and inversely related with depression (Ehrenberg, Cox, & Koopman, 1991). Clinically referred anxious youth and non-anxious youth, report different levels of emotional efficacy (Landon, Ehrenreich, & Pincus, 2007). Among non-clinical adolescents, self-efficacy is significantly related to both anxiety and depressive

disorders (Muris, 2002). The findings from these studies demonstrate a relationship between affective processes associated with anxiety and depression, and self-efficacy beliefs.

Reciprocal determinism, a principle from Social Cognitive Theory, characterizes the relationship between affect and self-efficacy beliefs. “Mood and efficacy beliefs are related both concurrently and predictively” (Bandura, 1997, p. 113). Mood states have influence over the development of self-efficacy beliefs, and in turn, self-efficacy beliefs influence the development of more enduring manifestations of depression and anxiety. These personal factors may interact with one another to influence health behaviors in children.

Studies examining the relationship between mood states and self-efficacy beliefs suggest that moods have a significant impact on self-efficacy beliefs (Schwartz, & Clore, 1988; Forgas, Bower, & Moylan, 1990; Salovey & Birnbaum, 1989). Wright and colleagues have explored how affective states at the time of action influence self-efficacy beliefs (Wright & Mischel, 1982). They found that successes in a negative mood dampen self-efficacy beliefs while failures in a positive mood leave people overestimating their capabilities. Findings from other studies suggest that global affective states can affect multiple domains of efficacy (Teasdale, 1983). Research also suggests that people will feel more efficacious and take on more challenging tasks when they are in a more positive mood. Kavanagh (1985) found that cardiac patients perform more health promoting behaviors after a cardiac intervention when they are in a positive mood state.

These studies suggest that mood states can have an influential role on self-efficacy beliefs.

According to the findings above, mood states appear to have an impact on self-efficacy beliefs. Children who struggle with internalizing behaviors may find themselves experiencing negative moods more frequently than children who do not struggle with internalizing behaviors. Negative mood states can weaken the development of self-efficacy beliefs. Children with internalizing behaviors may experience mood states that influence their self-efficacy beliefs and subsequently impact health behaviors.

Conversely, self-efficacy beliefs can also influence more enduring affective processes such as depression and anxiety. Bandura asserts that there are three ways in which self-efficacy beliefs affect the nature and intensity of emotional experiences: “through the exercise of personal control over thought, action, and affect” (Bandura, 1997, p.137). Much of the literature, concerning the influence of self-efficacy on affective processes, has investigated the impact of self-efficacy beliefs on the development of anxiety and depression.

Literature examining the impact of self-efficacy beliefs on anxiety has focused on the cognitive interpretations of physiological arousal (Bandura, 1997). For example, an ambiguous physiological arousal, such as an increased heart rate, can indicate fear, anger, or excitement. One way that self-efficacy beliefs may influence anxiety is by determining how the individual perceives the arousal and determining whether or not they believe they can cope with the arousal. If an individual has a weak sense of self-efficacy they may decide that the arousal is overwhelming and this will result in an anxious reaction.

Conversely, an individual with a strong sense of self-efficacy may interpret the arousal as excitement. Self-efficacy beliefs are a component of the cognitive appraisal of physiological arousal that determines whether or not the individual experiences anxiety.

Literature examining the impact of self-efficacy beliefs upon depression has focused on a different mechanism. This research has focused on the evaluation of outcome expectancies, as the mechanism by which self-efficacy beliefs impact depression. For example, self-efficacy beliefs may be weakened in an individual who experiences failure. Weakened self-efficacy beliefs may result in low self-esteem and feelings of worthlessness, which may lead to the development of depression (Bandura, 1997). Further research that has investigated the causal attribution of accomplishments has found a correlation between depression and self-efficacy beliefs. Individuals who are depressed and have low self-efficacy believe failures can be attributed to personal characteristics, whereas, successes are attributed to external factors (Alden, 1986). The opposite is true for individuals who have a high sense of self-efficacy and low depression. The study by Alden et.al. (1986) indicates that one of the links between self-efficacy and depression pertains to the appraisal of outcomes of behaviors.

The characterization of self-efficacy's mechanism on depression and anxiety has been dichotomized, with depression research focusing on appraisal of outcomes and anxiety research focusing on perceived control over physiological arousal. However, Bandura argues that anxiety and depression may share more commonalities than distinctions in their relation to self-efficacy (Bandura, 1997). He asserts that anxiety may have as much impact on appraisal of outcomes as depression, and depression may have as

much impact on cognitive interpretations of physiological arousal as anxiety. Bandura posits that failure is both anxiety provoking and depressing. He further states the difference in the relationships of anxiety and depression with self-efficacy is an artifact of research agenda as opposed to an actual difference. This rationale supports a focus on internalizing behaviors in the present study. The distinction between anxiety and depression in their relationship to self-efficacy, particularly in children, may not be significant. Examining internalizing behaviors in children may allow for the different mechanisms of self-efficacy on affective processes to be captured.

Relatively few studies have examined the relationship between affective processes and self-efficacy and the consequence of this relationship on health behaviors. There have been no studies conducted with children. In adults, a relationship between exercise self-efficacy and exercise behaviors was found to be mediated by depression (Dow, 2008). Given the adult findings, it is reasonable to explore this model in relation to children's health behaviors.

For children who struggle with internalizing problems, the relationship between affect and self-efficacy may be vital to understanding their health behaviors. Negative affect associated with internalizing problems may contribute to the development of weak self-efficacy beliefs around health behaviors, such as nutrition behavior and physical activity behavior. In addition, negative self-efficacy beliefs may be contributing to an overall negative affect, which manifests itself as internalizing problems. Investigating the interactive relationship between internalizing problems and self-efficacy beliefs provides

an opportunity to learn more about the personal factors that relate to children's health behaviors.

Hypotheses

This study examined research questions in the following three areas; relationship between mental health and health behaviors, relationship between cognitive factors and health behaviors, and the moderating relationship between mental health and cognitive factors and its relationship with health behaviors.

Relationship between mental health and health behaviors

The current study addresses the research question, to what extent does mental health predict health behaviors in preadolescent children? More specifically the three following hypotheses were tested:

- 1) Internalizing behaviors negatively significantly predict healthy eating behaviors in preadolescent children.
- 2) Internalizing behaviors negatively significantly predict unhealthy eating behaviors in preadolescent children.
- 3) Internalizing behaviors negatively significantly predict physical activity behaviors in preadolescent children.

Relationship between cognitive factors and health behaviors

The current study addresses the research question, to what extent do cognitive factors predict health behaviors in preadolescent children? More specifically the four following hypotheses were tested:

- 4) Sports self-efficacy positively significantly predicts physical activity behaviors in preadolescent children.
- 5) Delay of gratification positively significantly predicts physical activity behaviors in preadolescent children.
- 6) Delay of gratification positively significantly predicts healthy eating in preadolescent children.
- 7) Delay of gratification negatively significantly predicts unhealthy eating in preadolescent children.

Moderating relationship between mental health and cognitive factors

The current study addresses the research question, to what extent does the moderating relationship between mental health and cognitive factors predict health behaviors in preadolescent children. The moderating relationship was tested by the following three hypotheses:

- 8) The interaction between internalizing behaviors and sports self-efficacy significantly predicts physical activity behavior in preadolescent children.
- 9) The interaction between internalizing behaviors and delay of gratification significantly predicts physical activity behavior in preadolescent children.
- 10) The interaction between internalizing behaviors and delay of gratification significantly predicts healthy eating behavior in preadolescent children.
- 11) The interaction between internalizing behaviors and delay of gratification significantly predicts unhealthy eating behavior in preadolescent children.

Implications

The results of this study were expected to have several important implications. First, this study assessed whether or not children who struggle with internalizing problems symptoms have poorer health behaviors than those children who do not struggle with internalizing problems. This provides information as to whether or not these children are at increased risk for obesity. Second, examining hot cognition and self-efficacy and their relationship to health behaviors determined whether or not these cognitive factors are significant predictor of children's health behaviors. The findings from these hypotheses provide knowledge about influential personal factors that relate to obesity development. The moderating hypotheses, looking at hot cognition and self-efficacy in conjunction with depression and anxiety were designed to explain how and why depression and anxiety are sometimes, but not always, associated with unhealthy eating and weight gain. This line of research is consistent with the call in obesity prevention research for identifying causal psychological processes that relate to obesity development. Overall, this study was designed to contribute to the growing body of knowledge identifying significant personal factors in obesity development. Additionally, this study was expected to provide information that can aid in the design and implementation of obesity prevention efforts. For these reasons, this study was expected be a valuable and important contribution to children's health.

Chapter Three

Methods

Participants

The present study was conducted using secondary data analysis of the National Institute of Child Health and Development (NICHD) Study of Early Child Care and Youth Development (SECCYD) data set. This is a longitudinal data set, which recruited children from ten different U.S. cities (Little Rock, AR; Irvine CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA; and Madison, WI). Women giving birth at selected hospitals in these cities were approached to participate and screened for eligibility. During the recruitment period, 8,986 infants were born. Sixty percent of these infants were deemed eligible to participate and their mothers were willing to give consent for them to participate. Inclusion criteria were as follows, mother over the age of 18, healthy baby, baby not part of multiple birth or being adopted, living within an hour of the study site and not planning to move in the next year, and neighborhood, in which the family lives, was deemed safe to conduct home visits. A conditional sampling plan was used to reflect diversity in the following areas, economic, ethnic, and educational diversity, and 3,015 mothers were selected to be phone screened. One thousand four hundred and ninety infants were excluded due to poor infant health, lost to follow up, and potential for lost to follow up, therefore, in 1991, 1,364 infants and their families were enrolled in the initial phase of the study.

There have been four phases of data collection. The present study used data from Phase II and Phase III. Phase II data was collected from 1995-2000, when participants ranged from 3 years through first grade. Phase III data was collected from 2000-2005, when participants ranged from second grade through sixth grade. The present study used the delay of gratification task data from Phase II when participants were approximately 4.5 years old. All other measures were from the Phase III data when the participants were in sixth grade.

The SECCYD sample consists of 660 girls and 704 boys. A power analysis was conducted to determine the sample size needed in order for the analyses in this study to have sufficient power (0.8) (Cohen et.al., 2003). One hundred fourteen subjects were needed given an alpha level of .05 and an effect size of 0.1. The sample size of the SECCYD provided sufficient power for the analysis conducted in this study.

Procedure

Mothers who were enrolled in the study gave consent for their children to participate, as well as consent for themselves to provide parent data. The NICHD SECCYD data was collected through various self-report questionnaires, clinical interviews and laboratory assessments. The SECCYD included information on a wide range of constructs from health and social well being, to demographics, to information about childcare settings. For the purposes of this investigation, data pertaining to the following constructs of interest were analyzed: physical activity behavior, nutrition behavior, internalizing problems, physical activity efficacy, and hot cognition.

Measures

Study Variables

Internalizing Behaviors Measure

Child Behavior Checklist (CBCL) –Anxious/Depressed subscale

The CBCL is a well-established instrument used widely in the literature to measure various constructs associated with children's behaviors and psychopathology (Achenbach, 2001). The CBCL is a paper and pencil questionnaire completed by the parent about their child's functioning. The response options in the CBCL are based on a three point likert scale ranging from not true to often true.

The anxious/depressed subscale of the Child Behavior Checklist (CBCL) is a clinical syndrome subscale, which is comprised of twelve items concerning issues of fears, feelings, and depressive behaviors (Achenbach, 2001). Factor analyses of the anxious/depressed subscale demonstrated that this subscale has items that load on a common factor characterized as negative affectivity (Achenbach, 2001). Negative affectivity is a trait thought to be common to both anxiety and depression, particularly in childhood (Clark & Watson, 1991). Questions, which have been found to load on the common factor of negative affectivity, inquire about behaviors such as, crying frequently, worrying, and being withdrawn.

Reliability and validity statistics for the Anxious/Depressed subscale have been computed with a sample of 1,605 non-referred children (Achenbach, 2001).

Demographics for this sample are as follows, 53% boys, 47% girls; mean age = 11.7 years; non-Latino white 57%, African American 21%, Latino 10%, and mixed/other

13%. For this sample, test-retest reliability ($r = .82$) and internal consistency ($\alpha = .84$) were computed to be high. Stability of scores over a twelve-month period ($r = .68$) and the stability of scores over a twenty-four month period ($r = .56$) are considered moderate.

Data exists for the internal consistency of the anxious/depressed subscale with the SECCYD sample. The reliability statistic was computed with the Phase III data. The anxious/depressed subscale showed moderate internal reliability for both boys ($\alpha = 0.82$) and girls ($\alpha = 0.81$).

Analysis providing support for the criterion validity of the anxious/depressed scale has been conducted using questionnaire data from the Behavior Assessment System for Children (BASC) (Reynolds, & Kamphaus, 1992). Mother reports from the CBCL for the anxious/depressed scale correlated moderately with the BASC scale for anxiety ($r = .54$) and correlated moderately with the BASC scale for depression ($r = .60$). Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV checklists and clinician diagnoses (based on multiple sources including clinical interviews, histories, tests, and medical data) were also used to establish criterion validity for the anxious/depressed scale and withdrawn/depressed scales. For the anxious depressed scale, the correlation with DSM-IV checklists was moderate ($r = .51$) and the correlation with clinician diagnoses was small ($r = .27$).

*Nutrition Behavior Measure**Child Eating Habits and Body Self Image Questionnaire-Healthy and Unhealthy Foods Subscale*

The Child Eating Habits and Body Self Image Questionnaire (CEHBSIQ) is a paper and pencil survey administered to the child. For the present study the nutrition subscale was used to represent nutrition behavior in the analysis. The nutrition behavior subscale (9 items) was comprised of two different subscales, healthy eating scale and unhealthy eating scale. Each item asks the question; Yesterday how often did you eat ___? The responses were based on a four point likert scale ranging from 1 = not at all to 4 = three or more times.

Reliability statistics were computed to determine the internal consistency for the nutrition subscales with the Phase III data. The healthy eating subscale demonstrated moderate internal reliability for boys ($\alpha = 0.52$) and girls ($\alpha = 0.61$). The unhealthy eating subscale also demonstrated moderate internal reliability for boys ($\alpha = 0.64$) and girls ($\alpha = 0.50$). No validity statistics for the CEHBSIQ were found in the literature.

The nutrition items from the CEHBSIQ were modified from the Youth Risk Behavior Survey (YRBS) nutrition items. The YRBS is widely used instrument, which has reliability and validity data available in the literature. However, the modification of the YRBS for the CEHBSIQ significantly changed the characteristics of the measure. The YRBS required a dietary recall of the past seven days, whereas questions on the CEHBSIQ require a twenty-four hour dietary recall. This modification to the twenty-four hour dietary recall is consistent with child nutrition literature, which suggests that dietary

recall beyond twenty four hours is developmentally inappropriate (Baranowski & Domel, 1994). Due to this significant modification, psychometric properties reported on the YRBS were not relevant to the reliability and validity of the CEHBSIQ.

Physical Activity Behavior Measure

Self-Administered Physical Activity Checklist (SAPAC)

The SAPAC was a self-report, interviewer-administered checklist developed to be used in children ten and older (Perry, 1990). The checklist contained 24 items with a yes/no response format. The child was asked whether or not they engaged in a particular physical activity for more than five minutes in the last twenty-four hours. The twenty-four hour recall used on this measure of physical activity was consistent with literature suggesting that in preadolescence, anything beyond a twenty-four recall is developmentally inappropriate and has low validity (Sallis, 1991; Sallis et al., 1993; Sallis, Buono, Roby, Micale, & Nelson, 1993).

Due to recall issues limiting accuracy of children's self reports, criterion validity, that is comparing a child's self report to other more objective measures of physical activity, emerged as the primary methodological concern in self-report measures of physical activity with children. The criterion validity of the SAPAC was tested in a study conducted by Sallis (1996), which compared results from the self-report questionnaire to two objective physiological measures. The first objective physiological measure of physical activity was a heart monitor worn by children and continuous heart rate data was downloaded from the device. The correlation between scores on the heart monitor and the SAPAC was moderate ($r = .51, p < .001$). The second objective physiological measure of

physical activity was an accelerometer worn by children. The accelerometer provided a quantity and quality measurement of movement in the vertical plane, which provided an index score of motion or physical activity. The correlation between scores on the accelerometer and the SAPAC were also moderate ($r = 0.33, p < .001$). The study by Sallis (1996) demonstrated that the SAPAC had moderate validity with objective physiological measures of children's physical activity.

Self-Efficacy Measure

How I do in School-Sports Self-efficacy subscale

The construct of physical activity efficacy was represented by a measure called, How I do in School, which measured self-efficacy towards sports and academics. The sports self-efficacy subscale was used in the analysis for this study. The How I do School scale is a self-report, self-administered questionnaire. Five items within this scale comprise the sports self-efficacy subscale. Three items in the sports self-efficacy subscale corresponded to the expectation of being successful at sports, such as, How good at sports are you?; How good would you be at learning something new in sports?. The remaining two items corresponded to how much the child values being good at sports, for example, In general, how useful is what you learn in sports?. The responses were based on a seven item likert scale with responses ranging from 1 = not at all good to 7 = very good. This scale was constructed based on theoretical underpinnings from Wigfield and Eccles Expectancy-Value theory. Expectancy-Value theory asserts that an individual's behavior is influenced by how well they believe they will perform the behavior and how much they value this behavior (Wigfield & Eccles, 1992; Wigfield, 1994).

The sports self-efficacy subscale was a slightly modified version of the Self and Task Perception Questionnaire (STPQ) (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). The STPQ has shown to be a stable measure across time. A longitudinal sample, which studied children from first grade through high school at seven different time periods, found reliability statistics for the sports competence questions to be high ($\alpha = 0.84$ to 0.94). Reliability statistics for the sports value questions were also high ($\alpha = 0.85$ to 0.93) (Jacobs et al., 2002). Another study conducted by Wigfield and colleagues (1997) reported internal consistency of the STPQ. Internal consistency across time and domains for the competence items was high, with alphas ranging from $.74$ to $.90$. Reliability statistics for the value items demonstrated moderate to high internal consistency with alphas ranging from $.57$ to $.88$ (Wigfield et al., 1997).

Reliability statistics were calculated to examine the internal consistency for the sports self-efficacy subscale of the How I do in School measure. These analyses were computed with the Phase III sample of the SECCYD. The sports self-efficacy subscale was comprised of both items pertaining to efficacy and items pertaining to the value of the activity. The sports self-efficacy scale demonstrated high internal reliability for the Phase III SECCYD study sample for both boys ($\alpha = 0.89$) and girls ($\alpha = 0.89$).

Analysis was also conducted to test the criterion validity of the STPQ. The self-report of children's self-efficacy, measured by the STPQ, was compared to external reports of the child's self-efficacy made by teachers and parents (Wigfield et al., 1997). In a longitudinal design, with assessments occurring annually from first to sixth grade, teacher report ratings of sports self-efficacy were significantly related to child self-report

of sports self-efficacy every year except one (Wigfield et al., 1997). Parental ratings of sports self-efficacy were significantly related to child self-report of sports self-efficacy at every time point (Wigfield et al., 1997).

Measure of Hot Cognition

Delay of Gratification Task

The delay of gratification task was the only measure used from the Phase II data when the participants were 4.5 years old. All other measures were obtained from Phase III of the SECCYD when the participants were in sixth grade. This measure was selected for its unique ability to predict self-regulation behavior in children and adolescents.

The delay of gratification task was a laboratory-based assessment of children aged four years and five months based on Mischel's theoretical model of self-regulation (Mischel, Shoda, & Rodriguez, 1989; Mischel, Shoda, & Rodriguez, 1992). The delay of gratification task was a self-imposed waiting task. The child was put in a room with an amount of food they prefer (m&m's, pretzels, or animal crackers). The child was told if they could wait for the researcher to return to the room (7 minutes) they could have a large amount of food. If they could not wait for the researcher to come back in the room they rang a bell and the researcher came back into the room, but they were given a smaller amount of the food. The food was put in front of the child during the waiting time. The amount of time the child attends to the food was recorded, as well as, the amount of time the child did not attend to the food. The time the child was able to wait was also recorded. Reliability statistics for the laboratory-based delay of gratification task were not found in the literature.

The criterion validity of the delay of gratification task designed by Mischel has been tested. The delay of gratification task has been shown to be a valid predictor of self-regulation in various realms of behavior from preschool to adolescence. In a study conducted by Shoda and colleagues (1990) delay of gratification in preschool was shown to correlate with parent measures of adaptive coping skills and personality correlates associated with self-regulation (California Q-Sort), as well as SAT scores (Shoda, Mischel, & Peake, 1990). The parent measures were obtained approximately ten years after the delay of gratification task occurred when the average age of the participants was fifteen. The Shoda and colleagues study (1990) supported the criterion validity of the delay of gratification task and demonstrated that the predictive ability of the task extends into adolescence.

In the study conducted by Shoda and colleagues (1990), the children were randomized into four conditions based on whether or not the rewards were exposed and whether or not cognitive or attentional strategies were given to the preschoolers. On all three outcome measures, (Coping questionnaire, California Q-Sort, and SAT) the most significant results were found in the condition where children were exposed to the rewards and were not given cognitive or attentional strategies. This rewards exposed/no strategies condition was the condition employed in Phase II of the SECCYD sample (NICHD, 2005) and, therefore, the results for these conditions were explored in depth to demonstrate the validity of the conditions used in the SECCYD. In all three of these measures, children who were able to delay gratification longer in preschool had more significant correlations with higher coping skills, personality traits, such as planfulness,

and higher SAT scores. On the California Q-Sort 5 of the 11 items in the rewards exposed/no strategies condition were found to be significantly correlated with delay of gratification scores in preschool. For SAT scores, the rewards exposed/no strategies condition in the preschool task was found to be significantly related to both SAT verbal and SAT math scores. These findings provide evidence that the delay or gratification task administered in preschool is a valid predictor of self-regulation behavior in childhood and adolescence.

Demographic Variables

There were several sociocultural factors that appeared to be related to both physical activity behavior and nutrition behavior and consequently the development of obesity in preadolescent children. According to literature, gender is a primary factor in children's health behaviors (Hoelscher et al., 2009) and evidence also suggests that mechanisms for engaging in health behaviors between boys and girls were disparate enough to warrant different intervention strategies (Davison, Werder, Trost, Baker, & Birch, 2007). Preadolescence is a time when social, psychological, and biological factors associated with gender become prominent due to the onset of puberty. Given this the present study conducted preliminary analyses to determine whether or not there was a significant difference between girls and boys on the study variables.

Research has also demonstrated that the race and socioeconomic status impact nutrition behavior and physical activity behavior in preadolescent children.

(Bean, Melanie Kerr Van Ogtrop (1), 2006; Beydoun & Wang, 2010; Bruss, Morris, & Dannison, 2003; Caprio et al., 2008; Cerin & Leslie, 2008; Dollman, Ridley, Magarey,

Martin, & Hemphill, 2007; Fairclough, Boddy, Hackett, & Stratton, 2009; Hoelscher, Barroso, Springer, Castrucci, & Kelder, 2009; Mota, Ribeiro, & Santos, 2009; Singh, Kogan, Siahpush, & van Dyck, 2008; Zhang & Wang, 2004). Measures representing these constructs were analyzed in the preliminary analyses.

In addition to demographic factors, there was evidence to suggest that maternal depression impacted the mental health and health behaviors of children. Literature suggests that maternal depression had a strong link to the development of depression in offspring (Hammen, Burge, & Adrian, 1991; Kennard et al., 2008; Milan, Snow, & Belay, 2009; Whaley, Pinto, & Sigman, 1999). The importance of family involvement in children's health behaviors has also been demonstrated in the literature and maternal level of depression may have impeded involvement in health behavior change in children (Bautista Castano, Doreste, & Serra Majem, 2004; DeMattia, Lemont, & Meurer, 2007; Ells et al., 2005). Therefore, maternal depression was also examined in the preliminary analyses.

Chapter Four (Results)

Preliminary analyses

Preliminary analyses consisted of assessing the suitability of the study variables for the primary analysis of Ordinary Least Squares Regression, addressing missing data using multiple imputation, and identifying demographic variables as possible covariates for the primary analyses. Skewness and kurtosis were also evaluated for the study variables. Acceptable values for skew and kurtosis fall within the range of -2.0 to 2.0 (Lewis-Beck, Bryman, & Liao, 2004).

Preliminary analyses were also completed to assess gender differences on the study variables. Results revealed significant differences between boys and girls on two of the variables, unhealthy eating and sports self-efficacy, with boys reporting higher levels on both variables. Results for these analyses and descriptive statistics for the study variables are reported in Table 1. Given these results and the existing literature in this area suggesting differences between girls and boys, all preliminary and primary data analyses were conducted separately for girls and boys.

Table 1. Descriptive Statistics of Study Variables and Gender Comparison of Study

Variables.

Variable	<u>Boys</u>			<u>Girls</u>			<u>Gender Comparison</u>	
	N	Mean	SD	N	Mean	SD	t	df
Nutrition	508	3.56	2.30	503	3.61	2.43	-.28	1009
Behavior-Healthy Eating								
Nutrition	507	3.64	2.53	503	2.98	2.11	4.57**	1008
Behavior-Unhealthy Eating								
Physical Activity	442	107.06	86.42	454	96.85	76.26	1.88	894
Sports Self-Efficacy	508	5.97	1.19	504	5.76	1.19	2.66*	1010
Delay of Gratification								
Internalizing Behaviors	512	53.11	5.74	510	52.56	4.82	.30	1020

Note: Significance values for p were adjusted using the Bonferroni correction

- *p < .05/6 = .008
- ** p < .01/6 = .001

Descriptive Statistics

Nutrition Behavior

The construct of nutrition behavior was represented by two subscales of the CEHBSIQ, healthy eating and unhealthy eating. The skew and kurtosis for these variables in both the girls and boys sample fell within the acceptable range. The descriptive statistics for this variable are reported in Table 1.

Internalizing Behaviors

The construct of internalizing behaviors was represented by the anxious/depressed subscale of the CBCL. This subscale can be observed as either a raw score total or the T-score total. T-score totals are used when comparison across subscales is desired, and when interpretation is aimed towards a clinical population. However, when T-score totals are used the variability at the low range of the subscale is diminished. Given that the current study was not comparing across subscales of the CBCL, and that capturing variability within the low range of values would be consistent with a prevention focus, I decided to use the raw score total instead of the T-score total. The descriptive statistics are reported in Table 1. The level of skew for both girls and boys fell within the acceptable range, however the level of kurtosis was higher than the acceptable value, 4.43 for girls and, 5.93 for boys. Although these values fall outside the established acceptable range, with sample sizes over 200, as in the current study, underestimations of variance associated with abnormal kurtosis values disappear (Tabachnick & Fidell, 2001).

Physical Activity Behavior

The construct of physical activity behavior was represented by the total number of minutes spent in physical activity during the last school day attended as reported in the Self-Administered Physical Activity Checklist (SAPAC). Descriptive statistics for this variable are displayed in Table 1. The values associated with skew and kurtosis for boys fell within the acceptable range. The skew value for girls also fell within the acceptable range, but the kurtosis value for girls was slightly higher than the acceptable range (2.99), indicating a positive kurtosis and higher peak than a normal distribution. However, this kurtosis value is most likely not an underestimation of the variance associated with the variable due to the large sample size of the study (Tabachnick & Fidell, 2001).

Delay of Gratification

The hot cognition construct is represented by scores from Mischel's delay of gratification task (Mischel, Shoda, & Rodriguez, 1989; Mischel, Shoda, & Rodriguez, 1992). Consistent with previous literature utilizing this task, the variable used for the present analysis is the amount of time a child was able to delay gratification of a short term goal for a more desirable long term goal. Descriptive statistics for the variable are displayed in Table 1. The values associated with skew and kurtosis fell within the acceptable range.

A histogram of this variable reveals a bimodal distribution at the extreme ends of the distribution. It is unclear whether or not past research using the delay of gratification task found the distribution of the variable to be bimodal. What is known is that previous studies implementing this task used a range of zero to fifteen or twenty minutes (Shoda, Mischel, & Peake, 1990). In the present study the range was zero to seven minutes. This

shortened range may account for the frequency of values found at the seven minute value, which comprised one mode of the bimodal distribution.

A bimodal distribution threatens the assumption of normality needed for ordinary least squares regression analyses (Tabachnick & Fidell, 2001). Given the threat to the assumption of the statistical model, alternative methods for representing this variable in the statistical analysis were explored.

DeCoster (2009) outlines scenarios in which dichotomizing a continuous variable is justified and warranted. There are two scenarios outlined that apply to the case of the delay of gratification variable. One of these scenarios is when the variable reflects an extreme group analysis, where the variable is distributed on the extreme ends of the distribution as opposed to a normal distribution, as is the case with the bimodal distribution of the delay of gratification variable. This is one rationale to justify representing the delay of gratification variable in a non-continuous manner in the primary analysis.

The second scenario outlined by DeCoster (2009) that applies to the delay of gratification variable, states that a variable should be grouped if the grouped variable holds more theoretical significance than the continuous variable. The bimodal distribution suggests there are three distinct groups for delay of gratification that hold more significance than a continuous representation of the variable. The high frequencies on the ends of the distribution suggest that there are many children who can successfully complete the delay of gratification task and there are many children who have difficulty delaying gratification for any significant length of time. The remainder of the sample is

found in the middle of these two extremes and in this category children seem to be able to delay gratification for some length of time but are unable to successfully complete the task. The demarcation of these three groups provides a more theoretically meaningful interpretation than a continuous variable. With the grouped variable, results can describe a child who has great difficulty, some difficulty, and no difficulty with delay of gratification. The interpretation of delay of gratification as a continuous variable does not allow for the distinction reflected in the bimodal distribution that demonstrates there are many children who have significant difficulty delaying gratification and many children who have no difficulty delaying gratification. The categorized variables may also hold more applied significance because children may be targeted for intervention based on their category of delay of gratification. The two reasons described above, along with the threat to normality posed by a bimodal distribution, justify treating the delay of gratification variable as a non-continuous variable.

For the delay of gratification scores, a new ordinal variable was created that consisted of three categories. The first category, labeled low, included children who were unable to delay for any amount of time through children who were able to delay for thirty seconds. The second category, labeled moderate, included children who were able to delay anywhere between .31 seconds and 6 minutes 59 seconds. The third category, labeled high, included children who were able to delay gratification for the full seven minutes.

The cutpoints in the distribution were chosen to reflect ranges that had interpretive significance. Each category appears to reflect a unique reaction to the delay

of gratification task. Children in the first category appear to have difficulty sustaining any effort towards delay of gratification (0-30 seconds). The children in the second category reflect the largest range (.31-6:59), however all the children in this range are able to sustain some amount of delay of gratification yet none of them were able to sustain for the full seven minutes. The children in the third category are unique in that all children in this category successfully completed the delay of gratification task. In addition, these cutpoints allowed the number of participants in each category to be relatively balanced, which aids the statistical analysis. This three category variable was then coded into dummy variables for the primary analyses. The two dummy variables used in the primary analyses were a Low vs. High comparison and a Moderate vs. High comparison.

Sports Self-Efficacy

The construct of sports self-efficacy was represented by scores on the sports self-efficacy subscale of the How I Do in School scale. Descriptive statistics for this variable are displayed in Table 1. The skew and kurtosis for this variable in both the girls and boys sample fell within the accepted range.

Missing Data

Primary analyses include six variables of interest. All six variables have some missing data. The average amount of missing data among the study variables is 28%. The amount of missing data for each variable ranges from 25% on the anxious/depressed subscale to 34% on the self-administered physical activity checklist. Multiple imputation was used to eliminate missing data points for each variable. Ten imputations of the data set were created and pooled results were used in the primary analyses. Multiple

imputation is considered to be best practice for handling missing data issues (Schafer, 2002; Widaman, 2006). This procedure increases the power associated with the primary analyses and reduces the risk of bias created by such procedures as listwise deletion.

Correlations

Pearson correlation analyses were computed to examine the correlations between the study variables. For the primary analyses of regression, high correlations among predictor variables, referred to as multicollinearity, are not desirable and can negatively impact the validity of the regression model (Tabachnick & Fidell, 2001) p. 116). If two variables share a bivariate correlation of .70 or higher, it is recommended to exclude these from the analysis (Tabachnick & Fidell, 2001). Tables 2 and 3 provide correlation matrices for the study variables. Although some correlations are significant, no correlations are .7 or higher and therefore there is no concern that multicollinearity will threaten the validity of the primary analyses.

Table 2. Correlations between study variables for Girls

Variable	1	2	3	4	5	6
1. Healthy Eating	--	.13*	.23**	.08	-.03	.02
2. Unhealthy Eating		--	.01	-.01	-.16*	.16*
3. Physical Activity			--	.20**	.02	.06
4. Sports Self-Efficacy				--	-.06	-.00
5. Delay of Gratification					--	.01
6. Anxious/Depressed						--

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

Table 3. Correlations between study variables for Boys

Variable	1	2	3	4	5	6
1. Healthy Eating	--	.08	.17**	.17**	-.08	-.05
2. Unhealthy Eating		--	-.00	.06	-.12	-.01
3. Physical Activity			--	.22**	-.00	-.09
4. Sports Self-Efficacy				--	.02	-.18**
5. Delay of Gratification					--	.10
6. Anxious/Depressed						--

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

Identifying Covariates

Race

The construct of race was represented by a nominal variable with four categories, representing the racial identification of the participants. The children's race was reported by their mothers by a demographic questionnaire distributed during Phase I of the study. The four categories are White, Black, Hispanic, and other. One-way ANOVAs were conducted to determine whether or not there are significant group differences in each study variable based on race. Bonferroni correction was used to decrease the likelihood of Type I errors due to multiple analyses. Tukey post hoc comparisons were conducted if there was a significant result to determine which group comparison was significant. Results are displayed in Table 4. Race was found to be a significant factor for the study variables. Ideally given the significant differences found between races, primary analyses would be conducted separately for each racial group. However, the small number of participants in some of the racial categories does not yield a large enough sample for the primary analyses proposed. Given the significance of racial differences for this sample, as well as the supporting literature reviewed earlier, race will be entered as a covariate into step 1 of each regression analysis. By entering these variables into step 1 of the regression equation, variance in the outcomes due to this variable will be controlled, which will allow for testing of the unique variance associated with the study variables. Due to the categorical nature of the variable, for the primary analysis the race variable will be recoded into group comparisons using dummy variables.

Table 4. Mean comparison of ethnicity across study variables.

Study Variable	Girls				Boys			
	White	Black	Hispanic	Other	White	Black	Hispanic	Other
	(N=503)	(N=84)	(N=40)	(N=33)	(N=539)	(N=89)	(N=43)	(N=33)
Healthy Eating	3.62 ^{abcd}	3.49 ^{abcd}	3.38 ^{abcd}	3.88 ^{abcd}	3.51 ^{abcd}	4.07 ^{abcd}	3.26 ^{abcd}	3.65 ^{abcd}
Unhealthy Eating*	2.82 ^{acd}	4.31 ^b	2.42 ^{acd}	2.64 ^{acd}	3.54 ^{acd}	4.64 ^{bcd}	3.66 ^{abdc}	2.88 ^{abcd}
Physical Activity	100.40 ^{abcd}	89.22 ^{abcd}	86.78 ^{abcd}	70.08 ^{abcd}	103.30 ^{acd}	107.45 ^{bcd}	132.03 ^{abcd}	123.48 ^{ab}
Behavior								cd
Delay of Gratification	2.47 ^{acd}	1.82 ^{bcd}	2.30 ^{abcd}	2.04 ^{abcd}	2.35 ^{acd}	1.62 ^{bc}	2.16 ^{abcd}	2.38 ^{acd}
**								
Sports Self-Efficacy	5.73 ^{abcd}	5.89 ^{abcd}	5.85 ^{abcd}	5.92 ^{abcd}	5.91 ^{abcd}	6.33 ^{abcd}	5.98 ^{abcd}	5.85 ^{abcd}
Anxious/Depressed	2.65 ^{abcd}	1.97 ^{abcd}	2.41 ^{abcd}	2.52 ^{abcd}	2.51 ^{abcd}	1.95 ^{abcd}	2.58 ^{abcd}	3.42 ^{abcd}

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

- Bonferroni correction was used to prevent inflation of type I error rate.
- 1 Other category is comprised of Asian, Pacific Islander, American Indian, Eskimo and Aleutian.
- a=White, b=Black, c=Hispanic, d=Other. Means that do not share subscripts were found to have a significant in Tukey post hoc comparisons.

Socioeconomic Status

Income to needs ratio and Maternal Education

The construct of socioeconomic status was represented by two variables, level of maternal education and a ratio of income to needs for the family of the child participant. Maternal level of education was an ordinal variable containing twelve categories ranging from completed seventh grade to doctoral degree. The income to needs ratio was a continuous variable that was computed by dividing the total family pre-tax income from the year 2002/2003 by the poverty threshold for a household. The year 2002/2003 was the year the child participants were in sixth grade and the poverty thresholds were

obtained from the US census bureau. The correlation between the two SES variables for both boys and girls was 0.57. This correlation indicates that although these two SES variables are related, they may also have a unique relationship with the outcome variables, and for this reason both variables were tested for their relationship to the study variables. Results are displayed in Tables 5 and 6. Both variables were found to have significant relationships with the study variables. Given the significance found with this sample, as well as the supporting literature, maternal education and income to needs ratio will be entered as covariates into step 1 of each regression model.

Table 5. Correlations between maternal education and study variables.

	Boys	Girls
Variable	Maternal Education	Maternal Education
1. Healthy Eating	.06	.16**
2. Unhealthy Eating	-.20**	-.16**
3. Physical Activity	.02	.01
4. Sports Self-Efficacy	-.10*	-.01
5. Delay of Gratification	.25**	.24**
6. Anxious/Depressed	-.02	-.03

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

Table 6. Correlations between Income-to-needs ratio and study variables.

Variable	Boys	Girls
	Income-to-needs ratio	Income-to-needs ratio
1. Healthy Eating	.06	.10*
2. Unhealthy Eating	-.16**	-.15**
3. Physical Activity	.12*	.07
4. Sports Self-Efficacy	-.01	.04
5. Delay of Gratification	.27**	.25**
6. Anxious/Depressed	-.04	-.01

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

Maternal Depression

A maternal depression variable was created that reflects the average depression score for mothers from the time the study child was one month old until the study child was in sixth grade. Mother depression was assessed seven times within that time span using the Center for Epidemiological Studies Depression module (CES-D). The average of these seven scores is the maternal depression variable. Maternal depression was found to have a significant relationship with three of the study variables, unhealthy eating, delay of gratification, and anxious/depressed. Results are displayed in Table 7. Given the significance found with this sample, as well as the supporting literature, maternal depression will be entered as a covariate into step 1 of each regression analysis.

Table 7. Correlations between Maternal Depression and study variables.

	Boys	Girls
Variable	Maternal Depression	Maternal Depression
1. Healthy Eating	-.04	.04
2. Unhealthy Eating	.14**	.15**
3. Physical Activity	.06	.05
4. Sports Self-Efficacy	-.01	-.05
5. Delay of Gratification	-.20**	-.17**
6. Anxious/Depressed	.26**	.37**

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

Primary Analyses

Primary analyses addressed eleven hypotheses that were divided into the three clusters outlined in chapter two. Results for hypotheses are reported separately for girls and boys. All of the hypotheses were tested using hierarchical regression techniques. The statistical tradition hypothesis was used to test the hypotheses. The statistical tradition hypothesis is expressed by the following null and alternative hypothesis, $H_0: \beta = 0$, and $H_1: \beta > 0$. For all hypotheses, the beta coefficient (β) was reported for each predictor block. Four covariates were also entered into step 1 of every regression model, ethnicity, maternal education, income-to-needs ratio and maternal depression. For the moderating hypotheses, steps of analysis outlined by Frazer, Tix, and Barron (2004) were followed.

Relationship between mental health and health behaviors

Hypotheses in this cluster are examining the relationship of anxious/depressed behaviors to the following health behaviors, healthy eating, unhealthy eating, and physical activity. Zero order correlations between the scores on the CBCL anxious/depressed scale and the health behaviors are displayed in the preliminary analyses section in Tables 2 and 3.

Hypothesis 1: Anxious/depressed behaviors will negatively predict healthy eating behaviors in preadolescent children

To test hypothesis 1, which is investigating whether or not anxiety/depression scores are a significant predictor of healthy eating behaviors, beyond the effects of the specified covariates, a hierarchical regression analysis was used. Scores on healthy eating behavior were regressed upon scores on anxious/depressed scale with the covariates entered in the first step of the regression model.

For girls, standardized beta coefficients reveal that the relationship between anxiety/depression and healthy eating behaviors is not significant beyond the effects of the covariates ($\beta = .03$, $t = .80$, $p > .05$, $r = .04$). Of the specified covariates only income-to-needs ratio had a significant beta coefficient in relation to healthy eating ($\beta = .10$, $t = 2.37$, $p < .05$, $r = .10$). This means that families with higher income-to-needs ratios have girls who report more healthy eating. Results for the analysis can be found in Table 8.

The regression results suggest hypothesis 1 was not supported, which means

anxiety/depression scores do not significantly predict healthy eating behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that the relationship between anxiety/depression and healthy eating behaviors is not significant beyond the effects of the covariates ($\beta = .01$, $t = .19$, $p > .05$, $r = .01$). None of the specified covariates had a significant relationship to the outcome variable of healthy eating. Results for analysis can be found in Table 8. The regression results suggest hypothesis 1 was not supported, which means anxiety/depression scores do not significantly predict healthy eating behaviors in preadolescent boys.

Table 8. Hierarchical Regression model for anxious/depressed behaviors predicting healthy eating behaviors. ^a

Predictor	<u>Girls</u>		<u>Boys</u>	
	(n=660)		(n=704)	
	β	t	β	t
Step 1				
Ethnicity comparison White	-.42	-.85	-.01	-.01
Ethnicity comparison Black	-.17	-.31	.55	1.12
Ethnicity comparison Hispanic	-.38	-.59	-.17	-.30
Income-to-needs ratio	.10	2.37*	.06	1.44
Maternal Education	.09	1.75	.03	.63
Maternal Depression	.03	1.10	.00	.10
Step 2				
Anxious/Depressed subscale	.03	.80	.01	.19

• $p < .05$, ** $p < .01$.

• ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Hypothesis 2: Anxious/depressed behaviors will negatively predict unhealthy eating behaviors in preadolescent children.

To test Hypothesis 2, which is investigating whether or not anxiety/depression scores are a significant predictor of unhealthy eating behaviors, beyond the effects of the specified covariates, a hierarchical regression analysis was used. Scores on unhealthy eating behavior were regressed upon scores on anxious/depressed scale, with the covariates entered in the first step of the regression model.

For girls, standardized beta coefficients reveal that the relationship between anxiety/depression and unhealthy eating behaviors is positive and significant beyond the effects of the covariates ($\beta = .09, t = 2.90, p < .05, r = .12$). Of the specified covariates, only the ethnicity comparison variable for Blacks had a significant beta coefficient in relation to unhealthy eating ($\beta = 1.54, t = 3.18, p < .05, r = .14$). This means that in comparison to all other ethnic groups Black girls report a significantly higher rate of unhealthy eating. Results for the analysis can be found in Table 9. The regression results are consistent with hypothesis 2, which means anxiety/depression scores significantly predict unhealthy eating behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that the relationship between anxiety/depression and unhealthy eating behaviors is negative and significant beyond the effects of the covariates ($\beta = -.07, t = -1.20, p < .05, r = -.08$). Of the specified covariates, ethnicity comparison for Blacks ($\beta = 1.23, t = 2.14, p < .05, r = .10$) and maternal education ($\beta = -.09, t = -2.11, p < .05, r = -.09$) had a significant relationship to the outcome variable of healthy eating. Covariate analysis reveals that Black boys, in

comparison to all other ethnic groups, report a higher rate of unhealthy eating and maternal education has a negative significant relationship to unhealthy eating. Results for analysis can be found in Table 9. The regression results are consistent with hypothesis 2, which means anxiety/depression scores significantly predict unhealthy eating behaviors in preadolescent boys.

Table 9. Hierarchical Regression model for anxious/depressed behaviors predicting unhealthy eating behaviors.

Predictor	<u>Girls</u>		<u>Boys</u>	
	(n=660)		(n=704)	
	β	t	β	t
Step 1				
Ethnicity comparison White	.39	1.01	.56	1.20
Ethnicity comparison Black	1.54	3.18*	1.23	2.14*
Ethnicity comparison Hispanic	.08	.15	.46	.74
Income-to-needs ratio	-.04	-.96	-.07	-1.45
Maternal Education	-.07	-1.84	-.09	-2.11*
Maternal Depression	.02	1.10	.03	1.33
Step 2				
Anxious/Depressed subscale	.09	2.90*	-.07	-1.97*

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

Hypothesis 3: Anxious/depressed behaviors will negatively predict physical activity behaviors in preadolescent children.

To test hypothesis 3, which is investigating whether or not anxiety/depression scores in this particular regression model is a significant predictor of physical activity behaviors, beyond the effects of the specified covariates, a hierarchical regression analysis was used. Scores on physical activity behavior were regressed upon scores on anxious/depressed scale, with the specified covariates entered in the first step of the regression model.

For girls, standardized beta coefficients reveal that the relationship between anxiety/depression and physical activity behaviors is not significant beyond the effects of the covariates ($\beta = 1.04$, $t = .90$, $p > .05$, $r = .04$). None of the specified covariates were found to be significant in relation to physical activity. Results for the analysis can be found in Table 10. The regression results suggest hypothesis 3 was not supported, which means anxiety/depression scores do not significantly predict physical activity behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that the relationship between anxiety/depression and physical activity behaviors is not significant beyond the effects of the covariates ($\beta = -1.21$, $t = -.97$, $p > .05$, $r = -.04$). Of the specified covariates, only the income-to-needs ratio variable ($\beta = 4.73$, $t = 2.64$, $p < .05$, $r = .14$) had a significant relationship to the outcome variable of healthy eating. Results for analysis can be found in Table 10. The regression results suggest hypothesis 3 was not supported, which means anxiety/depression scores do not significantly predict physical activity behaviors in boys.

Table 10. Hierarchical Regression model for anxious/depressed behaviors predicting physical activity behaviors. ^a

Predictor	<u>Girls</u>		<u>Boys</u>	
	(n=660)		(n=704)	
	β	t	β	t
Step 1				
Ethnicity comparison White	26.44	1.75	-8.40	-.54
Ethnicity comparison Black	19.63	1.12	-4.18	-.22
Ethnicity comparison Hispanic	23.22	1.06	15.51	.77
Income-to-needs ratio	2.23	1.67	4.73	2.64*
Maternal Education	-.99	-.69	-.36	-.22
Maternal Depression	.74	1.07	1.28	1.63
Step 2				
Anxious/Depressed subscale	1.04	.89	-1.21	-.97

• $p < .05$, ** $p < .01$.

• ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Relationship between cognitive factors and health behaviors

Hypotheses in this cluster are examining the relationship of the cognitive factors, delay of gratification and sports self-efficacy, to the following health behaviors, healthy eating, unhealthy eating, and physical activity. Zero-order correlations between the scores on the cognitive factors and the health behaviors are displayed in the preliminary analyses section in Tables 2 and 3.

Hypothesis 4: Sports self-efficacy will positively predict physical activity behaviors in preadolescent children.

To test hypothesis 4, which is investigating whether or not sports self-efficacy scores are a significant predictor of physical activity behaviors, beyond the effects of the specified covariates, a hierarchical regression analysis was used. Scores on physical activity behavior were regressed upon scores on the sports self-efficacy scale, with the specified covariates entered in the first step of the regression model.

For girls, standardized beta coefficients reveal that the relationship between sports self-efficacy and physical activity behaviors is positive and significant beyond the effects of the covariates ($\beta = 9.83, t = 3.46, p < .01, r = .15$). None of the specified covariates had a significant beta coefficient in relation to healthy eating. Results for the analysis can be found in Table 11. The regression results are consistent with hypothesis 4, which means sports self-efficacy scores significantly predict physical activity behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that the relationship between sports self-efficacy and physical activity behaviors is positive and significant beyond the

effects of the covariates ($\beta = 15.40$, $t = 4.68$, $p < .01$, $r = .22$). Of the specified covariates, only the income-to-needs ratio had a significant and positive relationship to the outcome variable of healthy eating ($\beta = 4.59$, $t = 2.65$, $p < .01$, $r = .14$). Results for analysis can be found in Table 11. The regression results are consistent with hypothesis 4, which means sports self-efficacy scores significantly predict physical activity behaviors in preadolescent boys.

Table 11. Hierarchical regression analyses model for sports self-efficacy predicting physical activity behaviors ^a

Predictor	<u>Girls</u>		<u>Boys</u>	
	(n=660)		(n=704)	
	β	t	β	t
Step 1				
Ethnicity comparison White	28.80	1.92	-7.98	-.52
Ethnicity comparison Black	18.79	1.07	-7.51	-.39
Ethnicity comparison Hispanic	23.98	1.10	14.17	.71
Income-to-needs ratio	2.21	1.70	4.59	2.65*
Maternal Education	-1.02	-.71	.06	.04
Maternal Depression	1.06	1.64	1.29	1.84
Step 2				
Sports self-efficacy subscale	9.83	3.46**	15.40	4.68**

• $p < .05$, ** $p < .01$.

• ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Hypothesis 5: Delay of gratification will positively predict physical activity behaviors in preadolescent children.

To test hypothesis 5, which is investigating whether or not delay of gratification is a significant predictor of physical activity behaviors, beyond the effects of the specified covariates, a hierarchical regression analysis was used. Scores on physical activity behavior were regressed upon scores on delay of gratification, with the specified covariates entered in the first step of the regression model. Delay of gratification was represented in the analysis by two dummy variables created for group comparison, High vs. Low and Moderate vs. High.

For girls, standardized beta coefficients reveal that neither group comparison of delay of gratification had a significant relationship with physical activity behaviors beyond the effects of the covariates (Low vs. High comparison $\beta = 2.46$, $t = .25$, $p > .05$, $r = .01$) (Moderate vs. High comparison $\beta = 3.72$, $t = .50$, $p > .05$, $r = .02$). None of the specified covariates had a significant beta coefficient in relation to physical activity behavior. Results for the analysis can be found in Table 12. The regression results suggest hypothesis 5 was not supported, which means delay of gratification does not significantly predict physical activity behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that neither group comparison of delay of gratification had a significant relationship with physical activity behaviors beyond the effects of the covariates (Low vs. High Comparison $\beta = -5.99$, $t = -.56$, $p > .05$, $r = -.02$), (Moderate vs. High Comparison $\beta = -5.42$, $t = -.62$, $p > .05$, $r = -.03$). Of the specified covariates, only the income-to-needs ratio had a positive and significant

relationship to the outcome variable of physical activity behavior ($\beta = 4.62, t = 2.56, p < .05, r = .13$) This means that for families who were more wealthy, scores for the index child on delay of gratification were higher. Results for analysis can be found in Table 12. The regression results suggest hypothesis 5 was not supported, which means delay of gratification does not significantly predict physical activity behaviors in boys.

Table 12. Hierarchical Regression model for delay of gratification predicting physical activity behavior. ^a

Predictor	<u>Girls</u>		<u>Boys</u>	
	(n=660)		(n=704)	
	β	t	β	t
Step 1				
Ethnicity comparison White	27.13	1.80	-8.79	-.57
Ethnicity comparison Black	18.26	1.03	-2.32	-.12
Ethnicity comparison Hispanic	23.11	1.06	15.71	.78
Income-to-needs ratio	2.34	1.76	4.62	2.56*
Maternal Education	-.92	-.63	-.53	-.33
Maternal Depression	.92	1.45	1.16	1.58
Step 2				
Delay of Gratification Low vs. High	2.46	.25	-5.99	-.57
Delay of Gratification Moderate vs. High	3.72	.50	-5.42	-.62

- $p < .05$, ** $p < .01$.
- ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Hypothesis 6: Delay of gratification will positively predict healthy eating in preadolescent children.

To test hypothesis 6, which is investigating whether or not delay of gratification is a significant predictor of healthy eating behaviors beyond the effects of the specified covariates, a hierarchical regression analysis was used. Scores on healthy eating behavior were regressed upon scores on delay of gratification, with the specified covariates entered in the first step of the regression model.

For girls, standardized beta coefficients reveal that neither group comparison of delay of gratification had a significant relationship with healthy eating behaviors beyond the effects of the covariates (Low vs. High comparison $\beta = -.12$, $t = -.41$, $p > .05$, $r = -.02$) (Moderate vs. High comparison $\beta = .25$, $t = 1.04$, $p > .05$, $r = .05$). Of the specified covariates, only the income-to-needs ratio had a significant and positive beta coefficient in relation to healthy eating behavior ($\beta = .10$, $t = 2.27$, $p < .05$). This means that for families who were more wealthy, scores for the index child on delay of gratification were higher. Results for the analysis can be found in Table 13. The regression results suggest hypothesis 6 was not supported, which means delay of gratification does not significantly predict healthy eating behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that neither group comparison of delay of gratification had a significant relationship with healthy eating behaviors beyond the effects of the covariates (Low vs. High Comparison $\beta = .22$, $t = .78$, $p > .05$, $r = .03$), (Moderate vs. High Comparison $\beta = -.14$, $t = -.62$, $p > .05$, $r = -.03$). None of the specified covariates was a significant predictor of the outcome variable of healthy eating behavior.

Results for analysis can be found in Table 13. The regression results suggest hypothesis 6 was not supported, which means delay of gratification does not significantly predict healthy eating behaviors in preadolescent boys.

Table 13. Hierarchical Regression model for delay of gratification predicting healthy eating behavior. ^a

Predictor	<u>Girls</u>		<u>Boys</u>	
	(n=660)		(n=704)	
	β	t	β	t
Step 1				
Ethnicity comparison White	-.41	-.84	-.05	-.12
Ethnicity comparison Black	-.23	-.43	.47	.95
Ethnicity comparison Hispanic	-.42	-.66	-.22	-.38
Income-to-needs ratio	.10	2.27*	.07	1.54
Maternal Education	.09	1.82	.03	.64
Maternal Depression	.03	1.51	.01	.23
Step 2				
Delay of Gratification Low vs. High	-.12	-.41	.22	.78
Delay of Gratification Moderate vs. High	.25	1.04	-.14	-.62

• $p < .05$, ** $p < .01$.

• ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Hypothesis 7: Delay of gratification will negatively predict unhealthy eating in preadolescent children.

To test hypothesis 7, which is investigating whether or not delay of gratification is a significant predictor of unhealthy eating behaviors, beyond the effects of the specified covariates, a hierarchical regression analysis was used. Scores on unhealthy eating behavior were regressed upon scores on delay of gratification, with the specified covariates entered in the first step of the regression model.

For girls, standardized beta coefficients reveal that neither group comparison of delay of gratification had a significant relationship with unhealthy eating behaviors beyond the effects of the covariates (Low vs. High comparison $\beta = .43$, $t = 1.47$, $p > .05$, $r = .07$) (Moderate vs. High comparison $\beta = .42$, $t = 1.86$, $p > .05$, $r = .09$). Of the specified covariates, two variables, ethnicity group comparison for Blacks ($\beta = 1.43$, $t = 2.88$, $p < .05$, $r = .13$) and maternal depression ($\beta = .03$, $t = 1.98$, $p < .05$, $r = .09$) had significant beta coefficients in relation to unhealthy eating behavior. The finding for ethnicity group comparison means that Black girls, in comparison to all other ethnic groups, report a higher level of unhealthy eating. The finding for maternal depression means that the higher reported maternal depression is related to a higher report of unhealthy eating in girls. Results for the analysis can be found in Table 14. The regression results suggest hypothesis 7 was not supported, which means delay of gratification does not significantly predict unhealthy behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that neither group comparison of delay of gratification had a significant relationship with unhealthy eating behaviors

beyond the effects of the covariates (Low vs. High Comparison $\beta = .58$, $t = 1.84$, $p > .05$, $r = .08$), (Moderate vs. High Comparison $\beta = .41$, $t = 1.74$, $p > .05$, $r = .08$). Of the specified covariates, only the ethnicity comparison for Blacks had a significant relationship to the outcome variable of unhealthy eating behavior ($\beta = 1.24$, $t = 2.16$, $p < .05$, $r = .10$). This means that Black boys, in comparison to all other ethnic groups, report a higher level of unhealthy eating. Results for analysis can be found in Table 14. The regression results suggest hypothesis 7 was not supported, which means delay of gratification does not significantly predict unhealthy eating behaviors in preadolescent boys.

Table 14. Hierarchical Regression model for delay of gratification predicting unhealthy behavior.

Predictor	<u>Girls</u> (n=660)		<u>Boys</u> (n=704)	
	β	t	β	t
Step 1				
Ethnicity comparison White	.49	1.27	.61	1.29
Ethnicity comparison Black	1.43	2.88*	1.24	2.16*
Ethnicity comparison Hispanic	.12	.22	.49	.80
Income-to-needs ratio	-.03	-.63	-.07	-1.40
Maternal Education	-.06	-1.54	-.08	-1.90
Maternal Depression	.03	1.98*	.01	.61
Step 2				
Delay of Gratification Low vs. High	.43	1.48	.58	1.84
Delay of Gratification Moderate vs. High	.42	1.86	.41	1.74

- $p < .05$, ** $p < .01$.

Moderating relationship between mental health and cognitive factors and its impact on health behaviors

Hypotheses in this cluster are examining the moderating relationship of mental health and the cognitive factors, delay of gratification and sports self-efficacy, to the following health behaviors, healthy eating, unhealthy eating, and physical activity. Zero-order correlations between the scores on mental health, the cognitive factors, and the health behaviors are displayed in the preliminary analyses section in Tables 2 and 3.

Hypothesis 8: The interaction between anxious/depressed behaviors and sports self-efficacy will predict physical activity behavior.

To test hypothesis 8, which is investigating whether or not the interaction between anxiety/depression scores and sports self-efficacy is a significant predictor of physical activity behavior, beyond the effects of the specified covariates and the main effects of anxiety/depression and sports self-efficacy, a hierarchical multiple regression analysis was used. This analysis consisted of three steps. In the first step the specified covariates were entered into the equation. In the second step the two predictors, internalizing behaviors and sports self-efficacy, were grand mean centered and entered into the regression equation. Predictor variables were grand mean centered in order to prevent the issue of multicollinearity (Dearing & Hamilton, 2006). In the third step, the interaction term, which contains the grand mean centered internalizing behaviors variable and grand mean centered sports self-efficacy variable, was entered. This third step will be testing the significance of the variance accounted by this interaction term beyond the variance

accounted for by the covariates and the two main effects. The outcome variable is physical activity behavior.

For girls, standardized beta coefficients reveal that the relationship between the interaction of anxiety/depression and sports self-efficacy and physical activity behaviors is not significant beyond the effects of the covariates and the main effects ($\beta = -1.03$, $t = -1.31$, $p > .05$). None of the specified covariates had a significant beta coefficient in relation to physical activity, however the main effect of sports self-efficacy had a significant beta coefficient in relation to physical activity ($\beta = 10.44$, $t = 3.60$, $p < .05$). Results for the analysis can be found in Table 15. The regression results suggest hypothesis 8 was not supported, which means the interaction between anxiety/depression scores and sports self-efficacy does not significantly predict physical activity behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that the relationship between the interaction of anxiety/depression and sports self-efficacy and physical activity behaviors is not significant beyond the effects of the covariates and the main effects ($\beta = -.07$, $t = -.08$, $p > .05$, $r = .002$). Of the specified covariates, only the income-to-needs ratio had a significant beta coefficient in relation to physical activity ($\beta = 4.61$, $t = 2.67$, $p < .05$, $r = .07$). In addition, the main effect of sports self-efficacy had a significant beta coefficient in relation to physical activity ($\beta = 15.39$, $t = 4.47$, $p < .05$, $r = .12$). Results for the analysis can be found in Table 15. The regression results suggest hypothesis 8 was not supported, which means the interaction between anxiety/depression scores and sports

self-efficacy does not significantly predict physical activity behaviors in preadolescent boys.

Table 15. Moderating model for the interaction between sports self-efficacy and anxious/depressed behaviors predicting physical activity behavior.^a

Predictor	<u>Girls</u>		<u>Boys</u>	
	(n=660)		(n=704)	
	β	t	β	t
Step 1				
Ethnicity comparison White	28.30	1.88	-8.15	-.53
Ethnicity comparison Black	19.76	1.14	-7.85	-.40
Ethnicity comparison Hispanic	23.66	1.10	13.98	.70
Income-to-needs ratio	2.09	1.59	4.61	2.67*
Maternal Education	-.88	-.61	.05	.03
Maternal Depression	.85	1.23	1.32	1.72
Step 2				
Anxious/Depressed subscale	1.13	.96	-.16	-.13
Sports Self-efficacy scale	10.44	3.60**	15.39	4.47**
Step 3				
Anxious/Depressed X Sports Self-efficacy	-1.03	-1.31	-.07	-.08

- $p < .05$, ** $p < .01$.
- ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Hypothesis 9: The interaction between anxious/depressed behaviors and delay of gratification will predict physical activity behavior.

To test hypothesis 9, which is investigating whether or not the interaction between anxiety/depression scores and delay of gratification is a significant predictor of physical activity behavior beyond the effects of the specified covariates and the main effects of anxiety/depression and delay of gratification, a hierarchical multiple regression analysis was used. This analysis consisted of three steps. In the first step the specified covariates were entered into the equation. In the second step the two predictors were entered into the regression equation. The anxiety/depression scores were grand mean centered and the both group comparisons (low vs. high and moderate vs. high) for delay of gratification were entered. Predictor variables were grand mean centered in order to prevent the issue of multicollinearity (Dearing & Hamilton, 2006). In the third step, two interactions term were entered. The first interaction term consisted of the grand mean centered anxiety/depression score and the low vs. high delay of gratification group comparison. The second interaction term contained the grand mean centered anxiety/depression scores and the moderate vs. high delay of gratification group comparison. This third step will be testing the significance of the variance accounted by the interaction terms beyond the variance accounted for by the covariates and the two main effects. The outcome variable is physical activity behavior.

For girls, standardized beta coefficients reveal that the relationship between the interaction of anxiety/depression and both group comparisons of delay of gratification on physical activity behaviors are not significant beyond the effects of the covariates and the

main effects (Low vs. High group comparison $\beta = 4.23, t = 1.45, p > .05$) (Moderate vs. High group comparison $\beta = 1.25, t = .51, p > .05$). None of the specified covariates or main effects had a significant beta coefficient in relation to physical activity. Results for the analysis can be found in Table 16. The regression results suggest hypothesis 9 was not supported, which means the interaction between anxiety/depression scores and delay of gratification does not significantly predict physical activity behaviors in preadolescent girls.

For boys, of the specified covariates, only the income-to-needs ratio had a significant beta coefficient in relation to physical activity ($\beta = 4.60, t = 2.53, p < .05, r = .07$). In addition, the main effect of anxiety/depression had a significant beta coefficient in relation to physical activity ($\beta = -.3.99, t = -2.13, p < .05, r = .06$). The interaction of anxiety/depression and delay of gratification was significant for the low vs. high delay of gratification group in the model in which physical activity behaviors was the outcome ($\beta = 9.56, t = 2.49, p < .05$). The association between anxiety/depression and physical activity differed for boys in the low delay of gratification group versus those in the high delay of gratification group. The interaction of anxiety/depression and delay of gratification for moderate vs. high group comparison was not significant, however ($\beta = 3.34, t = 1.38, p > .05, r = .04$).

Based on recommendations by Dearing and Hamilton (2006), the simple slopes of the significant moderator hypothesis of anxiety/depression and low vs. high delay of gratification on physical activity behavior was further assessed. Interactions for physical activity behavior between high and low delay of gratification are displayed in Figure 1. In

this figure associations between physical activity behavior and anxiety/depression CBCL scores are graphed for children who are either characterized as high delay of gratification or low delay of gratification. Anxiety/depression CBCL values are plotted from 1 *SD* below the mean (i.e. 0) to 1 *SD* above the mean (i.e. 5.55). As evidenced by Figure 1, children characterized with low delay of gratification have increased physical activity behavior as their anxiety/depression CBCL scores increase, however, the value associated with the simple slope is not statistically significant ($\beta = 5.58, t = 1.57, p > .05$). Conversely, children characterized with high delay of gratification have decreased physical activity behavior as their anxiety/depression CBCL scores increase and the value associated with the simple slope is statistically significant ($\beta = -3.99, t = -2.13, p < .05, r = -.06$).

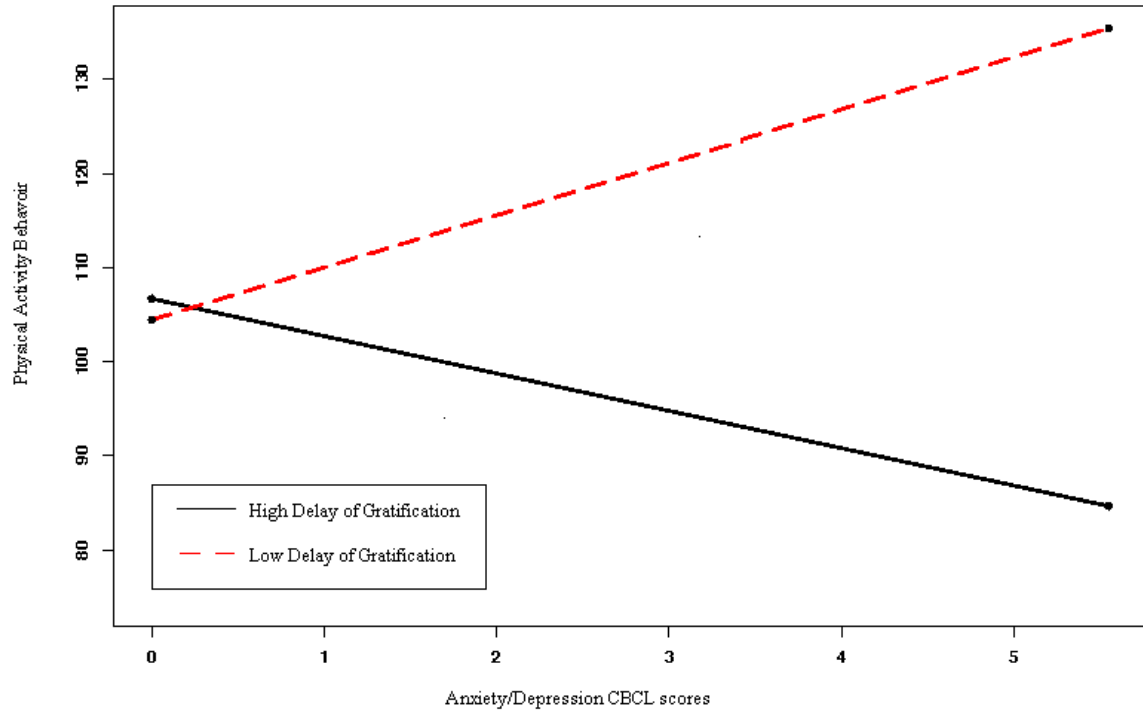
Results for the analysis can be found in Table 16. For the delay of gratification group comparison of low vs. high, the regression results are consistent with hypothesis 9, which means the interaction between anxiety/depression scores and delay of gratification significantly predicts physical activity behaviors in preadolescent boys. For the delay of gratification group comparison of moderate vs. high, the regression results suggest hypothesis 9 was not supported, which means the interaction between anxiety/depression scores and delay of gratification does not significantly predict physical activity behaviors in preadolescent boys.

Table 16. Moderating model for the interaction between delay of gratification and anxious/depressed behaviors predicting physical activity behavior. ^a

Predictor	<u>Girls (n=660)</u>		<u>Boys (n=704)</u>	
	β	t	β	t
Step 1				
Ethnicity comparison White	24.98	1.64	-8.81	-.57
Ethnicity comparison Black	18.71	1.06	-1.08	-.05
Ethnicity comparison Hispanic	22.19	1.02	16.08	.79
Income-to-needs ratio	2.28	1.71	4.60	2.53*
Maternal Education	-.95	-.64	-.42	-.26
Maternal Depression	.67	.98	1.21	1.57
Step 2				
Anxious/Depressed subscale	-.35	-.20	-3.99	-2.13*
Low vs. High Delay of Gratification	2.44	.25	-2.26	-.21
Moderate vs. High Delay of Gratification	3.40	.46	-5.14	-.59
Step 3				
Anxious/Depressed X Low vs. High Delay of Gratification	4.23	1.45	3.34	1.38
Anxious/Depressed X Moderate vs. High Delay of Gratification	1.25	.51	9.56	2.49*

- $p < .05$, ** $p < .01$.
- ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Figure 1.



Hypothesis 10: The interaction between anxious/depressed behaviors and delay of gratification will predict healthy eating behavior in preadolescent children.

To test hypothesis 10, which is investigating whether or not the interaction between anxiety/depression scores and delay of gratification is a significant predictor of healthy eating behavior, beyond the effects of the specified covariates and the main effects of anxiety/depression and delay of gratification, a hierarchical multiple regression analysis was used. This analysis consisted of three steps. In the first step the specified covariates were entered into the equation. In the second step the two predictors were entered into the regression equation, anxiety/depression and delay of gratification. The

anxiety/depression scores were grand mean centered and both group comparisons (low vs. high and moderate vs. high) for delay of gratification were entered. Predictor variables were grand mean centered in order to prevent the issue of multicollinearity (Dearing & Hamilton, 2006). In the third step, two interaction terms were entered. The first interaction term consisted of the grand mean centered anxiety/depression score and the low vs. high delay of gratification group comparison. The second interaction term contained the grand mean centered anxiety/depression scores and the moderate vs. high delay of gratification group comparison. This third step will be testing the significance of the variance accounted for by the interaction terms beyond the variance accounted for by the covariates and the two main effects. The outcome variable is healthy eating behavior.

For girls, standardized beta coefficients reveal that the relationship between the interaction of anxiety/depression and both group comparisons of delay of gratification on physical activity behaviors are not significant beyond the effects of the covariates and the main effects (Low vs. High group comparison $\beta = .06, t = .61, p > .05$) (Moderate vs. High group comparison $\beta = -.07, t = -.85, p > .05$). Of the specified covariates, only the income-to-needs ratio had a significant beta coefficient in relation to healthy eating ($\beta = .10, t = 2.19, p < .05, r = .06$). Neither of the main effects had a significant beta coefficient in relation to healthy eating. Results for the analysis can be found in Table 17. The regression results suggest hypothesis 10 was not supported, which means the interaction between anxiety/depression scores and delay of gratification does not significantly predict healthy eating behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that the relationship between the interaction of anxiety/depression and both group comparisons of delay of gratification on physical activity behaviors are not significant beyond the effects of the covariates and the main effects (Low vs. High group comparison $\beta = .03, t = .24, p > .05$) (Moderate vs. High group comparison $\beta = .01, t = .13, p > .05$). None of the specified covariates or main effects had a significant beta coefficient in relation to healthy eating behavior. Results for the analysis can be found in Table 17. The regression results suggest hypothesis 10 was not supported, which means the interaction between anxiety/depression scores and delay of gratification does not significantly predict healthy eating behaviors in preadolescent children.

Table 17. Moderating model for the interaction between delay of gratification group and anxious/depressed behaviors predicting healthy eating behavior. ^a

Predictor	<u>Girls (n=660)</u>		<u>Boys (n=704)</u>	
	β	t	β	t
Step 1				
Ethnicity comparison White	-.48	-.96	-.05	-.11
Ethnicity comparison Black	-.24	-.45	.49	.99
Ethnicity comparison Hispanic	-.45	-.70	-.20	-.36
Income-to-needs ratio	.10	2.19*	.06	1.50
Maternal Education	.09	1.81	.03	.65
Maternal Depression	.02	1.07	.01	.14
Step 2				
Anxious/Depressed subscale	.05	.80	.01	.08
Low vs. High Delay of Gratification	-.14	-.47	.24	.79
Moderate vs. High Delay of Gratification	.24	1.01	-.14	-.63
Step 3				
Anxious/Depressed X Low vs. High Delay of Gratification	.06	.61	.03	.24
Anxious/Depressed X Moderate vs. High Delay of Gratification	-.07	-.85	.01	.13

- $p < .05$, ** $p < .01$.
- ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Hypothesis 11: The interaction between anxious/depressed behaviors and delay of gratification will predict unhealthy eating behavior in preadolescent children.

To test hypothesis 11, which is investigating whether or not the interaction between anxiety/depression scores and delay of gratification is a significant predictor of unhealthy eating behavior, beyond the effects of the specified covariates and the main effects of anxiety/depression and delay of gratification, a hierarchical multiple regression analysis was used. This analysis consisted of three steps. In the first step the covariates, ethnicity, maternal education, income-to-needs ratio, and maternal depression were entered into the equation. In the second step the two predictors were entered into the regression equation, anxiety/depression and delay of gratification. The anxiety/depression scores were grand mean centered and both group comparisons (low vs. high and moderate vs. high) for delay of gratification were entered. Predictor variables were grand mean centered in order to prevent the issue of multicollinearity (Dearing & Hamilton, 2006). In the third step, two interaction terms were entered. The first interaction term consisted of the grand mean centered anxiety/depression score and the low vs. high delay of gratification group comparison. The second interaction term contained the grand mean centered anxiety/depression scores and the moderate vs. high delay of gratification group comparison. This third step will be testing the significance of the variance accounted for by the interaction terms beyond the variance accounted for by the covariates and the two main effects. The outcome variable is unhealthy eating behavior.

For girls, standardized beta coefficients reveal that the relationship between the interaction of anxiety/depression and both group comparisons of delay of gratification on physical activity behaviors are not significant beyond the effects of the covariates and the main effects (Low vs. High group comparison $\beta = -.01$, $t = -.12$, $p > .05$, Moderate vs. High group comparison $\beta = .04$, $t = .53$, $p > .05$). Of the specified covariates, only the ethnicity group comparison for Blacks had a significant beta coefficient in relation to unhealthy eating ($\beta = 1.51$, $t = 3.01$, $p < .05$, $r = .08$). Neither or the main effects had a significant beta coefficient in relation to healthy eating. Results for the analysis can be found in Table 18. The regression results suggest hypothesis 11 was not supported, which means the interaction between anxiety/depression scores and delay of gratification does not significantly predict unhealthy eating behaviors in preadolescent girls.

For boys, standardized beta coefficients reveal that the relationship between the interaction of anxiety/depression and both group comparisons of delay of gratification on physical activity behaviors are not significant beyond the effects of the covariates and the main effects (Low vs. High group comparison $\beta = .01$, $t = .02$, $p > .05$, Moderate vs. High group comparison $\beta = -.06$, $t = -.79$, $p > .05$). Of the specified covariates, only the ethnicity comparison for Blacks had a significant beta coefficient in relation to unhealthy eating behavior ($\beta = 1.14$, $t = 1.98$, $p < .05$, $r = .05$). Results for the analysis can be found in Table 18. The regression results suggest hypothesis 11 was not supported, which means the interaction between anxiety/depression scores and delay of gratification does not significantly predict unhealthy eating behaviors in preadolescent boys.

Table 18. Moderating model for the interaction between delay of gratification group and anxious/depressed behaviors predicting unhealthy eating behavior. ^a

Predictor	<u>Girls (n=660)</u>		<u>Boys (n=704)</u>	
	β	t	β	t
Step 1				
Ethnicity comparison White	.47	1.23	.57	1.19
Ethnicity comparison Black	1.51	3.10*	1.14	1.98*
Ethnicity comparison Hispanic	.12	.53	.45	.73
Income-to-needs ratio	-.03	-.87	-.07	-1.32
Maternal Education	-.06	-1.52	-.08	-1.88
Maternal Depression	.02	.99	.02	1.13
Step 2				
Anxious/Depressed subscale	.07	1.54	-.03	-.58
Low vs. High Delay of Gratification	.41	1.42	.55	1.70
Moderate vs. High Delay of Gratification	.36	1.61	.42	1.77
Step 3				
Anxious/Depressed X Low vs. High Delay of Gratification	-.01	-.12	.01	.02
Anxious/Depressed X Moderate vs. High Delay of Gratification	.04	.53	-.06	-.79

- $p < .05$, ** $p < .01$.
- ^a Analysis was also conducted using listwise deletion. Results were the same as those obtained by multiple imputation.

Chapter Five (Discussion)

The results of the present study suggest that there are significant relationships between personal factors, namely affective and cognitive factors, and children's health behaviors. In the realm of affective factors, internalizing behaviors were found to have a significant relationship with unhealthy eating behaviors for both boys and girls, but were not found to have a significant relationship with healthy eating behavior or physical activity behavior. Among the cognitive factors, sports self-efficacy and delay of gratification, sports self-efficacy was found to be a significant predictor of physical activity behavior for both boys and girls, whereas delay of gratification was not found to be significantly related to any of the health behaviors. Several moderating hypotheses were investigated in this study, exploring the interactive relationship between internalizing behaviors and cognitive factors and its influence on health behaviors. Of these hypotheses, the relationship between internalizing behaviors and delay of gratification as a predictor of physical activity behavior was supported for boys comparing high versus low delay of gratification. The remainder of the moderating hypotheses were not supported.

The results from the current study illustrate three key points in understanding the health behaviors of preadolescent children. First, it is clear that mental health and cognitive factors are associated with health behaviors at this developmental time period. Second, these results call attention to the fact that each health behavior is explained by different personal factors. This is true even within the realm of nutrition behavior, where unhealthy eating and healthy eating appear to be differentially associated with

internalizing behaviors. Third, by trying to understand the reasons why personal factors would have an association with certain health behaviors and not over others, it is plausible that there are other factors not accounted for by the study that are interacting with the investigated constructs and impacting the hypothesized relationships. These factors may be occurring at any level of the biopsychosocial model. Results from this study suggest that investigating the influence of affective and cognitive factors on the health behaviors of preadolescent children is a worthwhile endeavor. Results also suggest that relationships between these constructs are complicated and nuanced. Given the relationships between personal psychological factors and health behaviors demonstrated by this study, and the possibility that more nuanced relationships between these constructs exists, continued investigation in this area is warranted.

Results from the current study support existing theoretical frames used to conceptualize the role of health behaviors within the issue of childhood obesity. Social Cognitive Theory emphasizes the importance of personal factors when understanding behavior change. The personal factors in the current study, internalizing behaviors, self-efficacy, and delay of gratification, were all found to have significant and specific relationships with preadolescent health behaviors. A major principle of Developmental Psychopathological Theory emphasizes that the interactive relationships between influential factors needs to be explored as possible explanations for behavior. The results from the present study support this notion as well. Delay of gratification was not found to be a significant predictor of physical activity behavior but when this construct was combined with internalizing behaviors it was found to be significantly associated with

physical activity behavior in boys. These results are consistent with Developmental Psychopathological Theory and suggest it is important to understand the interrelationships among influential factors of health behaviors. The results of the current study are consistent with major principles from both Social Cognitive Theory and Developmental Psychopathological Theory, and provide evidence that these two theoretical frames are useful in understanding the relationship between personal factors and health behaviors in preadolescent children.

Findings from the current study have implications for the conceptualization and implementation of obesity prevention efforts as well. Results clarify which personal factors are salient for the health behaviors in preadolescent children. In addition, by analyzing the specific health behaviors separately, it appears that certain personal factors are significant for particular health behaviors and not for other health behaviors. This type of detailed investigation will allow those creating interventions to target significant factors to the appropriate health behavior. In addition, understanding significant personal factors associated with health behaviors may help to identify children who are at risk for struggling to establish and maintain healthy behaviors. Information gained from this study can help in identifying who may benefit from an intervention and what types of factors need to be addressed as part of these interventions, which would aid in the prevention of obesity.

Results also suggest particular sociocultural factors may influence the health behaviors of preadolescent children. Analyses revealed that gender was significantly associated with many of the personal factors and health behaviors investigated in this

study. It is not surprising that gender was found to be significant in this investigation, particularly given the developmental time period being studied. Preadolescence is a time when gender differentiation is likely to occupy a prominent role in development, as this is the time period when biological maturation in puberty occurs, with average age of menarche being 12.43 years (Chumlea et al., 2003) and average age for puberty for boys is 12.0 years (Herman-Giddens, Wang, & Koch, 2001). These results are consistent with existing literature that reveals differences between girls and boys in health behaviors (Hoelscher, 2009; Davison, Werder, Trost, Baker, & Birch, 2007) and with the general premise that gender is a significant factor in children's health behaviors.

Race was the second sociocultural factor that was found to be significant in this study. Preliminary analyses revealed that the varied racial groups represented in the study differed significantly on many study variables. Several of the primary analyses also supported the idea that race is a significant factor in the relationships explored in this study. The findings from the primary analyses regarding race will be described in more detail during the discussion of the specific hypotheses. Given the findings from the preliminary and primary analyses, it did not seem prudent to ignore the racial difference noted, hence, race was entered as a covariate in the primary analyses. However, this is not the ideal method for handling significant racial differences (Helms, Jernigan, & Mascher, 2005). Ideally, separate analyses would be conducted for each racial group as was done in the case of gender. For the current study the sample size for each racial group was too small to conduct separate analyses. Future studies will need to have sufficient sample sizes so that analyses can be conducted separately for each racial group.

Findings from the current study are consistent with a large body of existing literature that has investigated differences in health behaviors across racial groups (Eneli, 2008; Ogden et al., 2006; Ogden, Carroll, & Flegal, 2008; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Yancey & Kumanyika, 2007). Study results provide evidence to warrant continued investigation of the influence of race on children's health behaviors.

Above, are the general findings found by the current study. The results in relation to each cluster of hypotheses will now be examined.

Cluster One Hypotheses

The three hypotheses that comprise the cluster one hypotheses examined the relationship of internalizing behaviors with the three different health behaviors, healthy eating, unhealthy eating, and physical activity. The relationship between internalizing behaviors and unhealthy eating behavior was supported for both boys and girls. Conversely, the relationships of internalizing behaviors to both physical activity and healthy eating were not supported. In addition, there was a gender difference in the relationship between internalizing behaviors and unhealthy eating. For girls the relationship was positive, meaning the more internalizing behaviors present the more unhealthy eating behaviors were reported, whereas for boys the relationship was negative, meaning the more internalizing behaviors present the less unhealthy eating behaviors were reported. In addition to the main findings, some of the covariates were found to be significant. Socioeconomic status was a significant positive predictor of healthy eating in girls and physical activity in boys. In addition, Black children were found to have higher rates of unhealthy eating compared to other racial categories in the

study sample. The findings from the covariate analysis suggest that socioeconomic status and race are important constructs to consider when examining factors associated with unhealthy eating behavior. Results from the category one hypotheses suggest that mental health factors have an impact on children's health in behaviors that undermine healthy living, such as unhealthy eating behavior, as opposed to behaviors that promote healthy living, such as healthy eating and physical activity. In addition, the nature of the impact of mental health on unhealthy eating behavior appears to be different for girls and boys.

Consideration of the possible mechanisms of action between internalizing behaviors and health behaviors, particularly the difference between healthy and unhealthy eating, will help to explain the differential results for internalizing behaviors.

Internalizing behaviors may serve as an impediment to engaging in the goal of eating healthy foods. Eating healthy foods is perceived as a behavior to strive for and internalizing behaviors may impede that goal process. Conversely, children who display more internalizing behaviors may use unhealthy eating as a way to cope with negative and possibly overwhelming emotions. The Affective Regulation Model recognizes that eating is a way to cope with mood by providing distraction and comfort from negative mood (Goossens, Braet, Van Vlierberghe, & Mels, 2009). This idea of eating as a way to cope with mood is widely accepted idea and the origins and complexity of this relationship has been explored in the literature (Davis, Burleson, & Kruszewski, 2011; De Boo & Spiering, 2010; Frydenberg, 2008; Goossens et al., 2009; Greeno & Wing, 1994; Harrell & Jackson, 2008; Martyn-Nemeth, Penckofer, Gulanick, Velsor-Friedrich, & Bryant, 2009; Newman, O'Connor, & Conner, 2008; Rutledge & Linden, 1998; Stotts,

2010; Thome & Espelage, 2004). One theoretical explanation for a possible mechanism linking unhealthy eating and mood can be found in Nolen Hoeksema's work on cognitive coping styles in depression (Nolen-Hoeksema, 1994). Nolen Hoeksema (1994) argues that there are two predominant coping styles for depression and other mental health conditions, a ruminative coping style and a distraction solution-focused coping style (Nolen-Hoeksema, 1994; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). In the ruminative coping style a person's energy is directed towards coping with the emotional experience of a stressor and employing strategies to cope with the emotions. In the distraction solution-focused style a person's energy is directed at finding solutions to alleviate the stressor or distract away from the stressor. Children with higher internalizing behaviors, who engage in the ruminative coping style, may be using unhealthy eating as a way to cope with the affective experience related to stressors. Combining the Affective Regulation Model and the Nolen Hoeksema's model on coping allows for the interpretation that unhealthy eating behavior may be a coping mechanism for internalizing behaviors.

Interestingly according to study results, this conceptualization could only be true for girls and not boys. The relationship between internalizing behaviors and boys was found to be negative, meaning that boys with internalizing behaviors engage in less unhealthy eating than boys with less internalizing behaviors. This suggests that boys and girls may have different strategies for coping with negative mood. This finding is not surprising given that extensive research has been conducted highlighting gender differences in many areas of stress and coping including impact of different stressors, and

amount and type of coping strategies employed (Davis et al., 2011; De Boo & Spiering, 2010; Sontag & Graber, 2010; Stotts, 2010). This finding is also consistent with Nolen-Hoeksema's work, which has found a gender difference in coping styles, with girls and women tending to engage more in the ruminative coping style with boys and men tending to engage in the distraction solution focused coping style. If boys are not engaging in the ruminative coping style they may not rely on food to distract and comfort from negative mood and thus have lower rates of unhealthy eating than girls. The idea that eating may be used as a coping mechanism for low mood and that there is gender difference in this relationship has been investigated in adult populations and clinical populations for depression and binge eating disorder (Davis et al., 2011; Greeno & Wing, 1994; Harrell & Jackson, 2008; Sontag & Graber, 2010; Stotts, 2010; Wagener & Much, 2010). There has been some exploration that this relationship exists in the childhood non-clinical population (De Boo & Spiering, 2010; Goossens et al., 2009; Nolen-Hoeksema, 1994) and results from this study contribute to the growing body of literature in this area.

The interpretation above raises questions about how society views nutrition behavior and what types of messages children are receiving about nutrition behavior. Where do children learn the idea that unhealthy food helps a bad mood? While it is proven that certain unhealthy foods activate positive neurotransmitters, such as serotonin, and that certain aspects of food and stress have biological mechanisms (Davis et al., 2011; Newman, O'Connor, & Conner, 2007), it is plausible to consider that this association may also have some component that is socially learned. I wonder if the distinction between internalizing behaviors influence on healthy and unhealthy eating

would exist if children learned that consistent healthy eating behavior helps to improve and sustain positive mood and also learned more adaptive ways of coping with negative feelings.

In addition, biological and social factors may be interacting with the psychological factors to influence children's health behaviors. It has been found that the onset of puberty is associated with the development of obesity, with girls who reach puberty earlier are more likely to become obese than girls who do not develop earlier. Conversely, boys who develop earlier are less likely to become obese than boys who develop later (Wang, 2002). This finding suggests that the social influence of gender and the biological event of puberty may also need to be considered when understanding the psychological factors influencing children's health behaviors. This example highlights the possibility of intersections between the biological, psychological, and social levels of development and suggests that these interactive relationships may be influencing health behaviors and consequently obesity development.

Among the three hypotheses in cluster one, there were two findings that suggest socioeconomic status and race may influence children's health behaviors. The current study assessed socioeconomic status with two different measures, income to needs ratio and maternal education. Income to needs ratio emerged as a significant positive predictor of healthy eating behavior for girls. This finding is not surprising given the fact that healthy food costs more than unhealthy food and there is literature that supports the notion that children from lower socioeconomic status are at a higher risk for developing obesity (Eneli, 2008; Yancey & Kumanyika, 2007). Interestingly, maternal education

was not a significant predictor of healthy eating behavior in girls, but maternal education was found to be a significant negative predictor of unhealthy eating in boys. This difference found between socioeconomic measures helps to disentangle which factors associated with socioeconomic status may be contributing to health behaviors. It may be mothers with less education know that it is good to eat fruits and vegetables, but it is the economic costs of fruits and vegetables that prohibit them from buying healthy food for their children. And again the gender difference is observed, where maternal education was not found to be a significant predictor of health behaviors in girls but was found to be a significant negative predictor of unhealthy eating in boys. It is unclear why this gender difference is observed and further research should assess the influence of gender on this relationship between maternal education and health behaviors. This finding suggests that factors in the sociocultural realm, as well as the mental health realm, have differential impact on health behaviors based on gender.

Findings from hypothesis two revealed that Black children had significantly higher rates of unhealthy eating than any other race group. The effect size of this covariate was slightly higher than the effect size of the main finding, indicating racial identification is as significant as internalizing behaviors in predicting unhealthy eating. It should be noted that race was entered before the socioeconomic status predictors therefore, results from this study cannot comment on the unique variance accounted for by race apart from socioeconomic status, which has also been found to be a predictor of nutrition behavior (Beydoun & Wang, 2010; Fairclough et al., 2009). However, the finding that Black children engage in more unhealthy eating behavior compared to other

racess also has support in the literature (Gaskins et al., 2007). In particular, Black girls have been found to have high rates of unhealthy eating in two national studies (NHANES 1999-2000 and National Heart and Growth Study) and efforts to understand the relationship between unhealthy eating and this population have been made (Sherwood, Story, & Obarzanek, 2004). The finding from the current study contributes to this established evidence that Black people have higher rates of unhealthy eating and extend this finding to the preadolescence. Although it may seem that exploration of the nutrition behavior of Black girls may be specific enough to uncover the risk factors for children at risk for obesity, other studies suggest that the construct of race needs to be further deconstructed in order to understand who is at risk for obesity. One study investigated subgroups of an adult Black population for rates of unhealthy eating and healthy eating and risk for cardiovascular disease (Lancaster, Watts, & Dixon, 2006). It was found that non-Hispanic Blacks born in the United States had more unhealthy eating, less consumption of fruits and vegetables, and greater risk for cardiovascular disease than the other Black adults assessed in the study, Hispanic Blacks born in the United States, non-Hispanic Blacks not born in the United States, and Hispanic Blacks not born in the United States. These findings suggest that not only is there a need for studies to be designed to allow for separate analyses of racial groups, subgroups within racial groups need to be included to further probe the underlying mechanisms between race and obesity that are currently obscured by the broad social construct of race.

Results from cluster one hypotheses support and extend findings found in existing literature. As stated in the literature review, when investigating significant factors related

to health behaviors, it is common to conduct separate analyses for different health behaviors. Furthermore within the realm of nutrition behavior, researchers have explored healthy and unhealthy eating separately (Croll, Neumark-Sztainer, Story, & Ireland, 2002; Edmundson et al., 1996; Hoelscher et al., 2004; Kalavana, Maes, & De Gucht, 2010a; Shepherd et al., 2006). A study by Kalavana (2010) and colleagues set out to investigate significant factors for healthy and unhealthy eating in the realms of family and peer influence and self-regulation among Greek adolescents. These factors, such as family cohesion, peer attitude towards food, and self regulation cognitions, were found to have differential effects on healthy and unhealthy eating. Results from the current study support and extend the findings from the Kalavana study. The findings from cluster one hypotheses demonstrate that, along with the factors identified in the Kalavana study, mental health also has a significant differential relationship to healthy and unhealthy eating. The results from cluster one support the idea that healthy and unhealthy eating are predicted by different factors and extend this notion to the realm of mental health factors.

Results from the current study are also consistent with Kalavana's findings regarding sociocultural influence on health behaviors (Kalavana, Maes, & De Gucht, 2010a). It should be noted that similar sociocultural influences were found despite the fact that the current study utilized a sample from the United States and the Kalavana study utilized a sample from Greece. In both studies, gender was found to be a significant factor in health behaviors. Kalavana also found socioeconomic status to be a significant predictor of health behaviors. Furthermore, both studies report that the socioeconomic measure of income was a significant influence on children's health behaviors and

parental level of education was not found to be a significant influence on children's health behaviors. One difference in the two studies is that in the current study, maternal education was found to be a significant negative predictor of unhealthy eating in boys whereas, parental education was not found to be a significant predictor of any health behaviors in the Kalavana study. These findings provide evidence that, although income level and level of parental education are meant to represent socioeconomic status, they may have differential relationships with children's health behaviors. This suggests exploring the meta-construct of socioeconomic status requires nuanced investigations, which deconstructs the factors that socioeconomic status represents.

Results from the current study provide evidence that mental health factors are important for understanding the issue of childhood obesity. Findings from cluster one hypotheses provide evidence that mental health factors, namely internalizing behaviors, are associated with obesity development through the mechanism of unhealthy eating behaviors. This is an important contribution to existing literature examining the relationship between mood and obesity. Literature has already demonstrated that depression shares a significant relationship with obesity, however, this relationship can be influenced by factors at the biological, psychological, and social levels of development (Bradley et al., 2008; Braet, 1997; Goodman, 2002; McElroy, 2004; Mustillo, 2003; Pine, 1997; Zimetkin, Zoon, Klein, & Munson, 2004). For example, biological or hormonal changes associated with depression may also have an influence on obesity development. The results from the current study suggest that the association of internalizing symptoms to unhealthy eating is one pathway that links depression and obesity. This finding

suggests that the role of mental health on health behaviors is a worthwhile direction for further exploration in understanding obesity development in childhood.

Overall, findings from the cluster one hypotheses make several contributions to the existing literature in this area. First, this study provides evidence that a relationship exists between children's internalizing behaviors and their health behaviors. Second, it is now known that the investigation of influences on different health behaviors separately should be extended to the realm of mental health factors. And finally, results from the cluster one hypotheses strengthen the claims of existing literature that sociocultural factors, in particular gender, race, and socioeconomic status, are significant influences on children's health behaviors.

Cluster Two Hypotheses

Cluster two hypotheses investigated the relationship of the cognitive factors, sports self-efficacy and delay of gratification, with health behaviors. As hypothesized, sports self-efficacy was found to be a significant predictor of physical activity behavior in both boys and girls. Conversely, none of the delay of gratification hypotheses were supported. The results of these two cognitive factors will be discussed separately.

Sports Self-Efficacy

Bandura (1997) theorizes that self-efficacy is a prominent and significant influence on behaviors. Self-efficacy is a construct that has a well-established literature in various realms of behavior, including health behaviors (Hausenblas, Nigg, Downs, Fleming, & Connaughton, 2002; Kelly et al., 1991; Landaas, 2006; Shields et al., 2008; Tapler, 1996; Kitsantas, 2000; Luszczynska, Tryburcy, & Schwarzer, 2007). The results

from the present study contribute to this literature by providing evidence that sports self-efficacy is a significant predictor of physical activity behavior for both boys and girls. Further, the effect sizes associated with the sports self-efficacy findings are the largest effect sizes found in the study, including covariate analysis, with the boys effect size reported at .22 and girls reported at .15. These results suggest that when studying influences on children's health behaviors in preadolescence, self-efficacy is a construct that should be included.

The present study had two major limitations with regards to the study of self-efficacy. First, measures of self-efficacy were not available for all the health behaviors studied. There were no measures available in the database to study nutrition self-efficacy. Second, the construct of sports self-efficacy is limited in that it is a measure of self-efficacy in relation to sports and does not encompass the entire realm of physical activity behavior. Sports self-efficacy is one aspect of physical activity behavior and efficacy for physical activity in general may be different than sports self-efficacy. It might be that much of the physical activity that children in preadolescence engage in is centered on sports, as opposed to adulthood when more solitary physical activity is pursued and earlier childhood when more spontaneous physical activity occurs. However, there is also the possibility that the concept of self-efficacy in sports, as opposed to more general physical activity efficacy, may be confounded by other factors that determine success in sports such as teamwork, peer relationships, and competition. The understanding of the role of self-efficacy, as derived from this study, would have been improved if self-

efficacy measures of nutrition behavior and a more general measure of physical activity efficacy were used.

Beyond the measurement improvements already mentioned, there are other important ways to further investigate concepts associated with self-efficacy. Future studies should explore the relationship between different types of self-efficacy. Bandura is very clear that specific types of self-efficacy need to be measured distinct from one another however, he also talks about the relationship between different types of self-efficacy. Distinct types of self-efficacy may share a similar set of sub skills. For example, it is known that self-regulation skills are an important aspect to establishing healthy behaviors, for activities such as setting goals and creating incentives. (Bandura, 1977; Ridder & Wit, 2006). It may be that a shared component of nutrition self-efficacy and physical activity self-efficacy is confidence in self-regulation skills. A new direction for research would be to understand the contribution of self-regulatory skills on the various types of self-efficacy associated with children's health behaviors.

Another avenue of investigation regarding self-efficacy that may be valuable in the applied realm is exploring the acquisition of self-efficacy skills. It has been found that self-efficacy in different realms can impact one another if they are learned simultaneously, a concept Bandura has labeled codevelopment (Bandura, 1997). For example, children who start to experience nutrition self-efficacy may transfer some of those feelings of confidence towards physical activity efficacy if they are learning and practicing both types of efficacy simultaneously. It would be valuable to determine if the concept of codevelopment exists in the various types of self-efficacy needed for

children's health behaviors. This information could aid in the design of interventions where developing several types of self-efficacy skills would be a component of the intervention. These two lines of inquiry, exploring the common factors and codevelopment between different types of self-efficacy, may have important implications for understanding and developing healthy lifestyles in children.

Delay of Gratification

Surprisingly, despite the fact that several studies have demonstrated self-regulation as a significant predictor of health behaviors (Kalavana, Maes, & De Gucht, 2010b; Kitsantas, 2000; Kitsantas & Kitsantas, 2005), none of the hypotheses investigating the direct effect of delay of gratification on health behaviors were found to be significant. These results may be due to measurement issues associated with the study design. One issue is that there was a significant time lapse between measurement of delay of gratification, measured when the children were 4.5 years, and measurement of health behaviors, measured when the children were in sixth grade. There is a developmental aspect to self-regulation that may have confounded the results. According to the model of self-regulation put forth by Mischel (1989), the hot system, which is measured by the delay of gratification measures, develops relatively early in life whereas the cool system, which are strategies to promote self-regulation, develops later in childhood. It may be that the participants had very little development of their cool systems when they were 4.5 years and hence there were children with high and low scores of delay of gratification. However when these participants were in sixth grade, children who had low delay of gratification may have developed cool systems that impacted their self regulation

capabilities. This developmental shift would have been inadvertently captured in the measure of health behaviors at sixth grade but would not have been captured by the measure of delay of gratification at age 4.5 years.

Although the explanation above seems theoretically plausible, studies by Mischel and others have found that this measure of delay of gratification at age 4.5 years can transcend development even into adolescence (Shoda, Mischel, & Peake, 1990). In order to explain why in this case delay of gratification measures were not able to predict future behavior, attention should be directed to the reporting method of the measures in question. The health behavior measures were self-report questionnaires about real-world behaviors. The delay of gratification was a laboratory observation of an experimentally manipulated scenario. Mischel theorizes about the “if...then” property of self-regulation and personality theory in general (Mischel, 2009). He explains that personality research has focused on discovering universal traits and has been disappointed to find that many personality traits appear inconsistent in their ability to predict behavior. He posits a more accurate interpretation of these results is that personality consists of stable traits that interact with context and environment, which modifies the manifestation of these traits. This idea has been distilled down to the “if...then” statement, meaning if some contextual factor is in place then the personality trait will have this amount of influence.

In the case of the present findings, it may be that delay of gratification plays a role in children’s health behaviors at sixth grade. However, since the measures of health behaviors were real world self-report measures, contextual variables needed to be included in the prediction equation in order to understand the impact of delay of

gratification outside the laboratory setting. Contextual variables may have an undeniable impact on health behaviors that would diminish the influence of an internal psychological factor such as delay of gratification. For example, a child who has high delay of gratification may be able to make select healthy foods in a laboratory setting, however, in the context of the real world this child may come from a family of low SES background where being able to afford healthy foods is difficult for the child's family. This explanation suggests that future studies need to be more explicit in including relevant aspects of context in hypotheses concerning the impact of delay of gratification on children's health behaviors.

The findings from the current study diverge from current literature that has found self-regulation to be a significant predictor of health behaviors (Kalavana, Maes, & De Gucht, 2010b; Kitsantas, 2000; Kitsantas & Kitsantas, 2005). These studies utilized self-report measures of self-regulation and health behaviors and administered them concurrently, which differs from the design of the current study. In addition, the measures of self-regulation in these studies are very different from the self-regulation construct captured by the delay of gratification task. In these studies, self-regulation is a composite measure made up of properties from the cool system, such as goal setting and planning. This composite measure does not capture the degree to which an individual needs to use the cool system to compensate for the desires of the hot system, it merely measures the properties of the cool system without taking into account how developed these properties need to be to overcome an individual's activity in the hot system. In this way, these measures of self-regulation are very different from the self-regulation construct measured

in the current study. Future research may want to find ways to explore ways to measure the dialectical relationship between the hot system and cool system of self-regulation. It would be useful to understand how developed an individual's cool system components are in relation to the activity of their hot system. This research would be particularly valuable in the context of childhood when cool system components are still being developed and may reveal an ideal point of intervention for health prevention work. Although, the findings from the current study did not find a significant direct relationship between delay of gratification and health behaviors in children, for reasons outlined above, continued exploration of the impact of self-regulation on health behaviors appears to remain a worthwhile endeavor.

Cluster Three Hypotheses

For the proposed moderating models, all of the hypotheses, except for one, were not supported. The moderating hypothesis that investigated the relationship between internalizing behaviors and delay of gratification on physical activity behavior was found to be significant for boys. This hypothesis was found to be significant for the high versus low delay of gratification group and not significant for the moderate versus low delay of gratification. Hence, the relationship was only supported when the extreme groups are compared, children who are able to delay gratification for the entire duration of the experiment and children who are not able to delay gratification for any significant period of time. A graph of the simple slopes of the interaction term reveal that boys who have low delay of gratification report higher rates of physical activity as their internalizing behaviors increase, that is, boys who have low delay of gratification are more active if

they experience more internalizing behaviors. Conversely, boys who are characterized as high delay of gratification report less physical activity when they experience more internalizing behaviors. This result supports the possibility that if additional significant factors, such as mental health and gender, are taken into account, the manifestation of delay of gratification on health behaviors may emerge significant. It supports the “if...then” equation put forth by Mischel to understand personality constructs in a more contextual manner, meaning when gender and mental health are added to the prediction equation a more accurate depiction of the relationship between delay of gratification and health behaviors is revealed.

Evidence that the interactive relationship between internalizing behaviors and cognitive factors is an influence on children’s health behaviors is a novel contribution to the literature. Furthermore, it is important to note that in the context of this study, the relationship between internalizing behaviors and delay of gratification was only significant for physical activity in boys. These results highlighting the difference in gender, foster consideration of other factors that may be interacting with the relationship between cognition and affect to differentiate it’s influence on various health behaviors.

Even more interesting are the results revealed by graphing the simple slopes of the significant interaction term. As stated above, a graph of the simple slopes of the interaction term reveal that boys who have low delay of gratification report higher rates of physical activity as their internalizing behaviors increase, that is, boys who have low delay of gratification are more active if they experience more internalizing behaviors. Conversely, boys who are characterized as high delay of gratification report less physical

activity when they experience more internalizing behaviors. This finding is slightly surprising and contrary to intuition, which may hypothesize that boys who have a better delay of gratification would be able to overcome their internalizing behaviors to engage in physical activity behavior, when in fact exactly the opposite has been demonstrated by this study.

One possible explanation for these results is that boys who struggle with issues of both delay of gratification and internalizing behaviors are using physical activity behavior as a way to manage their emotions. These boys are experiencing more negative emotions and have poor impulse control and engaging in physical activity may be a means to avoid or cope with the emotional experience. Engaging in physical activity may be a distraction from the internal experience associated with anxiety and depression. The idea of physical activity being a distractive coping mechanism is consistent with the distraction solution focused coping style put forth by Nolen Hoeksema, which has been found to be more prevalent in boys than girls (Nolen-Hoeksema, 1999). Of course, these boys may be engaging in other physical activities, such as fidgeting or acting out in the classroom, which may not be as adaptive as the purposeful physical activities measured by the present study. These boys may have not found internal self-regulatory mechanisms to cope with their emotional experience and hence have turned to distraction from external experiences, such as physical activity.

Effortful control, which is a temperament characteristic embodying the characteristics of self-regulation, has been found to be a protective factor for depressive symptoms in both boys and girls (De Boo & Spiering, 2010). Boys who possess strong

effortful control or high delay of gratification may not need to rely on external distraction strategies such as physical activity to cope with internalizing symptoms. The results of the present study support the premise that effortful control would be a significant factor for boys. However, the same finding was not replicated with girls. It may be that the coping mechanisms associated with boys, physical activity behavior, have a stronger relationship with self regulation than with the coping mechanisms associated with girls, unhealthy eating. Further investigation would need to be conducted to explain the divergence of the results of the current study from the De Boo study. From this strengths-based perspective, boys who have difficulty with impulse control and internalizing behaviors may have found an adaptive way to cope with their emotional experience, which has the added bonus of engaging them in a healthy lifestyle choice.

Boys who experience internalizing behaviors but have high delay of gratification may not engage in physical activity in a similar manner as boys who do not have high delay of gratification. These boys may have learned to develop a more sophisticated cool system that allows for more internal coping with negative emotional experience and requires less reliance on outside distraction coping strategies. In addition, the self regulatory capacities in these boys coupled with low motivation associated with negative mood may inhibit them from engaging in more spontaneous opportunities to be physically active, decreasing the overall amount of physical activity reported by these children. The information learned by graphing the simple slope of the significant moderating hypothesis is a novel contribution to the literature and warrants further replication and investigation. The finding was significant but not strong ($p < .05$),

indicating that this finding needs to be replicated in further research and interpretations from this finding are speculative.

Interestingly, despite the fact that a relationship was demonstrated between internalizing behaviors and unhealthy eating behaviors, the moderating hypothesis that takes into account delay of gratification in this relationship was not found to be significant. Furthermore, it was found that girls with internalizing behaviors engage in more unhealthy eating, whereas boys with internalizing behaviors engage in less unhealthy eating. In interpreting the combination of these results it becomes apparent that gender may be an influential factor in understanding how mood and cognitive factors are related and how this combination is related to health behaviors. If one assumes that the health behaviors of unhealthy eating and physical activity serve as coping mechanisms for mood, then results suggest that girls may cope with eating unhealthy food and boys cope with physical activity. This finding is consistent with the idea prominent in the literature that boys and girls develop different coping mechanisms (Davis et al., 2011; De Boo & Spiering, 2010; Nolen-Hoeksema, 1999; Sontag & Graber, 2010). Work done by Nolen Hoeksema, in particular, provides one theoretical model to understand the different coping styles of boys and girls and men and women. This work allows for health behaviors to be thought of as coping strategies for mood and provides evidence that boys and girls may use different coping styles for negative mood, which cause them to turn to different health behaviors. (Nolen-Hoeksema, 1994; Nolen-Hoeksema, Larson, & Grayson, 1999; Nolen-Hoeksema & Jackson, 2001).

Nolen Hoeksema's theory also highlights the importance of the developmental time period, preadolescence, in understanding depression in adolescent girls (Nolen-Hoeksema, 1994). From her perspective, girls' tendency towards a ruminative coping style interacts with events related to puberty to increase the rate of depression in girls in adolescence. Nolen Hoeksema acknowledges the biological changes attributed to puberty and certainly others have provided evidence of hormonal changes affecting mood and eating (Davis et al., 2011; Newman et al., 2007). However, a sociocultural perspective on the onset of puberty is also cited by Nolen Hoeksema as a contributor to the cause of increased depression in adolescent girls. It is posited that bodily changes associated with puberty in girls, including gaining weight, are negative whereas bodily changes associated with puberty in boys, including developing more lean muscle mass, are positive and welcomed. In addition, when physical manifestations of puberty develop societal expectations for girls and boys become more pronounced and some of the attitudes expected for girls, such as decreased independence, may foster hopelessness and depression. There are many factors associated with puberty that may contribute to understanding the relationship between mood and health behaviors in preadolescence. This underscores the importance of investigating these relationships during the developmental time period of preadolescence. Perspectives, such as those provided by Nolen Hoeksema, offer several avenues that can be explored empirically to understand the complex and nuanced relationship between mood and health during this developmental time period.

Future studies need to be conducted to test the interpretation put forth in this discussion, which is that health behaviors can be considered coping mechanisms among children who struggle with internalizing behaviors. Studies will need to replicate the findings from the present study, as well as, use alternative statistical procedures, such as mediational analyses and experimental designs, to be able to draw causal interpretations from the results.

General Implications of Findings

Theoretical

The current study confirms two major tenets found in psychological theory. The first tenet is that there is a relationship between affect, cognition and behavior, which is the classic assumption of cognitive behavioral theory and a major component of many social psychological theories such as Bandura's Social Cognitive Theory, Mischel's CAPS Theory, and Lerner's Developmental Contextualism. Using this theoretical foundation, significant cognitive and affective influences of children's health behaviors were identified. Findings from the current study add to the well-established literature that cognitive and affective influences impact behavior. In addition, the current study has made a unique contribution by identifying specific influential factors in the realms of cognition and affect that influence children's health behaviors at a crucial developmental time period, preadolescence. The present study has taken a classic theoretical assumption and applied it to a challenging contemporary dilemma, identifying factors that may be contributing to the dramatic rise in childhood obesity.

The second major tenet of psychological theory that applies to the present study is the notion that there are many factors at several different levels interacting with each other to influence behavior. This is an assumption found in the biopsychosocial model of Developmental Psychopathological Theory and Bronfenbrenner's Ecological Model. The unique contribution that the present study makes is to explore the interactive relationship between internal psychological influences and children's health behaviors. The findings highlight significant factors related to children's health behaviors in the psychological realm. In addition, many of the study findings that may be interpreted as inconsistent, such as the differential effect of internalizing behaviors on healthy eating versus unhealthy eating, may have an alternative interpretation when viewed through a Developmental Psychopathological frame. Developmental Psychopathological Theory would posit that the "inconsistent" findings are evidence that the relationship between psychological factors and health behaviors may be influenced by other influences at different levels of development, which is contributing to the multifinality observed between the health behaviors. From this perspective, the findings support a broad conceptualization of the possible influential factors on children's health behaviors. For example, gender emerged as a prominent differentiating factor for several of the study hypotheses. The construct of gender may embody several other factors at the biological and social level that are interacting with the relationships at the psychological level to impact results. In addition, the developmental time period of preadolescence, when puberty occurs, may highlight several unique and significant factors that are impacting the relationships proposed by the current study. Including a measure of pubertal

development would have been ideal for the present study. However, the amount of data provided for pubertal development by the dataset did not provide enough power to conduct the analyses. Future studies will want to include measures of pubertal development to understand the contribution of the onset of puberty to the relationship between mood, cognitive factors, and health behaviors. Nonetheless given the findings from the present study, it can be presumed that psychological factors, such as internalizing behaviors, self-regulation, and self-efficacy, need to be a part of future more comprehensive explorations of the influences on children's health behaviors.

Research

One of the major contributions this study offers to the existing literature is that affective and cognitive factors influence children's health behaviors. In addition, in one instance, the relationship between affective and cognitive factors also appears to have a significant influence on children's health behaviors. These results support the notion that internal psychological characteristics need to be considered in research when attempting to identify influences on children's health behaviors, and subsequently understand influences of childhood obesity.

One of the major issues in the research on childhood obesity has been the inconsistent result of prevention efforts. Obesity prevention programs have not been able to demonstrate consistent results over time and across interventions (Stice, Shaw, & Marti, 2006). Some of this inconsistency may be due to the variability used in outcome measures. However, the results of the present study offer another possible explanation for the inconsistent results. Perhaps, research of these prevention efforts is not accounting for

the various factors that may be impacting their interventions. Influences at all levels of development may vary for their intervention participants, which are producing differentiated results for individuals within the intervention. This study demonstrates certain internal psychological characteristics can impact health behaviors. Prevention efforts that measure success without taking into account these variables will most likely have confounded results. These confounded results may be a reason why obesity prevention efforts appear to be inconsistent. In addition, the null results from the current study also suggest that understanding influences on children's health behaviors is complicated and nuanced. None of the psychological characteristics investigated in this study had a universal influence over the three types of health behaviors. These findings suggest that certain health behaviors may have different influential factors. The current study suggests that a decontextualized universal approach to evaluating obesity prevention efforts, which does not take into account the complicated relationship between significant influences of health behaviors, may not be adequate for understanding children's health behaviors.

The literature of childhood obesity calls for the identification of mechanisms of change for children's health behaviors. Although the present study does not identify any mechanisms of change, the results can be used to guide investigation in this area. In order to uncover these mechanisms, change in health behaviors need to be measured and mediators need to be identified. Initial steps towards investigation in this area would be to identify the factors to include in these models. This study has identified psychological characteristics that may be useful to explore in the context of a mediating relationship.

Mediators are the statistical technique used to identify mechanisms of change (Baranowski, Klesges, Cullen, & Himes, 2004). In particular, the relationship between internalizing behaviors and delay of gratification on physical activity suggests that the relationship between these two constructs is a promising area for mechanism of change research.

Applied

The results from the current study also have important implications for interventions associated with childhood obesity. Although the findings require replication, the factors associated with health behaviors in this study may be useful for identifying children who would benefit most from prevention and intervention efforts. For example, children who have low self-efficacy towards sports may be an ideal population to target with interventions designed to increase physical activity efficacy as well as physical activity. In addition, information about these factors may be used in the design of intervention efforts. For example, an intervention for children with low sports self-efficacy may be more successful if the program contains specific elements designed to improve self-efficacy. The present study also identified the construct of gender as a significant factor in preadolescent health behaviors. Interventions may need to be tailored to boys and girls who struggle with negative mood differently, based on how they use health behaviors to cope with mood. For example, interventions for girls may target unhealthy eating as it relates to a negative ruminative coping style where interventions for boys may want to emphasize developing self-regulation strategies to help cope with negative mood. The present study has identified significant influences on children's

health behaviors, which allows for the identification of at risk groups and helps to tailor interventions to produce successful results.

General Limitations of the Study

Some of the issues and concerns of the present study have already been identified in previous sections. However, there are some general issues that have yet to be discussed, as well as some issues that need to be highlighted as limitations. There are three limitations that pertain to the internal validity of the study. First, the study design was primarily cross-sectional and correlational, and not experimental, so no causal inferences can be drawn from the results. Second, the study utilized multiple types of methods, self-report, third party report, and laboratory observation, however none of the constructs were assessed with more than one type of methodology. That is, no construct included a measure of self-report and observation. The internal validity of the study would have been strengthened by diversity in measurement for each construct. If a phenomenon being observed in a self-report was also found in third party report or laboratory observation, it would strengthen the confidence in the results due to its presence in multiple methodologies. Third, all three predictors were measured at different time intervals, internalizing behaviors over six different time points, self-efficacy at sixth grade, and delay of gratification at age 4.5 years. The study would have been strengthened if all predictors were captured in the same time period. It would have eliminated the possibility that time of assessment accounted for any of the variability between the predictors on the outcomes. Finally, measurement in the realm of self-efficacy was deficient in two ways. The measure physical activity self-efficacy only

encompassed the realm of sports self-efficacy as opposed to a more general physical activity self-efficacy. In addition, there were no measures to assess the self-efficacy associated with unhealthy and healthy eating behavior. Given the robust results found with the sports self-efficacy measure, it would be valuable to include more general measures of self-efficacy for all three health behaviors assessed to ascertain the influence of self-efficacy on these behaviors.

The current study also has limitations related to external validity and generalizability of the results. First, the results of this study may only be applied to the unique developmental time period of preadolescence. The constructs explored in this investigation will have unique manifestations at different periods of development. Since preadolescence was the developmental period studied, results may only be generalized to this age. Second, the demographic characteristics of the study underrepresented many groups, including many racial groups and children from low socioeconomic backgrounds. The results of the study cannot be generalized to children who were not adequately represented in the sample. This is a real limitation of the study particularly since issues with childhood obesity are found to be more salient for children not represented by the study sample.

Finally, results of the study can only be generalized to the time period in which the study was conducted, which is 1995-2005. This limitation is significant given that the attention paid to the issue of childhood obesity, in virtually every facet of society, has dramatically increased over the past decade. I wonder if the relationships between the constructs would remain the same if they were assessed today. My hypothesis is that

these relationships would remain significant. The rate of unhealthy eating has hopefully decreased and rates of healthy eating and physical activity have hopefully increased in the children who do not experience internalizing symptoms, due to the myriad of interventions focused on preventing childhood obesity. However, the children who are experiencing internalizing symptoms and using unhealthy eating to cope may only decrease unhealthy habits when internalizing symptoms are ameliorated or they are given an alternative coping mechanism. Therefore, it is hypothesized that the relationship between psychological symptoms and health behaviors would still be found to be significant today. The present study is unable to test this hypothesis. This is a limitation of the current study and an interesting direction for future research.

In terms of analysis and statistical power, the major limitation of the current study relates to the generalizability issues raised above. Several ethnic and racial groups were not adequately represented in the study sample. These groups were found to have significant differences on the constructs being measured but the lack of participants in these categories severely compromised the statistical power for conducting separate analyses for each racial and ethnic group. This is a major limitation of the study and future studies should make every attempt to rectify this limitation.

The current study had several significant findings, however the magnitude of these findings was modest. Results from this study will need to be replicated in order to gain confidence in the results. In addition, there were many insignificant findings for the small number of significant findings. This suggests there is a need to identify and investigate additional factors that explain the variance in children's health behaviors.

There is also the possibility that the factors investigated in this study share relationships with other factors not included in the present models that influence their relationship to health behaviors. This may be the reason some of the proposed relationships were found to be insignificant, they may be interacting with other significant variables not accounted for by the current study. In addition, there is the possibility that there are other influential factors not included in the study interacting with the factors that were found to be significant creating spurious results. This possibility only emphasizes the need for replication of the significant results found by this study.

Future Research Directions

Throughout this discussion, future research directions have been described that would improve upon the understanding of the factors investigated by the current study. In addition to these suggestions, more general future research directions need to be mentioned. Given that the present study has demonstrated that internalizing behaviors, self-efficacy, and delay of gratification are related to the health behaviors of preadolescent children, these factors need to be included in more broad and comprehensive studies of health behaviors. The internal psychological characteristics that have been identified by this study need to be explored simultaneously with other influential psychological factors, as well as, significant factors in the biological and social realms of development. Further the interaction of contextual factors on these models needs to be studied as well. In addition, these investigations need to be tested within the context of an intervention if they are to have relevance for obesity prevention efforts. Any combination of factors may also be impacted by the context in which it is measured.

For example, Parcel (2003) found that school climate had a significant impact on the classroom portion of a school wide intervention but not a significant impact on the physical activity or cafeteria intervention. These results indicate that more research is needed to understand which factors are significant under what conditions and in which contexts. Therefore not only do the results of the current study need to be extended to the broader biopsychosocial model, the context in which this model is located also needs to be taken into account.

In addition, sociocultural factors need to be considered in future investigations on children's health behaviors. Given the existing literature and the results found in this study, future exploration of children's health behaviors may want to deconstruct the various biological, psychological, and social influences gender represents in order to provide a more in depth and useful understanding of the contribution of gender on children's health behaviors. In addition, future exploration of children's health behaviors may want to deconstruct the various biological, psychological, and social influences race represents in order to provide a more in depth and useful understanding of the contribution of race on children's health behaviors.

Since relationships between health behaviors, affective factors, and cognitive factors have been found by this study, one of the next logical steps would be to investigate these relationships over time. A longitudinal investigation of these constructs would help to understand how these constructs relate to one another over time. Another advantage to a longitudinal design is that these relationships will be able to be conceptualized in a more reciprocal manner than the present study allowed. The cross

sectional design of the present study was limited in that it does not allow for directionality in its interpretation. A longitudinal design would be able to provide more information about the development of the relationship between these constructs over time and whether or not one factor precedes the other in development. The impact of affective and cognitive factors on health behaviors was hypothesized. The more accurate representation of these relationships is that the constructs are mutually influencing each other over time as described by the concept of reciprocal determinism in Social Cognitive Theory. A longitudinal study with the constructs identified by the present study simultaneously assessed at several points in time may more accurately represent the real world relationships between these constructs and make a valuable contribution towards understanding the reciprocal relationship between affective and cognitive factors and health behaviors.

Another advantage to studying these constructs within a longitudinal design relates specifically to the mental health construct in the study. In the present study, anxiety and depression are combined into one construct, internalizing behaviors, due to the lack of differentiation found between these conditions in childhood. A longitudinal design that assessed both internalizing behaviors and separate constructs for anxiety and depression, such as those put forth by the Watson and Clark model, would be advantageous in terms of determining when these two conditions start to differentiate from one another and if this differentiation has a differential impact on health behaviors. It may be that anxiety and depression have unique impacts on the various health behaviors and a longitudinal design would help to answer that question.

In order to determine whether or not these identified constructs have an impact on the development of obesity they need to be tested within the context of an experimental design measuring health behavior change. Future studies need to understand if improving affective and cognitive factors results in improvement in health behaviors. The value of the contribution from experimental studies would also be greatly improved by repeated assessment of health behaviors across time. One of the issues present in the current literature on obesity prevention efforts is the sustainability of change in health behaviors over time (James, Thomas, & Kerr, 2007). Therefore, studies that examine the impact affective and cognitive factors have on the improvement of health behaviors need to assess the sustainability of the improvement from these interventions. This focus on sustainability will ensure that these studies make a worthwhile contribution to the fight against childhood obesity.

Finally, numerous analyses were completed in the present study with only a small number of significant findings. Another future research direction is that significant findings from this study need to be replicated to gain confidence in their validity.

Conclusion

The present study makes several unique contributions to the existing literature investigating children's health behaviors, as well as, to the childhood obesity literature. Findings support premises put forth by major theoretical frames used to conceptualize the issue of childhood obesity. Insights have been gained from the hypotheses that were supported and future research directions are found by interpreting the hypotheses that were not supported. Results also make a potentially valuable contribution to the

conceptualization and implementation of obesity prevention efforts. The current study provides a nuanced exploration of the psychological factors impacting children's health behaviors and can be used to inform future research directions that will improve the interventions used to combat childhood obesity.

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