

DO OVERWEIGHT INACTIVE PARENTS RAISE OVERWEIGHT INACTIVE  
CHILDREN? EXAMINATION OF THE INFLUENCE OF THE HOME  
ENVIRONMENT ON WEIGHT STATUS OF CHILDREN OVER TIME

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## ABSTRACT

The primary aim of this study was to test whether body mass index (BMI), psychosocial, and behavioral parental variables were associated with similar variables in children at baseline, and whether these variables also served as significant predictors of overweight status in children after two years. While there have been several cross-sectional studies examining the impact of parental behaviors and characteristics on similar variables in children, and several longitudinal studies predicting weight status, BMI percentile, and risk factors of disease in children over time, there is a paucity of research that has identified (cross-sectionally) and then tested (longitudinally) significant parental variables as predictors of weight status in children over time. The current study sought to expand this literature. It was hypothesized that parental variables such as weight, activity level, social support, and eating habits would be associated with BMI percentile, eating attitudes, food selection, energy consumption, and activity level of their children at baseline. These parental and environmental variables were then tested as predictors of the children's weight status after two years. Cross-sectional results provided partial support for the hypotheses, whereby less active caregivers with higher BMI's, less social support, and unhealthy dietary habits were associated with heavier children who consumed more calories, reported lower self-esteem, fewer dieting attitudes and behaviors, had a higher preoccupation with food, and consumed more calories from fat. However, the significant cross-sectional parental correlates at baseline were not significant predictors of weight status in children after two years. In order to design more effective environmental interventions, future studies should primarily utilize longitudinal data from all family

members to gain further insight into significant relationships between family members' weight, activity, and health status over time.

## INTRODUCTION

Research has shown that adult Americans tend to gain weight and become increasingly overweight as they age; as body weight increases towards obesity, there is a parallel shift in the rate and incidence of disease and mortality. Flegal and colleagues (2005) examined data from a nationally representative sample of US adults from 1971-2002 (NHANES I-III plus follow-ups) and found that obesity was associated with increased mortality relative to the normal weight category. However, despite a significant increase in the prevalence of obesity, recent findings indicate that, with the exception of diabetes, cardiovascular risk factors have actually *declined* over the past 40 years for all body mass indices (BMI). Gregg and colleagues suggest that this decline in risk factors may be associated with improvements in preventive care in obese individuals, since there has also been a substantial increase in the prevalence of anti-hypertensive and lipid-lowering medication usage, and the prevalence of *diagnosed* diabetes has increased in obese persons. Despite increased awareness of the connection between chronic health conditions and obesity and improvements in preventive care, the prevalence of obesity continues to rise (Bray, 2003; Must, Spadano, Coakley, Field, Colditz, & Dietz, 1999; Flegal, Graubard, Williamson, & Gail, 2005).

Numerous studies investigating weight loss interventions and weight-related disease prevention have been conducted over the past 30 years (Knowler, et al., 2002; Wadden & Osei, 2002). “Lifestyle behavior modification for obesity” is one approach that combines behavioral, dietary, and exercise components. Although this approach has been successful for initial weight loss, only approximately 20% of overweight individuals are able to maintain a loss of at least 10% of initial body weight for over a year

(Williamson & Perrin, 1996; Wing & Phelan, 2005). However, research has shown that long-term weight maintenance can be significantly improved with extended therapeutic contact (Perri & Corsica, 2002; Perri, McAllister, Gange, Jordan, McAdoo, & Nezu, 1988) and individuals who are able to successfully maintain their weight loss from 2-5 years have an increased chance of longer-term success (Wing & Phelan, 2005). Recently there has been a surge in environmental approaches to obesity, which speculate that the environment is responsible for the variance in level of activity, food intake, and food selection. Such approaches attempt to alter what is now commonly referred to as the “obesigenic” environment, or an environment in which sedentary lifestyle and unhealthy diets are promoted (Allison, et al., 2001; Davison & Birch, 2002).

Lifestyle interventions for disease prevention have also been investigated. The Diabetes Prevention Research Group conducted a large randomized clinical trial comparing the effectiveness of lifestyle intervention, lifestyle intervention plus placebo, and lifestyle intervention plus metformin in preventing or delaying onset of type 2 diabetes in at-risk adults. The lifestyle intervention was associated with a reduction of 58% and the metformin intervention was associated with a reduction of 31% in the incidence of diabetes as compared with placebo. Furthermore, the lifestyle intervention was particularly effective, preventing one case of diabetes per seven persons treated for seven years (Knowler et al., 2002).

Due to the difficulty of maintaining substantial weight loss, the strong association between obesity and disease, and an increase in childhood overweight and obesity, recent research efforts have shifted their focus from obesity treatment and secondary prevention efforts for adults, to primary and secondary prevention efforts with children. Childhood

obesity increases the risk of obesity in adulthood (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Therefore, preventing childhood obesity may be an effective means of preventing adult obesity and the development of obesity-related health conditions.

Previous research has shown that children with obese parents are at increased risk of becoming obese as adults. Both obese and nonobese children with obese parents are more than twice as likely to become obese adults, as children without obese parents (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). However, the relationship between parental/caregiver behaviors and weight, and the behaviors and weight of their children over time has not been widely investigated. On the whole, parents and caregivers tend to be responsible for the eating and physical activity habits of young children; therefore, it was the influence of parental/caregiver behaviors on the weight, dietary composition, eating attitudes, mood, self-esteem, and physical activity level of the child at baseline, and on weight change over time, that was the major focus of the current study. Before more effective interventions for obesity prevention in children can be designed and implemented, it was first necessary to identify familial variables that are associated with and may influence the child's weight and health behaviors, e.g., eating and physical activity. Furthermore, all too often, researchers assume that good correlates will also make good predictors and so will draw unfounded conclusions from cross-sectional data on the longitudinal relationships of these same variables. Thus, the secondary aim of this study was to test whether correlates of BMI percentile in children also acted as predictors of weight change longitudinally after two years.

## REVIEW OF THE LITERATURE

### Weight Status and the Growing Problem of Obesity and Overweight

Classification of Weight. Body Mass Index (BMI; in  $\text{kg}/\text{m}^2$ ) is the general standard for assessing weight status in adults; however, because BMI increases with age in growing children (Harsha & Bray, 1996), the criteria for measuring weight status must be adjusted to correct for the instability of BMI values in this age group. Currently a child or adolescent is considered at-risk for overweight if their BMI is between the 85<sup>th</sup> and 95<sup>th</sup> percentile and overweight if their BMI is at or above the 95<sup>th</sup> percentile of the revised Centers for Disease Control (CDC), sex specific BMI for age growth charts (Jolliffe, 2004; Kuczmarski, et al., 2000). The CDC growth charts are based on nationally representative data obtained from five surveys conducted between 1963 and 1994 (cycles II and III of the National Health Examination Survey and rounds I, II, and III of the National Health and Nutrition Examination Survey (NHANES)). The International Obesity Task Force has proposed the following classification values for BMI in adults: underweight, less than 18.5; normal range 18.5 to 24.9; overweight 25.0 to 29.9; obese class I, 30.0 to 34.9; obese class II, 35.0 to 39.9; and obese class III, 40.0 or higher (Bouchard, 1997). This classification system was created to allow for meaningful comparisons of weight status, and to identify individuals and groups at increased risk of morbidity and mortality, such that adverse health effects occur on a continuum with increasing adiposity (WHO, 1995, 2000).

Prevalence and Extent Indices. The prevalence of overweight and obesity in US children is growing at an alarming rate. Prevalence rates describe the proportion of overweight children in the population, whereas extent indices describe the extent to

which the measure exceeds the cutoff (e.g., the extent to which BMI exceeds the overweight ( $25-29.9\text{kg/m}^2$ ) or obese ( $\geq 30\text{kg/m}^2$ ) cutoff). According to Bray (2003), from 1963-1970 overweight prevalence in young children was 4.2%, from 1976-1980 the prevalence rates increased to 6.5%, and from 1988-1994 the prevalence increased again to 11.3% in children aged 6 to 11 years. Jolliffe (2004) analyzed NHANES data from 1971-2000 and found a 182% increase in the prevalence of overweight and a 247% increase in the extent of overweight among children ages 2-19 years. These data indicate that a greater percentage of children are becoming overweight and that children are becoming increasingly overweight, because the average BMI for these overweight children has significantly increased.

Numerous epidemiological studies have found that there is a marked increase in the prevalence of overweight and obesity in adults ( $\text{BMI} > 25.0$ ) (Flegal, Carroll, Kuczmarski, & Johnson, 1998; Flegal, Carroll, Ogden, & Johnson, 2002; Sturm, 2003); however, this increase is almost entirely due to increases in class I, II, and III obesity ( $\text{BMI } 30.0-34.9$ ;  $35.0-39.9$ ;  $> 40.0$  respectively) with relatively little or no change in the prevalence of overweight and pre-obese ( $\text{BMI } 25.0-29.9$ ). These data from the first National Health Examination Survey (NHES I: 1960-62) and the first, second, and third National Health and Nutrition Examination Surveys (NHANES I-III: 1971-74; 1976-80; 1988-94) indicate the largest increase is in the obese categories ( $\text{BMI} > 30.0$ ), which are the BMI ranges associated with increased risk of a wide variety of health conditions (e.g., hypertension, heart disease, stroke, diabetes, etc.). The 1995 US Dietary Guidelines cite a BMI of 25.0 as the upper limit of the “healthy weight” ranges for men and women.

Flegal and colleagues (2002) examined more recent data from the first, second, and third National Health and Nutrition Examination Surveys (NHANES I-III), and from the first two years (1999-2000) of the continuous NHANES survey. The overall prevalence rates of overweight and obesity for men and women age twenty years and older, were 64.5% for overweight and 30.5% for obesity, which reflects an increase in the prevalence of overweight by 8.6% and 7.6% in obesity, since NHANES III (1988-1994). These increases were similar across age, sex, and racial/ethnic group. These data indicate that well over half of American adults are overweight and almost a third are obese. Despite this increase in overweight and obesity, the general public may not accurately perceive their own weight status, or the weight status of their children.

Perception of Weight Status. The general public's definition of ideal weight and overweight tends to differ from those of health authorities. Crawford and Campbell (1999) found that the average BMI at which women considered themselves to be overweight was significantly lower than that for men. Men tended to overestimate what was considered to be overweight, with two thirds defining overweight at a level higher than the current cutoff. In addition, women defined an ideal body weight consistently lower than men, at all ages and across all BMI categories. Overall, women's ideal body weight tended to fall in the middle of the "healthy" range; whereas, men's ideals tended to fall at the upper end of the healthy-weight range. These results are supported by earlier research showing that, on the whole, the general public does not have an accurate definition of what is considered normal weight and overweight. Moreover, a large proportion of people don't classify themselves as overweight when in fact they are (Crawford & Campbell, 1999; Paxton, Sculthorpe, & Gibbons, 1994).

Research has also found that parental perception of their children's weight status is not always dependable, because a substantial percentage of parents fail to identify their obese children as overweight. Maynard and colleagues (2003) examined NHANES III data and found that nearly one third (32.1%) of mothers reported their overweight child as "about the right weight". There are a variety of explanations for this finding, including a reluctance to admit the overweight status of their child, a failure to recognize the overweight status, or a lack of understanding of what constitutes "overweight". Additionally, a lack of knowledge and mistrust of growth charts may contribute to inaccurate classification of children's weight status. Jain and colleagues (2001) examined data from low-income mothers and found that many were reluctant to describe their children as overweight and indicated concern about their child's weight only if they were teased or inactive; many believed that their children would "grow out of it". Research has also shown a gender bias, where parents are more likely to report daughters as overweight than sons. For children at risk for overweight, 29% of mothers considered daughters to be overweight and 14% reported sons as overweight. Maternal odds of misclassification of at risk children as overweight are significantly higher for daughters than sons (Maynard, Galuska, Blanck, & Serdula, 2003). Further research is necessary, but a possible explanation for such a discrepancy may be attributable to a difference in societal standards for acceptable body sizes for males vs. females. A direct causal link has not been established between maternal perception and obesity, but parental concern or dissatisfaction with a child's weight often leads to lowered self-concept and reduced participation in physical activities (Maynard, Galuska, Blanck, & Serdula, 2003).

## Etiological Theories of Weight Gain and the Obesity Epidemic

Various theories attempt to explain the rapid increase in the prevalence of overweight and obesity as stemming from genetic, physiological, social, cultural, environmental, and behavioral contributions, resulting in energy imbalance.

Energy Balance. The energy balance theory, posits that this high prevalence is due to an excess of energy intake relative to energy expenditure (World Health Organization, 2000). This equation is key to understanding weight gain and obesity; however, it provides little insight into the contributors of such an imbalance.

Genetics. Research has found that overweight parents are more likely to have overweight children; however, various possibilities exist as to the nature of the relationship between the weight of parents and their offspring. Stunkard and colleagues (1986<sup>a,b</sup>, 1998) studied the genetic contribution to obesity by examining concordance rates among twins and between adoptee's and biological parents. The concordance rates for varying degrees of overweight were twice as high among monozygotic than dizygotic twins, a difference which remained significant at a 25-year follow-up. A strong correlation was also found between adoptees' weight and their biological parents' BMI; no such relationship was found between adoptees' and adoptive parents' BMI. Maes, Neale, and Eaves (1997) estimate that genetics account for 50-90% of the variability in BMI, and Bouchard and colleagues (1990) estimate that 40% of the variance in daily energy expenditure (excluding strenuous physical activity) is attributable to genotype. Despite the substantial evidence linking genetics to body weight regulation, genetics cannot play the key role in the rapid increase in obesity and overweight, since population-

wide genetic alterations cannot happen in such a short time frame (Racette, Deusinger, & Deusinger, 2003).

Behavior and the Environment. The World Health Organization (WHO) declares that, although genes play an important role in body weight regulation, the dramatic increase in the prevalence of obesity over the past 20 years is due to a combination of behavioral and environmental factors (i.e., excess energy intake combined with sedentary lifestyles) (WHO, 2002). French, Story, and Jeffery (2001) speculate that the obesity epidemic is caused from an environment that encourages excessive food intake and sedentary behaviors, and discourages physical activity. Various researchers propose that examination of the family environment and, more specifically, parental lifestyle may allow for early identification of children at-risk for adult obesity (Burke, Beilin, & Dunbar, 2001). Parental obesity is associated with increased prevalence of obesity in children, and also increases the likelihood that a child will become an obese adult. Davison and Birch (2002) used the physical activity and dietary intake of parents' to classify families into obesigenic and non-obesigenic clusters. From these data, they predicted children's risk of obesity. In addition, similarities in terms of dietary intake and activity practices were found within each cluster, and marked dissimilarities were found across clusters; one cluster exhibited patterns that promoted the development of overweight while the other showed patterns that prevented weight gain. This research suggests that the home environment, including parental health behaviors, may be a good predictor of childhood overweight and subsequent obesity.

Gene-Environment Interaction. The World Health Organization (2000) proposes that dietary factors and physical activity patterns are the major modifiable factors that

strongly influence the energy balance equation, and that it is through these factors that many external forces promoting weight gain act (e.g., sedentary lifestyles and energy-dense diets). They also report that while genetics may be involved in weight gain, this does not appear to be the case for the majority of individuals. Instead, the current view is that the genes involved in weight gain may increase the susceptibility or risk of an individual to develop obesity when exposed to an adverse, or unfavorable environment (gene-environment interaction).

In sum, while genetic factors may contribute to weight gain in some individuals, it is likely that a combination of behavioral and environmental factors are responsible for the dramatic increase in obesity and overweight among adults and children. Furthermore, the health behaviors (e.g., physical activity and diet), attitudes, and home environment (i.e., obesigenic vs. non-obesigenic) of parents are likely to play a key role in the development of overweight and obesity in children.

#### Modifiable Behavioral and Environmental Factors Contributing to Weight Gain

Dietary Excess. An abundance of research supports dietary excess as a potential contributor to the rising rates of obesity and overweight. According to Nicklas and colleagues (2001), increases have occurred in the number of meals eaten at restaurants, portion sizes, food availability, snacking, and meal skipping.

Eating Behaviors and Modeling. Eating attitudes and behaviors can also substantially influence weight outcome. Early studies of vicarious learning have consistently shown that children vicariously learn many habits from adult models (Bandura, Ross, & Ross, 1961; 1963). Social learning theories posit that learning occurs when an individual observes a role model's behavior and subsequently patterns his or her

behavior accordingly. Social learning theories have been applied in theories of the acquisition of maladaptive eating behaviors, indicating that individuals imitate the eating behaviors of those present in their environment (Polivy, Herman, Younger, & Erksine, 1979). More recently, Fisher and colleagues (2002) found that parents who consumed more fruits and vegetables had daughters who consumed more fruits and vegetables. Such research suggests that parental modeling of eating behaviors and attitudes could influence children's eating style and weight outcome. Eating styles that contribute to familial patterns of obesity may be passed down through generations, with obese parents using child-feeding practices that foster the development of overweight and obesity. Costanzo and colleagues (1985) suggested that the genetic predisposition may interact with the physical and social environment to produce inherited patterns of overweight and obesity.

The family environment exerts significant influence on children's food preferences and consumption patterns. Numerous studies have reported that young children appear to have an innate ability to self-regulate energy intake, although when parents use more control in their child-feeding strategies, children show less evidence of self-regulation (Hood, Moore, Sundarajan-Ramamurti, Singer, Cupples, & Ellison, 2000; Johnson, 2000; Johnson & Birch, 1994). Both amount of parental control over children's food quantity and type, and modeling "normative" eating behavior could be instrumental in promoting skills acquisition in children. Deficits in children's self-regulation of energy intake and childhood overweight have been linked to self-reports of parental overeating and dietary restraint (Epstein, Valoski, Wing, & McCurley, 1990); children who are able to self-regulate energy intake tend to be leaner than those who show little self-regulation.

Johnson (2000) investigated parental eating behaviors and their pre-school children's ability to self-regulate. Johnson found that children differ in this ability, and that children's habits were related to parental eating behaviors and adiposity. An intervention teaching the children to recognize internal cues resulted in improved self-regulation. The author suggested that in order to create an optimal feeding environment, parents should serve as positive role models and provide structured meals and snacks consisting of a variety of healthy choices, frequent opportunities to try new foods, and gentle, firm limit-setting regarding appropriate meal time behavior. Optimally, parents and children should share control over the child's eating, where the child is able to focus on internal cues (i.e., hunger and satiety) instead of external cues (e.g., time on the clock, cleaning the plate) to regulate energy intake.

Eating Away from the Home. Another factor that may contribute to the rising rates of overweight and obesity is a change in eating habits. Eating habits have evolved over time, from families eating together at the kitchen table, to more frequent restaurant and fast food utilization. Between 1972 and 1995, the number of commercial eating establishments grew 89% and the number of fast food restaurants grew by 147%. Concurrently, there was an increase of 200% in the frequency of fast food consumption and 150% of other restaurant food consumption (French, Story, Jeffery, 2001).

An increasing amount of household food income is spent on food away from the home. During 1992-1994, approximately 46% of family food expenditures were spent on food and beverages consumed outside of the home, with 34% of the total food dollars spent on fast food; fast food accounted for over half of meals consumed away from home (Nicklas, Baranowski, Cullen, & Berenson, 2001). Nicklas and colleagues also found

that frequency of consuming restaurant food was positively related to increased body fatness in adults, and that estimated frequency of fast food consumption was positively associated with energy intake in women. Additionally, data from the 1994-1996 Continuing Survey of Food Intake by Individuals (CSFII) support a relationship between food source and body weight. Males who reported recently consuming food away from home (i.e., restaurant, fast food) were heavier than their counterparts, and females who reported recently eating at fast food restaurants were heavier than females who did not (Binkley, Eales, & Jekanowski, 2000). Foods consumed outside the home tend to be higher in energy and fat compared to at-home foods, which may partially explain the relationship between body weight and food source (Biing-Hwan, Guthrie, & Frazao, 1999).

The increased popularity of fast, convenient food products may partly be due to an increasing number of women entering the workforce, or returning to full- or part-time work following childbirth. According to the WHO (2000), people in paid employment tend to spend less time on shopping and cooking, and may not have the time or motivation to prepare food from scratch, therefore the demand for convenience food products should increase. This increase in restaurant and fast food consumption may contribute to the increasing adiposity of adults and children.

In addition to the increase in the frequency of restaurant and fast food consumption, there have also been increases in portion sizes in both pre-packaged, ready to eat foods, and in restaurants over the past 25 years (Diliberti, Bordi, Conklin, Roe, & Rolls, 2004; French, Story, & Jeffery, 2001). When eating out, people tend to consume a greater total amount of food than when eating at home. Data suggest that presentation of

larger portion sizes tends to increase intakes in both lean and obese adults, and in children (Bradley, 1983; Edelman, Engell, Bronstein, & Hirsch, 1986; Meguid, Laviano, & Rossi-Fanelli, 1998). Larger portion sizes may also contribute to the increasing adiposity of children and adults.

In sum, a variety of different modifiable dietary factors are likely to play a role in the development of less healthy eating practices and overweight and obesity in children and adults. Parental overeating and modeling of unhealthy eating behaviors are likely to influence the development of similar unhealthy eating behaviors in children.

Furthermore, with more women entering the workforce and both parents working longer hours, fast food options have become increasingly popular and a larger proportion of meals are eaten outside of the home. The growth in the number of commercial eating establishments and an increase in portion sizes of high calorie foods, are also likely to contribute to increased rates of overweight and obesity in children.

Physical Activity. Amount of physical activity and exercise has also been cited as an important influence on weight status; however, the reduction of energy expenditure may not be the only way that physical inactivity contributes to increased levels of adiposity. Various researchers have demonstrated significant relationships between inactivity and other adverse health behaviors, such as consumption of less healthy foods, increased fat intake, and more frequent smoking (Lytle, Kelder, Perry, & Klepp, 1995; Simoes, Byers, Coates, Serdula, Mokdad, & Heath, 1995).

Physical activity is defined as “any bodily movement produced by skeletal muscle that results in a substantial increase over the resting energy expenditure” (Bouchard & Shephard, 1994). Physical activity may include occupational work, household and other

chores, and leisure-time physical activity (sports and exercise). Exercise is a category subsumed under leisure-time physical activity, which refers to a purposeful and structured activity that is undertaken in order to improve or maintain physical fitness. Current recommendations for physical activity vary widely by organization and weight goal. For example, the Centers for Disease Control and Prevention and the National Institutes of Health recommend at least 150 minutes for weight loss, the American College of Sports Medicine recommends 200-300 minutes for weight loss and maintenance of weight loss, and the Institute of Medicine recommends 420 minutes of moderate, or greater intensity, exercise per week to prevent weight gain (Kruger, Galuska, Serdula, & Kohl, 2005; Pate, Pratt, Blair, et al., 1995). Despite extensive research supporting the benefits of physical activity, including decreased risk of a variety of health conditions (e.g., cardiovascular disease, stroke, diabetes, obesity, depression, cognitive decline), the US population has grown increasingly sedentary (Rosenberg, 1998).

The U.S Surgeon General (1995) reports that over 60% of adults are not regularly active, and 25% are not active at all. Among children age 12 to 21 years, nearly half are not vigorously active on a regular basis. Part of the decline among school-age children may be due to the decline in physical education class enrollment from 42% in 1991 to 25% in 1995. Over the past several decades, occupational physical activity has also decreased. Anecdotal evidence indicates that the most common occupations have shifted from heavy manual labor (farming, factory work, masonry, carpentry, etc.) to high technology and service sector jobs that presumably require far less physical exertion. However, the level of exertion required for heavy manual labor has also probably been

reduced due to the invention and utilization of modern labor-saving devices (in French, Story, & Jeffery, 2001).

Sedentary Behavior. In addition to the general decline in physical activity, there has also been an increase in sedentary behavior during leisure time. Physical inactivity, or sedentary behavior, is defined as “ a state when body movement is minimal and energy expenditure approximates RMR (resting metabolic rate)” (Dietz, 1996). Sedentary behavior not only refers to absence of activity, but also to engaging in physically passive behaviors such as watching television, reading, driving, eating, working at a computer, and talking on the telephone. Various researchers have examined the relationship between television viewing and BMI. Increased time devoted to television viewing (including VCR, computer and internet use, video games, etc.) has been cited as an important contributor to the decrease in physical activity and the increase in sedentary behavior during leisure time (Francis, Lee, & Birch, 2003; French, Story, & Jeffery, 2001; Jeffery & French, 1998; Wardle, Guthrie, Sanderson, Birch, & Plomin, 2001). Although the relationship between television watching and weight has been widely researched, the behavioral/nutritional mechanisms by which television watching contributes to increased body weight are less clear (Francis, Lee, & Birch, 2003). Among other things, television has been cited as a contributing factor to increased snacking, higher dietary energy/fat intake, and increased inactivity. Increased snacking and energy consumption during television watching may be associated with watching commercials encouraging consumption of energy-dense foods, or with the provision of a context that encourages overeating or frequent snacking (Francis, Lee, & Birch, 2003).

Robinson and Godbey (1997) examined the ways in which Americans spend their time and found that Americans report television watching is the least necessary part of their lives, yet more time is spent watching television than any other leisure-time activity (about 40% of all free time). They also found that the number of households with more than one television set has increased from 12% in 1960, to 50% in 1980, to 76% in 2000; households with three or more sets has also rapidly grown from 15% in 1980, to 24% in 1990, to 41% in 2000. There was also a substantial increase in the average amount of time spent watching television over the past two decades. Television viewing time increased 44% between 1965 and 1985 (from 10.4 hours/week to 15.1 hours/week). In 1999, the estimated hours of television viewing for persons twelve years and above was 28 hours per week (Nielsen, 2000).

Francis and colleagues (2003) found that in both overweight and non-overweight families, girls who watched more television consumed more snacks in front of the television; girls who snacked more frequently had higher intakes of fat from energy dense foods. Also, in families where neither parent was overweight, television watching was the only significant predictor of BMI increase. Television viewing was not a direct predictor of increases in BMI in girls from overweight families. Similar results were found in adults, although the positive association between television viewing hours, energy intake, and BMI was found only in women; television viewing also predicted weight gain in high-income women (French & Jeffery, 1998). In addition, Hu and colleagues (2003) found that watching television more than 10 hours per week, combined with walking less than 30 minutes per day, resulted in increased risk of obesity and type 2 diabetes.

In sum, an increase in sedentary behaviors and a decrease in physical activity have likely contributed to an increase in overweight and obesity. Advances in technology at home and in the work place are likely related to decreased physical activity and increased sedentary lifestyles. Physical inactivity has been linked to a variety of adverse health behaviors. In particular, television watching has been associated with increased high calorie snacking and decreased physical activity in children, both of which are associated with weight gain. Coupled with a decrease in physical activity at school, television watching and general inactivity may play a significant role in the development of overweight and obesity in children.

#### Psychological and Psychosocial Variables Associated with Weight Status in Adults and Children

Several other variables, such as social support, quality of life, self-esteem, and mood, are also associated with health behaviors and weight status.

Social Support. Social support has been linked to a variety of health behaviors in adults and children. Social support can be defined as any activity that moves an individual towards goals, and can include emotional, instrumental, and financial assistance. It has been linked to a number of health outcomes, and appears to be an important determinant of success in changing health behaviors; however, negative forms of support may actually hinder the attainment of such goals. (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). Research has generally shown that social support for physical activity and healthy eating in adults is positively related to engagement in these behaviors. Wing and Jeffery (1999) examined the impact of social support on weight loss and weight maintenance on participants recruited with and without friends or family members. Participants recruited with social support received social support strategies in

addition to the standard behavioral treatment (SBT) for weight loss. The results indicated that participants recruited and enrolled with social support were less likely to drop out of treatment and were more likely to lose more weight and maintain their weight loss at follow-up. Additionally, Janisse and colleagues (2004) found a positive relationship between physical activity, social support, and mood in women.

Social support for physical activity has been examined in overweight and non-overweight children. Zabinski and colleagues (2003) investigated the role of social support as a barrier to overweight children's physical activity. They found that overweight children reported less social support and less adult support for physical activity, than their lean counterparts. Taken together, it is likely that social support is an important factor in the initiation and maintenance of healthy eating and physical activity in both parents and children.

Quality of Life. Another important variable associated with weight status, is quality of life. Quality of life stems from a global evaluation of one's life situation, in relation to a subjectively comparable standard. Even though individuals may place importance on similar life domains (e.g., health, wealth, etc.), it is likely that the weight or value assigned to each domain varies by the individual. Research has often linked quality of life with overweight and obesity. Obesity at age 16-24 years has been shown to predict quality of life seven years later by objective measures such as likelihood of marriage, education, income, and poverty rate in women. Interestingly, these decrements were similar to comparable measures in people with other chronic health problems (Gortmaker, Must, Perrin, Sobal, & Dietz, 1993). In addition, formerly morbidly obese individuals who have lost substantial amounts of weight report significant improvements

in quality of life (Stunkard & Wadden, 1992). Obesity has also been shown to have an impact on perceived quality of life, whereby, gastric bypass patients who had lost 45kg (100 lbs) or more indicated that they would pass up multimillionaire status if it also required them to be obese and would rather be an amputee, blind, deaf, dyslexic, or diabetic than return to their formerly obese status (Rand & MacGregor, 1991). There is also a general consensus that weight loss, including small losses, is associated with improvements in quality of life (Knowler, et al., 2002).

Several researchers have examined similar quality of life variables in children. Schwimmer and colleagues (2003) investigated health-related quality of life in children, and found that obese children and adolescents reported significantly lower quality of life compared with their healthy peers. Interestingly, obese children and adolescents reported similar health-related quality of life as children and adolescents diagnosed with cancer. Additionally, even children at risk for becoming overweight (BMI 85<sup>th</sup>-94.9<sup>th</sup> percentile) reported lower physical functioning than normal weight children, and overweight children scored significantly lower on several health-related quality of life domains (Friedlander, Larkin, Rosen, Palermo, & Redline, 2003). Although weight appears to have a significant impact on quality of life in both adults and children, it is unclear whether the quality of life of parents is related to the weight or quality of life of their children.

Self-Esteem. The association between self-esteem and weight in adults and children is less clear. Self-esteem can be defined as an overall evaluation, or global measure, of one's worth or value. There are mixed findings in the literature, with some researchers finding similar levels of self-esteem for obese and nonobese children, and

others suggesting significantly lower levels of self-esteem for obese children (Epstein, Klein, & Wisniewski, 1993). Pierce and Wardle (1997) found that overweight children have lower general self-esteem than children who are not overweight. Additionally, overweight children's self-esteem tends to decrease over time from childhood to adolescence, whereas, the self-esteem of the population of children as a whole tends to remain stable over time (Muldoon, 2000). Several researchers have found that gender is related to self-esteem, whereby, girls tend to have lower self-esteem than boys, both in the overweight and normal weight population (Israel & Ivanova, 2002; Kostanski & Gullone, 1998). Differences in actual and perceived weight may partially account for some of the mixed findings investigating weight and self-esteem. Miller and Downey (1999) found that overweight and obese individuals have lower self-esteem, but that the relationship was actually stronger in individuals who perceived themselves as overweight than for individuals who actually were overweight.

Depression. Finally, the role of depression in the development and persistence of obesity in children and adolescents has been widely examined; however, less research has examined the causal direction of this relationship. Several researchers have found that childhood depression is associated with increased BMI in adulthood, after controlling for socioeconomic factors, which suggests that depression may predispose obesity as well as the other way around (Goodman & Whitaker, 2002; Pine, Goldstein, Wolk, & Weissman, 2001). Earlier research proposed the unidirectional view, which posits that social stigmatization of obesity leads to feelings of shame, guilt, and embarrassment, which may lead to depression. However, recent research has utilized longitudinal data to assess the relationship and the direction of the depression-obesity relationship more thoroughly.

Goodman and Whitaker (2002) found that having depressed mood at baseline independently predicted obesity at 1-year follow-up in normal, overweight, and obese adolescents after controlling for BMI z score at baseline, age, race, gender, parental obesity, number of parents in the home, and family socioeconomic status. Stunkard, Faith, and Allison (2003) used moderator and mediator analysis to examine the relationship between obesity and depression. They found that major depression in adolescence predicted a greater body mass index in adult life, than for those individuals who had not been depressed. A positive relationship was found in women between obesity and major depression; whereas, an inverse relationship was found in men. Additionally, adverse childhood experiences promoted development of obesity and depression and, most likely, their co-occurrence.

In sum, a variety of psychosocial and psychological variables are related to weight status and health behaviors of adults and children. Generally, increased weight status is associated with poorer self-esteem, decreased quality of life, and increased depression, although the causal direction of the relationship is not always clear. Furthermore, social support appears to play an important role in the initiation, engagement, and maintenance of health behaviors in children and adults. The relationship between psychosocial and behavioral variables in parents, and the development of overweight in their children is an area in need of further study.

#### Existing Research on Parental/Caregiver Influence

There is substantial cross-sectional and longitudinal research testing the relationship between various psychological and behavioral variables, and the weight status of the same individuals, but there is far less research testing the relationship

between parental and caregiver variables and similar variables in their children. Previous research has found that parental eating habits, smoking status, education, physical activity level, and social support are related to children's BMI, physical activity level, and dietary habits. Mothers' child-feeding practices have been found to directly relate to children's food preferences, energy intake, ability to self-regulate food, and body weight (Spruijt-Metz, Lindquist, Birch, Fisher, & Goran, 2002). Several researchers have found that parents who display high levels of disinhibited eating, especially when coupled with dietary restraint, may foster the development of excess body fat in their children. Also, parents who overly control their children's eating patterns at a young age, tend to have children who are unable to self-regulate energy intake (Hood, Moore, Sundarajan-Ramamurti, Singer, Cupples, & Ellison, 2000; Johnson & Birch, 1994). In addition, high-energy intake of both parents is associated with children's overweight status (Mirmiran, Mirbolooki, & Azizi, 2002). Children of nonsmokers and more highly educated mothers tend to consume a diet that conforms more closely to the current recommendations for healthy eating (Rogers, Emmett, & ALSPAC, 2003), and children of fathers who currently smoke are more likely to be overweight (Hui, Nelson, Yu, Li, & Fok, 2003). Both social support for children's physical activity and explicit modeling of physical activity by parents are associated with higher levels of physical activity in children. Also, children of active mothers or fathers are significantly more likely to be active as children, but if both parents are active the likelihood of the child being active increases dramatically (Davison, 2003; Moore, Lombardi, White, Campbell, Oliveria, & Ellison, 1991; Trost, Kerr, & Pate, 2001). Finally, children of parents with low levels of physical

activity and high levels of dietary intake are at increased risk of becoming overweight and obese than children from “non-obesigenic” families (Davison & Birch, 2002).

Parental BMI has also been linked to childhood overweight and food consumption. Several researchers have found a positive relationship between maternal obesity and dietary fat intake in children, and children with the strongest preferences for high-fat foods and the highest total fat intakes tend to have heavier parents (Fisher & Birch, 1995; Nguyen, Larson, Johnson, & Goran, 1996). Extensive research has found a link between parental overweight and obesity and childhood overweight and eventual obesity (Fogelholm, Nuutinen, Myöhänen, & Säätelä, 1999; Safer, Agras, Bryson, & Hammer, 2001).

In summary, there have been several cross-sectional studies examining the impact of parental characteristics and behaviors on specific anthropometric and behavioral variables in children, and several longitudinal studies predicting weight status, BMI, and risk factors of disease in children over time, but there is a paucity of research that has identified (cross-sectionally) and then tested (longitudinally) significant parental variables as predictors of weight change over time, of children enrolled in an intervention designed to prevent weight gain. Additionally, of the existing longitudinal research, none has comprehensively examined all of the variables in the current study, and none to date has utilized digital food photography to capture energy intake in children.

### Primary Aims

The current study was an ancillary study to the Wise Mind project, a larger school-based weight gain prevention program for children that was funded by the NIH, and received IRB approval in February, 2004 (see Appendix A). In this study, the

participants were a sub sample of the Wise Mind study sample of children, and their parents. The primary aim of this study was to test whether parental BMI, psychosocial, and environmental variables were associated with psychosocial and behavioral variables in children at baseline, and whether these variables longitudinally predicted weight change of children enrolled in a two-year intervention for weight gain prevention or alcohol, drug, and tobacco education. More specifically, variables in the home environment (i.e., parental eating habits, physical activity, sedentary behavior, social support for eating and exercise, and parental weight status) were tested as correlates of the weight, mood, activity level, energy consumption, food selection, and eating attitudes of children at baseline, and subsequently as predictors of weight change over the course of two years.

Examination of the relationship between psychosocial variables and change in weight change over time is important. A vast majority of longitudinal research has examined biological predictors of change (e.g., insulin resistance, leptin levels, hormones), but few studies have identified environmental variables that may play a role in the effectiveness of treatment, and could be useful to increase the effectiveness of existing and future approaches to weight gain prevention in children. Other researchers have attempted to identify psychosocial predictors of adiposity and various other behavioral variables (Davison & Birch, 2002; Hood, Moore, Sundarajan\_Ramamurti, Singer, Cupples, & Ellison, 2000; Locard, Mamelle, Billette, Miginiac, Munoz, & Rey, 1992; Strauss & Knight, 1999), but to date, research identifying specific environmental correlates of weight that also predict weight change over time, is lacking. Further, examination of variables in the family environment (e.g., eating habits, activity level,

social support), in addition to the school environment, could provide useful information that could be used in future health promotion efforts. For example, if the current study found that certain variables in the home environment were associated with weight in children at baseline, and that these variables predicted weight change over time, the next step would be to design a program incorporating modification of the home environment, in addition to the school environment, into the program design. In sum, in addition to modifying the school environment to promote health behaviors, it was also important to examine the behaviors of a primary caregiver in order to determine whether the type of home environment (i.e., one promoting healthy or unhealthy behaviors) had a direct influence on the weight of children, and whether this environment could potentially influence the effectiveness of a school-based intervention for weight gain prevention.

### Study Hypotheses

The specific hypotheses of the current study were:

It was hypothesized that parental BMI, psychosocial, and behavioral variables would be associated with BMI percentile, psychosocial, and behavioral variables in children at baseline:

Hypothesis 1: Heavier, less physically active parents would be more likely to have a heavier, less physically active child, who ate more total calories during school lunch.

Hypothesis 2: Parents with a higher BMI, less social support, and lower quality of life would be more likely to have a child with a higher BMI percentile and lower self-esteem.

Hypothesis 3: Children with higher BMI percentiles, who reported higher food preoccupation, lower dieting, ate more total calories at lunch, with a higher percentage of calories from fat would be more likely to have a parent who endorsed less healthy eating

patterns (more sweets, less healthy restaurant choices, eat fattier meat) and reported lower social support for healthy eating.

Hypothesis 4: Heavier, less active, more sedentary children would be more likely to have a heavier, less active parent, who watched more television.

Hypothesis 5: It was hypothesized that parental BMI, physical activity, social support, quality of life, and dietary habits would predict weight change of children, over the course of two years.

## METHODS

### Participants

Parents/primary caregivers who elected to complete the questionnaires on the Wise Mind project's website, and their children who were participants in the Wise Mind program for weight-gain prevention and alcohol/drug/tobacco (A/D/T) education, were participants in the current study. Five schools in the Baton Rouge Catholic Diocese school system volunteered to participate in the Wise Mind program. Four of these schools were randomly assigned to either the healthy eating and exercise (HEE) condition or the Alcohol/Drug/Tobacco prevention condition, and one predominantly African-American school was assigned to the HEE condition. Since the fifth school was not randomly assigned to a treatment condition, it was not included in the current study. Consequently, there were two schools in the HEE condition and two schools in the A/D/T condition.

Participants for the current study were recruited exclusively via e-mail and flyers sent out to the children at school. An example of one of these flyers appears in Appendix B. Of the participants in the four randomly assigned schools in the larger Wise Mind study (N=666), only 53.5% (n=356) of their guardians provided an e-mail address on the consent form. The child's guardian had the option to provide an e-mail address on the study consent form if they completed it in the Fall, but not if they completed it earlier in the year (i.e., the e-mail address option was not added until the Fall). Figure 1 illustrates the process whereby the current study sample was obtained.

This level of response is typical for online survey data (Jones & Pitt, 1999; Kaplowitz, Hadlock, & Levine, 2004). If you were to consider the total sample possible, including those who were not accessible via e-mail, twenty-three percent of the entire

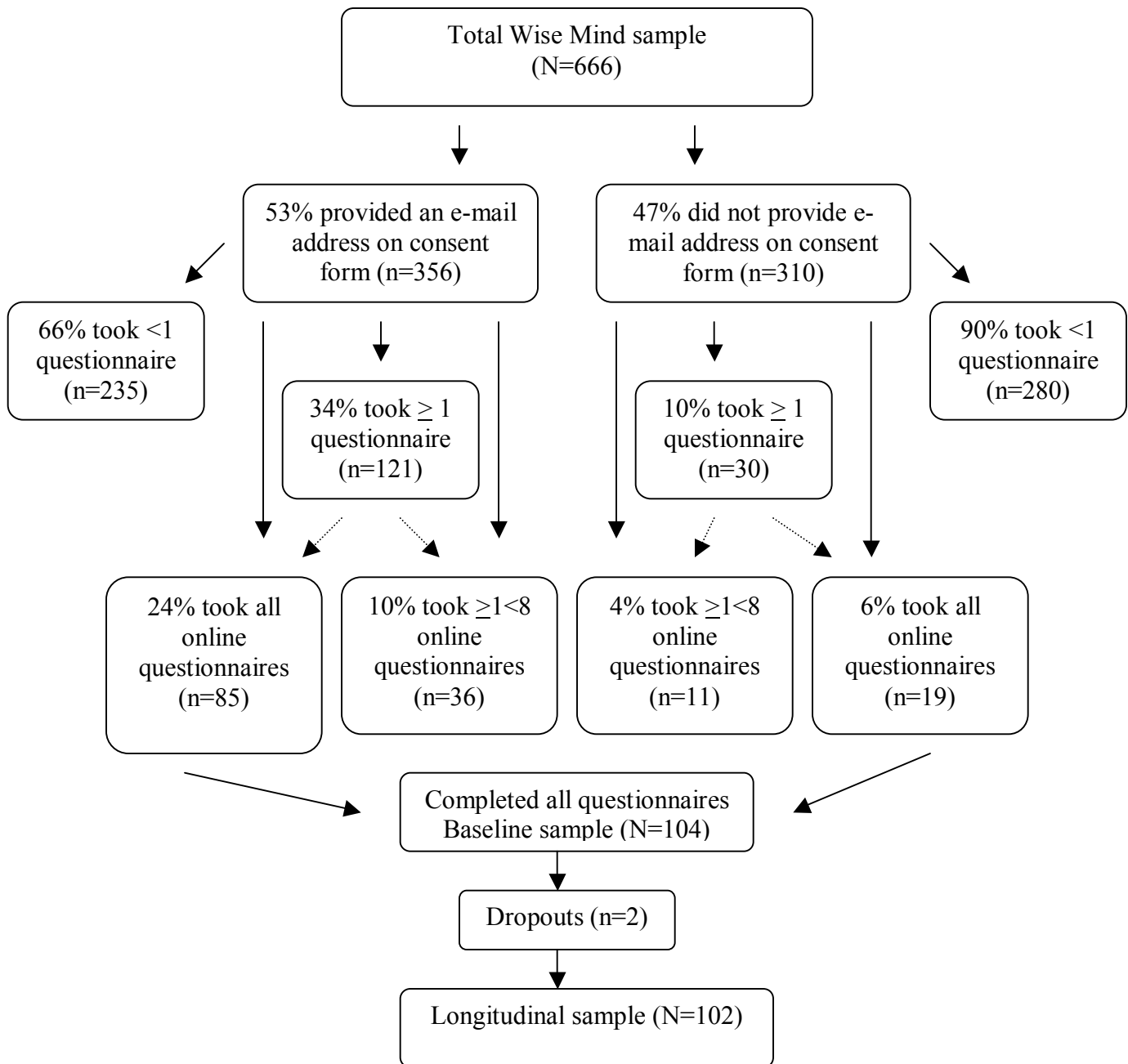


Figure 1. Flow chart of participant selection

sample took some of the assessments (n=151) and sixteen percent took all of them (n=104). However, because e-mail was the primary mode of contact with potential participants, only those adults who provided e-mail addresses were considered potential participants for the current study (n=356). If participants who did not provide their e-mail addresses are excluded (n=310), the response rates were thirty-four percent and twenty-four percent, respectively. The baseline sample consisted of 104 adults who elected to complete the questionnaires on the Wise Mind website, and their children (n=104). Thirty-two parents with children in the HEE group and seventy-two parents of children in the A/D/T control group completed the measures. Adult participants were primarily Caucasian (92.3%), female (88.5%), between the ages of 36-45 (62.5%), married (92.3%), college graduates (49.0%), employed full-time (57.7%), with a household income of \$70,000 or greater (67.3%).

As it was possible that parents who elected to take the questionnaires possessed different characteristics than those who did not elect to take the questionnaires, a preliminary internal validity check was conducted to investigate the possibility of a selection bias. The presence of a selection bias would indicate that the study sample was not representative of the target population of parents. In order to test for a selection bias, a Chi-Square analysis was conducted for ethnicity and sex, and a MANOVA was conducted on questionnaire completion status: questionnaire completers (i.e., parents who took all eight questionnaires), partial completers (i.e., took between one and seven), and questionnaire non-completers (i.e., didn't take any of the questionnaires), and the following children's variables: (1) age, (2) BMI percentile, (3) body fat percentage, (4) depression, (5) self-esteem, and (6) eating attitudes. Results from these analyses indicated

that a selection bias was not present for any of these variables: sex:  $\chi^2(2, N = 653) = 0.18, p >.05$ ; ethnicity:  $\chi^2(2, N = 653) = 2.86, p >.05$ ; age:  $F(2, 647) = 2.22, p >.05$ ; BMI percentile:  $F(2, 647) = 0.85, p >.05$ ; percentage body fat:  $F(2, 647) = 1.74, p >.05$ ; depression:  $F(2, 647) = 0.33, p >.05$ ; self-esteem:  $F(2, 647) = 1.14, p >.05$ ; eating attitudes: overconcern with body size and shape:  $F(2, 647) = 0.29, p >.05$ , dieting:  $F(2, 647) = 1.37, p >.05$ ; food preoccupation:  $F(2, 647) = 2.16, p >.05$ ; social pressure for weight gain:  $F(2, 647) = 0.50, p >.05$ ; vomiting:  $F(2, 647) = 0.48, p >.05$ ; caloric awareness and control:  $F(2, 647) = 0.69, p >.05$ ; and total ChEAT score:  $F(2, 647) = 0.62, p >.05$ .

#### Treatment Program – The Wise Mind Program

The current study was a sub-study of the Wise Mind project, which involved two school-based environmental approaches for the prevention of unhealthy behavior in children enrolled in grades two through six. The program for the experimental group (HEE) targeted weight gain prevention (inappropriate weight gain) and the program for the control group (A/D/T) targeted the prevention of alcohol/drug/tobacco abuse and use.

#### Intervention Targets for the Wise Mind Program

Energy and Nutrient Intake. The following targets were chosen for children in the HEE group, in terms of energy and nutrient intake: (1) Increased fruit, vegetable, and grain consumption was chosen as a target for behavior change, based on research which suggests that people do not generally consume adequate amounts of fruits and vegetables (Li, Serdula, Bland, Mokdad, Bowman, & Nelson, 2000), and that consumption of grains, especially at breakfast, can have beneficial effects on health (Nicklas, O'Neill, & Berenson, 1998); (2) decreased intake of dietary fat and sweets, due to the consensus that

a diet with no more than 30% of total energy from fat is ideal, and that reduced dietary fat intake has been a frequent target of obesity prevention programs. For the purposes of this study, total kilocalories consumed, percentage of total kilocalories from fat, types of foods selected, and eating attitudes of the children were the variables of interest.

Additionally, several parental variables were examined including (a) dietary habits; (b) restaurant eating habits, because there is an abundance of research linking eating out with increased energy intake and adiposity; and (c) social support for healthy eating.

Physical Activity. Reduction in sedentary behavior and increased lifestyle physical activity were chosen as behavioral targets for physical activity in the HEE group. These variables were chosen due to a consensus that the increase in overweight and obesity may stem, in part, from increased sedentary behaviors, e.g., television watching, video games, use of computers, etc. (Dietz, 2001; French, Story, & Jeffery, 2001). On the whole, the targets for the Wise Mind weight gain prevention/healthy eating and exercise (HEE) program focused on the modification of energy intake and expenditure.

### Procedure

The Wise Mind Environmental Intervention. The Wise Mind project involved environmental manipulations in the school environment. In the HEE group, menus and recipes for the school cafeterias were evaluated and modified to increase the availability of grains, fruits, and vegetables and to decrease the availability of fried foods and foods high in dietary fat and sugar. Menu boards were also created to describe the foods served and stickers were placed next to the Wise Mind foods (i.e., fruits, vegetables, grains, etc.). Each morning, the school Principal announced the Wise choices for the day, and

teachers sent home menus including indicators of the Wise choices for each school meal. In addition, health teachers were trained to present information about healthy eating, exercise, and the prevention of disease. Teacher training was utilized to ensure that valid information about healthy habits was presented and the students and faculty would be more likely to understand and follow the environmental cues. Goals for increasing physical activity and decreasing sedentary behaviors were also set up and posters promoting these concepts were positioned in appropriate places around the schools. Teachers were encouraged to develop more opportunities for safe physical activities and to encourage students to take advantage of these opportunities. To make physical activity more likely during breaks and recess, bins containing indoor and outdoor materials and equipment for physical activity (e.g., a variety of balls, bats, jump rope) were provided to each HEE school.

In the A/D/T control schools, the primary focus was on modifying expectancies and changing children's beliefs and attitudes about the use and abuse of alcohol, tobacco, and drugs; there were not, however, any environmental manipulations related to eating or physical activity. The same data were collected from the children and parents in the A/D/T condition as in the HEE condition.

### Data Collection

School Assessments. Four periods of assessment in the schools were used to test the hypotheses of the current study. Questionnaire data from both the A/D/T and the HEE school children were utilized at baseline, and anthropometric data were utilized at baseline and at twenty-four months. At each data collection period, the children took a series of questionnaires, and had their height, weight, and body impedance measured on

the Pennington metabolic bus. During each assessment period, the plate of each study participant was photographed before and after eating lunch, using a digital video camera.

Internet. Both the children participating in this school-based project and their parents had access to a website, which they could access on any computer with their own logon identification and password. The website contained specific sections designed for parents, teachers, children, and the family as a whole. Each parent and child had access to one of two websites containing a wealth of information and activities related to their specific group, (i.e., healthy eating and physical activity or alcohol, drugs, and tobacco). Before parents/caregivers were able to take any of the assessments on-line, they were directed to a page with a description of the study. They were then required to click a button signifying their consent, in order to gain access to the questionnaires (see appendix B). The questionnaires for the current study were posted under the “Family Activities” component of the website on both the HEE and A/D/T websites. Participants were awarded an on-line gift certificate ranging in value from \$5-10, for completion of all of the questionnaires within the designated two-month window. Parents were only able to take each questionnaire once, and after two months passed, the questionnaires were removed from the website and were no longer available.

Questionnaires. For the purposes of this study, the following questionnaire instruments were posted on the Wise Mind website for the parents: the Satisfaction With Life Scale (SWLS: Diener, Emmons, Larsen, & Griffin, 1985), the Sallis Social Support Surveys for Diet and Exercise Behaviors (Sallis, Grossman, Pinski, Patterson, & Nader, 1987), a demographics instrument, the Paffenbarger Physical Activity Questionnaire

(Taylor et al., 1978), the Diet Habit Survey (Connor, Gustafson, Sexton, Becker, Artaud-Wild, & Connor, 1992), and few questions about television habits.

The Satisfaction With Life Scale (SWLS: Diener, Emmons, Larsen, & Griffin, 1985) is a psychometrically sound 5-item questionnaire designed to assess the judgmental component of subjective well-being, or quality of life. Items are scored using a 7-point likert scale; scores range from 5-35 with higher scores indicating greater life satisfaction. This scale possesses adequate internal consistency and test-retest reliability ( $r$  values = .82-.89) and correlates sufficiently ( $r$  values  $> .50$ ) with longer measures of subjective well-being.

The Sallis Social Support Surveys for Diet and Exercise Behaviors (Sallis, Grossman, Pinski, Patterson, & Nader, 1987) is designed to assess social support specific to health-related eating (e.g., family and/or friends encouraged me not to eat unhealthy foods) and exercise (e.g., family and/or friends exercised with me). The first ten items of the questionnaire make up the Social Support for Eating Habits Survey. This section is scored separately for family and friends according to (1) Encouragement and (2) discouragement. The next thirteen items of the questionnaire make up the Social Support and Exercise Survey. This section is also scored differently for family and friends according to (1) Family Participation, and (2) Friend Participation; (3) Family Rewards and Punishment is only scored for family, and is an optional scale. The Family Encouragement and Family Participation scales used in the current study have acceptable test-retest reliability ( $r$  values = .77-.86) and internal consistency ( $r$  values = .61-.91).

The Demographics Instrument is a brief self-report survey designed to assesses a variety of variables including age, sex, ethnicity, education, household income, height,

weight, employment status, perception of health and weight status, and the presence of overweight and disease in family members. BMI was calculated from self-reported height and weight. The presence of overweight family members was determined from a forced choice item, which allowed the participant to respond by choosing which (if any) of their family members were overweight.

The Paffenbarger/Harvard Alumni Questionnaire (Paffenbarger, Blair, Lee, & Hyde, 1993) is an instrument designed to measure leisure time and occupational activity, and can be used to assess changes in exercise over time. This 8-item instrument uses Met scores (ratio of work metabolic rate to resting metabolic rate), which are predefined for a wide range of activities, to calculate approximate energy expenditure per week. One MET is defined as the energy expended while sitting quietly, which in the average adult is approximately 3.5 ml of oxygen per kilogram of body weight per minute (Montoye, Kemper, Saris, & Washburn, 1996). Weekly energy expenditure (Kcal/week) is calculated from blocks walked, stairs climbed, and amount of moderate and vigorous weekly activity. Activities are classified as light (< 3 METS), moderate (3-5 METS), and vigorous ( $\geq$  6 METS), and intensity of leisure-time physical activity is classified as light (5 kcal/min), moderate (7.5 kcal/min), and vigorous (10 kcal/min). For the purposes of this study, self-perception of physical activity habits, minutes of moderate activity engaged in each week, and minutes of weekly sedentary behavior (i.e., sitting activities) were determined.

The Diet Habit Survey is a 40-item self-report instrument designed by the nutrition staff at Oregon Health Sciences University. This instrument assesses 9 domains of eating habits and behaviors over the past month. These domains include the following:

1) meat, fish, and poultry; 2) dairy products and eggs; 3) fats and oils; 4) sweets and snacks; 5) grains, beans, fruits and vegetables; 6) beverages; 7) salt; 8) restaurants and recipes; and 9) seafood. This measure can be used to track changes in eating habits over time and has adequate test-retest reliability (0.88-0.95) (Becker, Connor, Sexton, & Connor, 1990). Research has also shown that changes in scores on this questionnaire after dietary intervention are correlated with changes in plasma cholesterol levels (Connor, Gustafson, Sexton, Becker, Artaud-Wild, & Connor, 1992).

The Television Habits Questionnaire is a brief 3-item questionnaire designed to assess the average number of hours per week of television viewing (including video and DVD usage), the number of televisions in the home, and whether there is a television set located in the bedroom.

The following children's questionnaires from the Wise Mind project, were used in the current study: The Self-Administered Physical Activity Checklist (SAPAC) (Sallis, et al., 1996), the Child Depression Inventory-Short Form (Kovacs, 1992), the Rosenberg Self-Esteem Scale (Rosenberg, 1965), the Children's Eating Attitudes Test (Maloney, McGuire, Daniels, & Specker, 1989), and the Physical Activity Social Support scale (Edmundson et al., 1996).

The Self-Administered Physical Activity Checklist (SAPAC: Sallis, et al., 1996) is a self-report one-day recall of physical activity and select sedentary activities using a checklist format. The checklist consists of 24 physical activities, space for listing 3 "other" activities, and a section for reporting TV/video viewing and video/computer game playing. Children report the number of minutes spent in each of the 24 physical activities during three periods of the previous school day (i.e., before school, during

school, and after school). Self-reported data from the SAPAC are summarized according to the following: (1) minutes of sedentary activities, (2) number of physical activities engaged in, (3) minutes of moderate to vigorous physical activity, and (4) minutes of vigorous physical activity. The SAPAC was validated with heart rate monitoring, and yielded statistically significant correlation coefficients ( $r = 0.57$ ,  $p < 0.001$ ). For the purposes of this study, the SAPAC was used to measure sedentary behavior in children.

The Godin (Godin & Shepard, 1985) was used to assess leisure time physical activity in children. The Godin is a simple 4-item self-report physical activity recall measure, designed to assess the average number of days per week spent engaging in a) vigorous exercise (heart beats rapidly), b) moderate exercise (not exhausting), and c) mild exercise (minimal effort) for at least 15 minutes. This questionnaire also assesses how many days per week, on average, the individual engages in regular activity during leisure time, long enough to work up a sweat (heart beats rapidly). A total score is derived by multiplying the frequency of each category by a standard metabolic equivalent (Vigorous x 9, Moderate x 5, Light x 3). Reliability and validity of this measure have been shown to be adequate (Koo & Rohan, 1998; Sallis et al, 1993) with children as young as the 4<sup>th</sup> grade. The Godin was used to assess total physical activity in children.

The Child Depression Inventory-Short Form (CDI-S: Kovacs, 1992) was used to assess the subjective levels of depressed mood in children. The CDI-S is a 10-item self-report scale designed to measure overt symptoms of depression in children. The complete CDI is a well-validated measure with acceptable levels of internal consistency ( $r$  values = .70-.86) and test-retest reliability over a one-month interval ( $r = .82$ ). The CDI-S correlates well with the full inventory ( $r = .89$ ). The CDI and the CDI-S are the most

frequently used self-report measures of depression in children (Fristad, Emery, & Beck, 1997).

The Rosenberg Self-Esteem Scale (Rosenberg, 1965) was utilized as a measure of global self-esteem in children. The Rosenberg is a 10-item self-report scale designed to measure children's sense of self-worth. Each item consists of a statement, and respondents rated the extent to which they agreed or disagreed with statements such as "On the whole, I am satisfied with myself" and "I certainly feel useless at times". Total scores range from 0 to 10, with higher numbers indicating a more positive global self-esteem. The Rosenberg has good internal ( $r = .77$ ) and test-retest ( $r = .82$ ) reliability.

The Children's Eating Attitudes Test (Maloney, McGuire, Daniels, & Specker, 1989) is a 26-item questionnaire designed to measure eating and weight control habits in children. Each item on the ChEAT was rated according to a 6-point likert scale ranging from "never" to "always". The factor structure of the ChEAT has recently been questioned, and subsequent analyses suggested and confirmed a slightly different factor structure (Anton and colleagues, in submission). This version of the ChEAT is made up of the following six factors: (1) Overconcern with weight and shape, (2) Dieting, (3) Food preoccupation, (4) Social pressure for weight gain, (5) Vomiting, and (6) Caloric awareness and control. The CHEAT is a reliable and valid measure for measuring eating disorder symptoms in children.

The Physical Activity Social Support scale (PASS; Edmundson et al., 1996) is an 18-item measure designed to assess perceived support for physical activity. Support from family, teachers, and friends is assessed in a yes-no format, and positive and negative social support are derived.

Body Mass Index (BMI): The height and weight of each child was measured in the Pennington metabolic bus, in normal school clothing, without shoes and socks. Height was measured using a stadiometer, and weight was measured using Tanita (model TBF-310) scales that measure body weight and body composition using a laptop computer. Height and weight was converted into BMI ( $\text{kg}/\text{m}^2$ ), which is the standard height/weight ratio for expressing the body mass of an individual (Bray, 2002). BMI increases with age in growing children (Harsha & Bray, 1996), therefore, BMI was converted to or interpreted in the context of the norms derived from the CDC growth charts, in order to correct for the instability of BMI values during childhood and adolescence. At risk for becoming overweight is defined as a BMI above the 85<sup>th</sup> percentile and overweight is defined as a BMI above the 95<sup>th</sup> percentile for age, sex, and height.

School Lunchtime Energy Consumption and Food Selection: Digital food photography was utilized to record food selection (i.e., type and quantity of food selected by each child) and plate waste (i.e., amount and type of food left on the plate at the end of the lunch period). The plate of each participant was photographed using a digital video camera at a fixed distance from the food, both before and after eating. The difference between food selection and plate waste defined food intake. The digital cameras were connected to computers equipped with a video capture board. Prior to each measurement, standard portions of the meal that was going to be served was photographed and used as a reference, so that the food composition could be analyzed using the Moore's Extended Nutrient database (MENu; Pennington Biomedical Research Foundation). Several dietitians independently viewed reference photographs and digital photographs of food

selection and plate waste, simultaneously on a spilt screen, in order to estimate the total food consumption of each child. The nutrient intake was then analyzed using the PBRC nutrient database, which uses USDA data from the Continuing Survey of Food Intakes by Individuals, 1994-1996, 1998. Servings of fruits and vegetables and servings of desserts and snacks were also analyzed. The digital food photography method is a valid and reliable approach; estimates of portion sizes related to food selections, plate waste, and food intake, using the digital food photography method, are highly correlated with actual food weights ( $r = 0.89-0.97$ ) (Williamson, et al., 2003).

### Statistical Analyses

An alpha level of .05 was used for the canonical correlations and for the multiple regression analyses, and missing questionnaire data were imputed using the mean of other participants. For consumption data, if the child was missing only one day of data, the third day was imputed based on the mean of the previous two days. Six students were missing all three days of consumption data and were thus removed from the consumption analyses. Missing anthropometric data at the final measurement period (year 2) were replaced with the last observation carried forward (18-months). All statistical analyses were conducted using Statistical Analysis Software (SAS version 8.2 SAS Institute Inc., Cary, NC).

To test for associations between variables in children and parents at baseline, four canonical correlation analyses were utilized to test the first four hypotheses, which were cross-sectional in nature. Canonical correlation allows for the simultaneous analysis of relationships between two sets of variables. Sets of variables on each side are combined to produce, for each side, a predicted value that has the highest correlation with the

predicted value on the other side (Tabachnick & Fidell, 2001). Table 1 lists the variables and groupings for each canonical correlation.

Table 1. Variate Sets for Canonical Correlation Analyses

Analysis	Set 1 (Child)	Set 2 (Parent)
1	BMI percentile	BMI
	Physical activity	Income
	Calorie consumption	Sedentary behavior
		Duration of physical activity
2	Mood	Quality of life
	Self-esteem	Social support for physical activity
	BMI percentile	BMI
3	BMI percentile	Meat choice (% fat)
	Food preoccupation	Social support for healthy eating
	Dieting	Restaurant choices
	Calorie consumption	BMI
	Calories from fat (%)	Sweet consumption
4	BMI percentile	BMI
	Physical activity	Television watching (hours/week)

(table continued)

	Sedentary behavior	Duration of physical activity
		Social support for physical activity
5	BMI percentile	BMI
	Social support for physical activity	View of own physical activity
	Physical activity	Duration of physical activity
	Sedentary behavior	Social support for physical activity
	Calorie consumption	
6	BMI percentile	BMI
	Overconcern with weight and shape	Meat choice (% fat)
	Dieting	Duration of physical activity
	Calorie consumption	
	Fruit servings	
	Dessert servings	

After completion of the Wise Mind study, an ANOVA was run to test whether children in the HEE group lost significantly more weight than children in the A/D/T group and whether weight change differed by school. There was not a significant difference between the two groups or four schools in the current sample or the larger Wise Mind sample,  $p > .05$ . As there was no treatment effect for the larger Wise Mind intervention (i.e., no difference in weight change between HEE and A/D/T groups) the sample was analyzed as a whole for the final analyses (N=102). Stepwise multiple

regression analysis was utilized to test parental variables as predictors of weight change over the course of two years. The number of participants included in the analysis met the recommended criteria of being 10 times the number of variables included in the analysis (Hair, Anderson, Tatham, & Black, 1998; Nunnally, 1967).

Stepwise multiple regression analysis was chosen because it can be used to predict weight change longitudinally from a linear combination of parental/caregiver variables. In the current study, this procedure was utilized to predict weight change (BMI percentile) over the course of two years. A forward stepping procedure was utilized ( $p < .15$  to enter and remove), with BMI percentile change over two years as the dependent variable. The following variables were entered as predictors of children's weight change at two years: child's baseline BMI percentile, child's age, parent baseline BMI, spouse weight status, parental minutes of moderate physical activity, parent's sedentary behavior, parent's TV hours per week, parental sweets/snack consumption, parent's restaurant choices, parental social support, and parent's satisfaction with life.

#### Secondary/Exploratory Analyses

Following completion of the primary baseline analyses mentioned above, two additional canonical correlation analyses and a series of bivariate correlations were run to test for associations between combinations of significant variables from each of the previous canonical analyses (see Table 1.). These analyses were exploratory in nature and were conducted to test for association between variables that may be useful for future studies.

## RESULTS

The baseline sample consisted of 104 children and adults, but as two children from the A/D/T group withdrew from the study prior to the third measurement period (i.e., before month 18), they were excluded from the longitudinal analyses. Consequently, the baseline sample for the current study consisted of 32 children and parents/caregivers in the HEE condition and 72 children and parents/caregivers in the A/D/T condition, and the sample for the longitudinal data analyses consisted of 32 HEE and 70 A/D/T families. As there was not a significant effect of Wise Mind treatment group (A/D/T vs. HEE) on weight change in the larger Wise Mind study, the sample for the current study was analyzed as a whole, and from this point forward, there is no distinction made between treatment groups.

Children were primarily Caucasian (95.2%), below the 85<sup>th</sup> percentile for BMI (61.5%), and approximately half of the sample was male (52.9%). The mean age for the sample of children was 9.52 years (S.D. =1.48). As mentioned earlier, adult Participants were primarily Caucasian (92.3%), female (88.5%), normal weight (49.0%), between the ages of 36-45 (67.5%), married (92.3%), college graduates (49.0%), employed full-time (57.7%), with a household income of \$70,000 or greater (67.3%). The descriptive data for the children and their participating parents/caregivers appear in Tables 2 and 3.

Table 2. Baseline Characteristics of Children (N=104)

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Variable	Mean	(sd)
Age (month)	114.26	(17.76)

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(table continued)

Sex	1.47 (0.50)
Race	1.05 (0.21)
BMI%	62.95 (33.30)

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Sex: 1=male; 2=female; Race: 1=Caucasian; 2=African-American; 3= Other

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Table 3. Baseline Characteristics of Parents/Caregivers (N=104)

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Variable	Mean (sd)
Age group	3.09 (1.31)
Sex	1.88 (0.32)
Race	1.16 (0.66)
BMI	25.91 (5.17)
Education	4.61 (0.84)
Income	7.20 (1.36)
Marital	1.11 (0.42)
Employment	1.87 (1.21)

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Age group: 1=18-25 yrs; 2=26-35yrs; 3=36-45yrs; 4=46-55yrs; 5=56-65yrs; 6= 66yrs+;

Sex: 1=male; 2=female; Race: 1=Caucasian; 2=African-American; 3=Hispanic; 4=

(table continued)

Asian; 5=other; Education: 1=grade school; 2=some high school; 3=graduated high school/GED; 4=1-3 years college or business/technical school; 5=college graduate; 6=postgraduate degree; Income: 1= <\$10,000/yr; 2=\$10,000-19,999/yr; 3=\$20,000-29,999/yr; 4=\$30,000-39,999; 5=\$40,000-49,999/yr; 6=\$50,000-59,999/yr; 7=\$60,000-69,999; 8=\$70,000+; Employment: 1=full-time; 2=part-time; 3=retired; 4=unemployed; 5=medical disability

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The results of the canonical analyses testing the first four hypotheses are discussed first, followed by exploratory baseline analyses, then the results of the analysis to test the fifth hypothesis are discussed, followed by the final exploratory analyses.

#### Primary Hypotheses

Cross-sectional Analyses. It was predicted that parental BMI, psychosocial, and behavioral variables would be associated with BMI percentile, psychosocial, and behavioral variables in children at baseline. This main hypothesis was broken down into smaller more specific hypotheses, so that each specific construct could be tested.

The first of these hypotheses postulated that heavier, less physically active parents would be more likely to have a heavier, less physically active child, who ate more total calories. The results of the first canonical correlation analysis to test this hypothesis are presented in Table 4. The first canonical correlation  $R = 0.43$  ( $p < .01$ ), explained 18% of the sample variation in the variable sets of health behaviors and demographic factors. The subsequent canonical correlations were not statistically significant. The standard coefficients represent the weights of the linear combination of the parent variables or the linear combinations of the child variables. BMI percentile of the child had the largest

canonical weight (0.83) in construction of the first canonical correlation for the child's data followed by lunchtime calorie consumption (0.29). For the first canonical variable for parent characteristics, BMI had the largest canonical weight (0.72) followed by duration of moderate physical activity (-0.56). In sum, less active caregivers with higher Body Mass Indices were associated with heavier children who consume more calories at lunch

Bivariate correlations derived from the canonical analysis indicated that in the parent, sedentary behavior was inversely related to duration of moderate physical activity  $r(96) = -0.30$ , and BMI of the parent was positively related to BMI percentile of the child,  $r(96) = 0.34$ .

Table 4. Canonical Correlation Analysis Results Between Demographics and Psychosocial/Behavioral Variables

Variables	Standardized canonical coefficient <sup>a</sup>	Correlation with first canonical variable <sup>b</sup>
Child		
BMI%	<b>0.83</b>	<b>0.40</b>
Physical activity±	-0.21	-0.15
Calories consumed	<b>0.29</b>	0.23
Demographics (parent)		
BMI	<b>0.72</b>	<b>0.35</b>

(table continued)

Income	-0.08	0.05
Sedentary behavior‡	0.08	0.12
Duration of Moderate Physical Activity‡	<b>-0.56</b>	<b>-0.30</b>
Canonical Correlation	<b>0.43**</b>	

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<sup>a</sup> Weights of the linear combination of child variables and parent demographic variables.

<sup>b</sup> Correlation coefficient between the first canonical variable for child variables and the individual parent demographic variables, or the first canonical variable for parent demographic variables and the individual child variables.

±Godin total mets. ‡ Paffenbarger, duration of sedentary behavior per week; duration of moderate levels of physical activity per week.

\*\*  $p < .01$ .

The second hypothesis postulated that Parents with a higher BMI, less social support, and lower quality of life would be more likely to have a child with a higher BMI percentile and lower self-esteem. The results of the second canonical correlation analysis to test this hypothesis are presented in Table 5. The first canonical correlation  $R = 0.38$  ( $p < .05$ ), explained 15% of the sample variation in the variable sets of psychosocial and weight factors. The subsequent canonical correlations were not statistically significant. The standard coefficients represent the weights of the linear combination of the child psychosocial and weight variables or the linear combinations of the adult psychosocial and weight variables. BMI percentile of the child had the largest canonical weight (0.93) in construction of the first canonical correlation for the child's data, followed by mood (-

0.38), and self-esteem (-0.35). For the first canonical variable for adult characteristics, BMI had the largest canonical weight (0.90) followed by social support for physical activity (-0.33). In sum, caregivers with higher Body Mass Indices and less social support for physical activity are associated with children who are heavier, with lower self-esteem, and are less depressed.

Examination of the bivariate correlations indicated that children’s self-esteem was inversely related to mood,  $r(102) = -0.32$ , and BMI percentile was positively associated with parent BMI,  $r(102) = 0.34$ , as mentioned earlier.

Table 5. Canonical Correlation Analysis Results Between Psychosocial and Weight Variables

Variables	Standardized canonical coefficient <sup>a</sup>	Correlation with first canonical variable <sup>b</sup>
<b>Psychosocial (child)</b>		
Mood	<b>-0.38</b>	-0.09
Self-esteem	<b>-0.35</b>	-0.07
BMI percentile	<b>0.93</b>	<b>0.34</b>
<b>Parent</b>		
Quality of life	-0.09	0.00
Social support for physical activity	<b>-0.33</b>	-0.17
BMI	<b>0.90</b>	<b>0.36</b>

(table continued)

Canonical Correlation

**0.38\***

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<sup>a</sup> Weights of the linear combination of child psychosocial and parent variables.

<sup>b</sup> Correlation coefficient between the first canonical variable for child psychosocial variables and the individual parent variables, or the first canonical variable for parent variables and the individual child psychosocial variables.

\*  $p < .05$

The third hypothesis postulated that children with higher BMI percentiles, who reported higher food preoccupation, lower dieting, ate more total calories at lunch, with a higher percentage of calories from fat would be more likely to have a parent who endorsed less healthy eating patterns (more sweets, less healthy restaurant choices, eat fattier meat) and reported lower social support for healthy eating. The results of the third canonical correlation analysis to test this hypothesis are presented in Table 6. The first canonical correlation  $R = 0.52$  ( $p < .01$ ), explained 27% of the sample variation in the variable sets of dietary and weight-related factors. The subsequent canonical correlations were not statistically significant. The standard coefficients represent the weights of the linear combination of the child dietary and weight-related variables or the linear combinations of parental BMI and dietary variables. Percentage of calories from fat consumed during school lunch had the largest canonical weight (0.77) in construction of the first canonical correlation for dietary and weight characteristics, followed by food preoccupation (0.60), BMI percentile (0.59), and dieting (-0.56). For the first canonical variable for adult dietary characteristics, restaurant choices had the largest canonical weight (-0.62), followed by BMI (0.44), meat type (-0.46), and social support for health

eating (-0.34). To summarize, heavier adults with less social support for healthy eating, who eat fattier meat, and make less healthy choices in restaurants are associated with children with higher BMI percentiles, who reported less dieting attitudes and behaviors, have a higher preoccupation with food, and consume more calories from fat during school lunch.

Examination of the bivariate correlations indicated that dieting was positively related to food preoccupation in children,  $r(96) = 0.40$ , and calories consumed at lunchtime was positively correlated with percentage of calories from fat consumed at lunchtime,  $r(96) = 0.31$ .

Table 6. Canonical Correlation Analysis Results Between Parent and Child Dietary Variables

Variables	Standardized canonical coefficient <sup>a</sup>	Correlation with first canonical variable <sup>b</sup>
Child Dietary		
BMI%	<b>0.59</b>	0.17
Food preoccupation†	<b>0.60</b>	0.14
Dieting†	<b>-0.56</b>	-0.12
Calories consumed	-0.19	0.07
Calories from Fat (%)	<b>0.77</b>	<b>0.37</b>
Parent Dietary		

(table continued)

Meat choice	<b>-0.46</b>	<b>-0.32</b>
Social support for healthy eating	<b>-0.34</b>	-0.21
Restaurant choices	<b>-0.62</b>	<b>-0.36</b>
BMI	<b>0.44</b>	0.16
Sweet consumption	0.15	0.06
Canonical Correlation	<b>0.52**</b>	

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<sup>a</sup> Weights of the linear combination of child dietary and parent dietary variables.

<sup>b</sup> Correlation coefficient between the first canonical variable for child dietary and the individual parent dietary variables, or the first canonical variable for parent dietary variables and the individual child dietary variables.

† ChEAT subscale.

\*\*  $p < .01$ .

The fourth hypothesis postulated that heavier, less active, more sedentary children would be more likely to have a heavier, less active parent, who watched more television. The results of the fourth canonical correlation to test this hypothesis are presented in Table 7. The first canonical correlation  $R = 0.44$  ( $p < .01$ ), explained 19% of the sample variation in the variable sets of physical activity and weight-related factors. The subsequent canonical correlations were not statistically significant. The standard coefficients represent the weights of the linear combination of the child physical activity and weight-related variables or the linear combinations of the parental physical activity and BMI. BMI percentile had the largest canonical weight (0.87) in construction of the

first canonical correlation for physical activity characteristics, followed sedentary behavior (-.49). For the first canonical variable for parental physical activity characteristics, BMI had the largest canonical weight (0.75), followed by minutes of moderate physical activity (-0.56). In sum, children with higher BMI percentiles who are less sedentary (i.e., spend less time watching TV and video games) are associated with heavier parents who do less moderate levels of physical activity.

Table 7. Canonical Correlation Analysis Results Between Parent and Child Physical Activity Variables

Variables	Standardized canonical coefficient <sup>a</sup>	Correlation with first canonical variable <sup>b</sup>
Child Physical Activity		
BMI%	<b>0.88</b>	<b>0.39</b>
Physical activity	-0.13	-0.09
Sedentary behavior	<b>-0.46</b>	-0.18
Parent Physical Activity		
BMI	<b>0.75</b>	<b>0.34</b>
Television Hours/Week	-0.25	-0.07
Duration of Moderate Physical Activity	<b>-0.56</b>	-0.29
Social support for physical activity	0.01	-0.05

(table continued)

Canonical Correlation

**0.44\*\***

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<sup>a</sup> Weights of the linear combination of child physical activity and parent physical activity variables.

<sup>b</sup> Correlation coefficient between the first canonical variable for child physical activity and the individual parent physical activity variables, or the first canonical variable for parent physical activity variables and the individual child physical activity variables.

\*\*  $p < .01$ .

#### Baseline Exploratory Analyses

The fifth canonical correlation was conducted as an exploratory analysis to test linear combinations of significant correlates from the previous four analyses. The results of the analysis between dietary variables, physical activity, and BMI percentile in children and physical activity and weight variables in parents are presented in Table 8. The first canonical correlation  $R = 0.49$  ( $p < .01$ ), explained 23% of the sample variation in the variable sets of dietary and weight-related factors. The subsequent canonical correlations were not statistically significant. The standard coefficients represent the weights of the linear combination of the child dietary, physical activity, and weight-related variables or the linear combinations of the parental physical activity and weight variables. BMI percentile had the largest canonical weight (0.73) in construction of the first canonical correlation for dietary, physical activity, and weight characteristics, followed by positive social support for physical activity (-0.39), and sedentary behavior (-0.42). For the first canonical variable for parental physical activity characteristics, view of physical activity had the largest canonical weight (0.57), followed by BMI (0.56), and

minutes of moderate physical activity (-0.40). In sum, children with higher BMI percentiles who get less positive social support for physical activity, and are less sedentary (time spent watching TV and video games) are associated with parents with higher BMI, who get less moderate physical activity, but think they should get more physical activity.

Examination of bivariate correlations indicated that child physical activity was positively associated with child positive social support for physical activity,  $r(96) = 0.31$ . Parent perception of the adequacy of their own level of physical activity (“I get enough” to “I should get more”) was inversely related to their social support for physical activity,  $r(96) = -0.32$  and inversely related to the child’s positive social support for physical activity,  $r(96) = -0.30$ . Again, BMI was positively related to BMI percentile,  $r(96) = 0.34$ .

Table 8. Exploratory Canonical Correlation Analysis Results Between Child Dietary/Physical Activity and Parent Physical Activity Variables

Variables	Standardized canonical coefficient <sup>a</sup>	Correlation with first canonical variable <sup>b</sup>
<b>Child Diet/Physical Activity</b>		
BMI%	<b>0.73</b>	<b>0.37</b>
Social Support for Physical Activity	<b>-0.39</b>	-0.18
Physical activity	-0.01	-0.09

(table continued)

Sedentary behavior	<b>-0.42</b>	-0.19
Calories consumed	0.28	0.24
Parent Physical Activity		
BMI	<b>0.56</b>	<b>0.34</b>
View of Own Physical Activity	<b>0.57</b>	<b>0.33</b>
Duration of Moderate Physical Activity	<b>-0.40</b>	-0.28
Social Support for Physical Activity	0.04	-0.12
Canonical Correlation	<b>0.49**</b>	

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<sup>a</sup> Weights of the linear combination of child diet/physical activity and parent physical activity variables.

<sup>b</sup> Correlation coefficient between the first canonical variable for child diet/physical activity and the individual parent physical activity variables, or the first canonical variable for parent physical activity variables and the individual child diet/physical activity variables.

\*\*  $p < .01$ .

A sixth canonical correlation was also conducted as an exploratory analysis to test linear combinations of significant correlates from the previous four analyses. The results of the analysis between dietary variables and BMI percentile in children, and dietary variables, physical activity, and weight variables in parents are presented in Table 9. The first canonical correlation  $R = 0.48$  ( $p < .05$ ), explained 23% of the sample variation in the variable sets of dietary and weight-related factors. The subsequent canonical

correlations were not statistically significant. The standard coefficients represent the weights of the linear combination of the child dietary and weight-related variables or the linear combinations of the parental dietary, physical activity, and weight variables. BMI percentile had the largest canonical weight (0.65) in construction of the first canonical correlation for dietary and weight characteristics, followed by servings of dessert (0.34), overconcern with body weight and shape (0.32), and total number of calories consumed during school lunch (0.29). For the first canonical variable for parental characteristics, minutes of moderate physical activity had the largest canonical weight (-0.66), followed by BMI (0.65). In sum, children with higher BMI percentiles who consume more servings of dessert, more calories during school lunch, and are more highly overconcerned with body weight and shape are associated with heavier parents who get less moderate physical activity.

Bivariate correlations were examined, and the following variables were significant in children: overconcern with body weight and shape was positively related to BMI percentile,  $r(95) = 0.32$  and dieting,  $r(95) = 0.49$ . Again, BMI percentile was positively related to BMI,  $r(95) = 0.34$ .

Table 9. Exploratory Canonical Correlation Analysis Results Between Child Dietary and Parent Health Behavior Variables

Variables	Standardized canonical coefficient <sup>a</sup>	Correlation with first canonical variable <sup>b</sup>

(table continued)

Child Dietary

BMI%	<b>0.65</b>	<b>0.39</b>
Overconcern with Weight and Shape†	<b>0.32</b>	0.25
Dieting†	-0.01	0.16
Calories consumed	<b>0.29</b>	0.26
Fruit Servings	-0.16	0.06
Dessert Servings	<b>0.34</b>	0.24

Parent Health Behaviors

BMI	<b>0.65</b>	<b>0.37</b>
Meat Choice	-0.15	0.00
Duration of Moderate Physical Activity	<b>-0.66</b>	<b>-0.36</b>

Canonical Correlation **0.48\***

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<sup>a</sup> Weights of the linear combination of child dietary and parent health behavior variables.

<sup>b</sup> Correlation coefficient between the first canonical variable for child dietary and the individual parent health behavior variables, or the first canonical variable for parent health behavior variables and the individual child dietary variables.

\*  $p < .05$ .

Following the exploratory canonical analyses, a series of bivariate correlations were analyzed to test for associations between variables at baseline that may be useful for future studies. Depressed mood in children was negatively related to self-esteem ( $r(102) = -0.31, p < .0001$ ), positively related to vomiting ( $r(102) = 0.46, p < .0001$ ), social

pressure for weight gain ( $r(102) = 0.31, p < .01$ ), food preoccupation ( $r(102) = 0.33, p < .01$ ), dieting ( $r(102) = 0.35, p < .0001$ ), and overconcern with weight and shape ( $r(102) = 0.45, p < .0001$ ). In addition, self-esteem was negatively related to overconcern with weight and shape ( $r(102) = -0.32, p < .01$ ), food preoccupation ( $r(102) = -0.38, p < .0001$ ), and social pressure for weight gain ( $r(102) = -0.30, p < .01$ ).

BMI percentile was positively associated with overconcern with weight and shape ( $r(102) = 0.36, p < .0001$ ) and parent BMI ( $r(102) = 0.34, p < .01$ ), and negatively associated with social pressure for weight gain ( $r(102) = -0.39, p < .0001$ ).

Parent BMI was positively associated with perception of health status, whereby higher BMI was associated with poorer perceived health ( $r(102) = 0.34, p < .0001$ ) and negatively related with perception of weight status ( $r(102) = -0.62, p < .001$ ) (i.e., parent's with higher BMI were more likely to perceive themselves as being overweight).

### Longitudinal Analyses

The fifth hypothesis postulated that baseline parental social support, weight status (BMI of parent and weight status of spouse), quality of life, sweet/snacking and restaurant habits, and duration of physical activity would predict weight change (BMI percentile) of children over the course of two years. This hypothesis was not supported. Table 10 shows the results of the multiple regression model tested to predict weight change in children over two years. The regression model was significant,  $p < .01$ , explaining 13% of the variance in child's weight change over the course of two years. The following variables met inclusion criteria in this model: television hours per week (parent), sweet/snack habits (parent), and quality of life (parent). Weight change in children over two years was positively associated with parental sweets/snack

consumption (i.e., healthier/less frequent consumption) and quality of life, and inversely associated with parental television watching (hours per week

Table 10. Stepwise Multiple Regression Model of Weight Change of Child After 2 Years

<u>Variable</u>	<u><math>\beta</math> (SE)</u>	<u><math>p</math></u>	<u>Model <math>R^2</math> / <math>p</math> value</u>
Television hours per week	-0.17 (0.11)	>.05	0.13/ <. 01
Sweets/snack consumption (high=healthier)	0.81 (0.33)	<. 05	
Quality of life	0.42 (0.17)	<. 05	

As an exploratory measure, the same analysis was then conducted 1) without baseline BMI percentile and 2) with treatment condition (HEE vs. A/D/T). However, because neither child's baseline BMI percentile nor treatment condition met criteria for inclusion in the model ( $p >.15$ ), the model remained unchanged.

## DISCUSSION

The primary aim of this study was to test whether parental BMI, psychosocial, and environmental variables were associated with psychosocial and behavioral variables in children at baseline, and whether these same variables predicted weight change of children after two years enrollment in an intervention for weight gain prevention.

The results of this study indicate that parental physical activity, weight status, social support, and dietary habits are significant correlates of weight and dietary habits of children cross-sectionally, but these same variables are not significant predictors of weight change of children over two years.

The following section is organized according to individual hypotheses and the discussion that follows, synthesizes the findings. A brief summary of the findings of the Wise Mind study is also included.

### Study Hypotheses

Hypothesis 1. It was hypothesized that heavier, less physically active, parents would be more likely to have a heavier, less physically active child, who ate more total calories. This hypothesis was partially supported; heavier, less physically active parents were associated with heavier children, who ate more calories during school lunch.

Although physical activity in children not a significant variable in the canonical set, the canonical weight approached significance (-0.21), which indicated that there may be a trend for heavier kids to exercise less.

These results are consistent with those of Davison and Birch (2001) who found that the child's baseline BMI and dietary intake and parents' energy intake, weight gain, and physical activity enjoyment predicted change in the child's BMI over the course of

two years. They also found a weaker association between child's BMI and physical activity although, as in this study, this could be partially due to the crudeness of the measure as several researchers have found a connection between parental physical activity and child's physical activity (Davison, 2003; Moore, Lombardi, White, Campbell, Oliveria, & Ellison, 1991; Trost, Kerr, & Pate, 2001).

Hypothesis 2. It was postulated that Parents with a higher BMI, less social support, and lower quality of life would be more likely to have a child with a higher BMI percentile and lower self-esteem. This hypothesis was partially supported by the canonical correlation analysis. Parents with higher BMI and less social support were associated with children with higher BMI percentiles and lower self-esteem; quality of life was not a significant variable in the canonical set.

The relationship between BMI and social support in parents and BMI in children is not surprising, since previous research has shown a direct relationship between social support and engagement in health behaviors in adults and children (Wing & Jeffery, 1999; Zabinski, Saelens, Stein, Hayden-Wade, & Wilfley, 2003) and an association between parental and child BMI (Fogelholm, Nuutinen, Myöhänen, & Säätelä, 1999; Safer, Agras, Bryson, & Hammer, 2001).

Although research testing the relationship between self-esteem and weight in children is mixed, the findings in the current study are consistent with those of previous researchers who found that obese and overweight children had significantly lower levels of self-esteem than children who are not overweight (Epstein, Klein, & Wisniewski, 1993; Pierce & Wardle, 1997).

The insignificance of quality of life in the model was surprising; however, the measure chosen to assess quality of life in parents for the current study was a brief generic measure of subjective well-being, which did not include items related to physical or mental health. It is possible that a measure designed more specifically to assess health-related quality of life may have yielded different results. Although quality of life has been shown to directly correlate with severity of obesity in individuals seeking weight loss treatment (Fontaine, Cheskin, & Barofsky, 1996), the relationship between weight and quality of life in overweight and normal individuals is less clear. Even among obese individuals, the most pronounced differences in quality of life relate to physical components and not emotional or general well-being (Fine, Colditz, Coakley, et al., 1999).

Hypothesis 3. It was postulated that children with higher BMI percentiles, who reported stronger food preoccupation, lower dieting, consumed more total calories at lunch, with a higher percentage of calories from fat would be more likely to have a parent who endorsed less healthy eating patterns (more sweets, less healthy restaurant choices, ate fattier meat) and reported lower social support for healthy eating. This hypothesis was partially supported; children with higher BMI percentiles, who reported lower dieting attitudes and behaviors, higher food preoccupation, and ate a higher percentage of calories from fat were associated with heavier parents who reported eating fattier meat, less healthy restaurant choices, and lower social support for healthy eating. The parent's sweet consumption and the child's calorie consumption at lunch were not significant variables in the canonical sets. Although, the child's calorie consumption during school lunch was not significant, further examination of the bivariate correlations indicated that

percentage of calories from fat and total calories consumed during school lunch were positively related.

These findings are consistent with previous research that has found a positive relationship between maternal obesity and dietary fat intake in children, and between heavier parents and children's stronger preference for high-fat foods and higher total fat intakes (Fisher & Birch, 1995; Nguyen, Larson, Johnson, & Goran, 1996). In addition, various researchers have demonstrated a relationship between parental dietary habits, child weight status, eating attitudes, and dietary habits (Fisher, Mitchell, Smiciklas-Wright, & Birch, 2002; Mirmiran, Mirbolooki, & Azizi, 2002).

Finally, the relationship between low social support and less healthy eating patterns in parents is consistent with previous research, which has demonstrated a significant relationship between social support and engagement in health behaviors (i.e., healthy eating and physical activity) (Wing & Jeffery, 1999; Zabinski, Saelens, Stein, Hayden-Wade, & Wilfley, 2003).

Hypothesis 4. It was hypothesized that heavier, less active, more sedentary children would be more likely to have a heavier, less active parent, who watched more television. This hypothesis was partially supported; Heavier, *less* sedentary children (spend less time watching TV and video games) were associated with heavier, less active parents. Physical activity for the child was not a significant variable in the canonical set; however less sedentary behavior (i.e., time spent watching television and playing video games) was a significant variable in both children and adults.

The relationship between physical activity and parental BMI and child BMI is consistent with previous research; however, the inverse relationship between sedentary

behavior and BMI was less expected. A potential explanation for these findings is that the children are spending their sedentary time engaging in activities other than television watching and playing video games such as reading, homework, surfing the Internet, etc. As the SAPAC sedentary behavior questions only assess time spent watching television and playing video games in children and the television habits questionnaire only assesses time spent watching television for parents, these questionnaires would not have measured such alternate sedentary “activities”. This prediction is consistent with the findings of Marshall and colleagues (2004), who suggest that while the total amount of sedentary behavior is inevitably prohibitive of physical activity, assessing the relationship between sedentary behavior and health status is unlikely to be explained using single markers of inactivity (i.e., television watching and videogames). However, these findings are inconsistent with previous research that has found a connection between television watching, BMI, and physical activity in children (Jago, Baranowski, Baranowski, Thompson, & Greaves, 2005; Hernandez, Gortmaker, Colditz, Peterson, Laird, & Parra-Cabrera, 1999), although this relationship is less clear in adults (Crawford, Jeffery, & French, 1999). In future studies, a more extensive measure of sedentary behavior should be used.

It was surprising that less active children were not associated with less active parents, even though less sedentary children were associated with less sedentary parents. Again, perhaps the lack of significance can be partially explained by the crude measurement of physical activity in children.

Hypothesis 5. It was postulated that baseline parental variables would predict weight change of children over two years. The model was significant, although the

variables that were correlated at baseline were not good predictors after two years. Healthier parental snacks/sweet consumption was associated with weight gain over two years, but this variable was not associated with parental BMI or child weight status at baseline. In addition, quality of life in parents was not associated with any children's variables at baseline, but was associated with weight gain over two years, but in the unexpected direction. Finally, duration of television watching (hours per week) was negatively associated with weight gain over two years. This relationship was also in the unexpected direction, but is consistent with the baseline analyses. These results indicate that baseline parental correlates of BMI percentile in children do not necessarily make good predictors of weight change over time (longitudinally).

Exploratory Analyses. The first exploratory analysis was a combination of variables from the first, third, and fourth hypotheses. Total calories consumed at lunch was positively related to servings of snacks and desserts consumed at lunch, higher BMI percentile, overconcern with weight and shape, BMI (parent), and was negatively associated with physical activity of the parent. These findings are consistent with previous research that has demonstrated a relationship between parental BMI and physical activity and child BMI and dietary composition (Davison & Birch, 2002; Wardle, Guthrie, Sanderson, Birch, & Plomin, 2001). The association between BMI and overconcern with weight and shape is consistent with findings by Shunk and Birch (2004) who found that girls at risk for overweight reported higher weight concern and body dissatisfaction and gained more weight over time than their normal weight peers.

The second exploratory analysis was a combination of all four hypotheses, but positive social support for physical activity was added for the child, since social support

for physical activity in the parent was previously examined. This analysis indicated that positive social support for physical activity of the child was inversely associated with BMI percentile, lunchtime calorie consumption, parent BMI, and view of physical activity (i.e., parent believed he/she ought to get more physical activity), and was positively related to sedentary behavior (child) and physical activity (parent).

This is consistent with previous research by Zabinski and colleagues (2003) who investigated the role of social support as a barrier to overweight children's physical activity. They found that overweight children reported less social support and less adult support for physical activity, than their lean counterparts.

#### Summary of Wise Mind Results

Although the Wise Mind study found no difference in weight gain prevention between the two interventions (HEE vs. A/D/T), the two interventions did significantly impact behaviors and expectancies that were theoretically linked to the different interventions. The weight gain prevention program (HEE) resulted in reduction of dietary fat intake, increased fruit and vegetable intake, and increased physical activity in comparison to the A/D/T active control condition and relative to baseline. The substance use program (A/D/T) resulted in healthier expectancies related to use of alcohol, drugs, and tobacco products, in comparison to the HEE condition and in relation to baseline. These findings are consistent with other relatively short-term school-based prevention programs that have found behavioral changes, but did not report significant changes in body weight in comparison to control arms (programs).

## CONCLUSION

The primary findings of this study at baseline are consistent with previous research examining the cross-sectional relationship between child and parental weight and dietary variables. Parents who reported less healthy lifestyle habits (i.e., were heavier, ate less healthy foods, exercised less, etc.) were associated with heavier children with less healthy habits at baseline (Davison & Birch, 2001; Fisher & Birch, 1995; Locard, Mamelie, Billette, Miginiac, Munoz, & Rey, 1992; Maffei, Talamini, & Tato, 1998; Safer, Agras, Bryson, & Hammer, 2001; Strauss & Knight, 1999). The current study extends the findings of previous research as significant correlates at baseline were also tested as predictors over time. The majority of research thus far has examined either the cross-sectional relationship between parental and child variables or has tested both but has used exploratory procedures to identify predictors (e.g., stepwise multiple regression). Assumptions are often made in the literature, that significant correlates will also be significant predictors. As the results of the current study indicate, this is not always the case. The results of the longitudinal analyses were not consistent with previous literature finding an association between parental and children's variables over time, however few used only baseline parental variables in the prediction and those that did used exploratory statistical procedures. Moreover, it is possible that in the current study changes in parental data over time were predictive of children's weight change over two years, however this should be tested further in future studies. Davison and Birch (2001) tested the relationship between parental variables and weight change with similar variables in their young daughters, and found that a combination of parental and child variables served as the best predictors of weight gain between ages five and seven years

old. Parent's weight was also measured more than once, so that the change in parent's weight across two years was entered as a predictor variable, as opposed to baseline weight in the current study.

Several limitations of the present study should be mentioned. First, the study sample was a sample of convenience and was not representative of all school children, because child participants were from local private schools. Additionally, the adult participants were a sub sample from the local private schools, since the Wise Mind study did not include all possible students at each school. Even though analyses indicated that children of participants in the current study were not significantly different from non-participants and the response rate was comparable to other studies using similar methodology, a larger sample would have been ideal.

Second, pubertal status of children was not assessed at baseline or after 2 years. As puberty has an impact on weight gain and adiposity, it is possible that some of the weight change in the current study may be due to puberty, or underweight individuals who gained weight to be within a normal weight range.

Third, the self-report questionnaire method of measuring physical activity in children is not ideal. Numerous researchers have cited the problem of measuring physical activity and sedentary behavior in children via self-report and have acknowledged the relative imprecision of such measures of physical activity in this population (Bogaert, Steinbeck, Baur, Brock, & Bermingham, 2003; Davison & Birch, 2001). However, although accelerometers are a preferable and far more valid measure of physical activity, due to constraints of the larger Wise Mind study, using accelerometers was not feasible and therefore self-report questionnaire data were used.

Fourth, only one parent completed questionnaires, when it would have been ideal to have questionnaire data from all caregivers in the home. Unfortunately, because participants were primarily recruited via email and only one parent's email address was listed on the consent for the larger Wise Mind study, this was not feasible in the current study. Despite this limitation, several of the questionnaires reflected the family environment (e.g., television watching, social support, etc.) and spousal weight status data were collected. Additionally parents' weight and height data were by self-report, however previous research suggests that self-reported height and weight data are sufficient and comparable to actual measurements in young adults (Kuczmarki, Kuczmarki, & Najjar, 2001).

Despite a number of limitations, this study has several strengths that should also be mentioned. First, the use of digital food photography provided strong data on children's dietary habits. Previous research has relied on self-report data from children or their parents, which do not provide information on plate waste or food selection, and are subject to memory bias.

Second, weight and height were measured at each time period and all of the questionnaire data were thoroughly checked before leaving each school, so that missing data were minimized.

Third, this study is one of only a few studies to examine parental influence on children in a school-based health improvement program, both cross-sectionally and longitudinally. In past research, it has frequently been erroneously assumed that significant correlates are equivalent to significant predictors. As the current study indicates, this is not always the case.

Finally, numerous studies have used the Internet as a means of dispersing information and collecting information from participants following several group or individual face-to-face meetings; however, no studies to date have tested the utilization of e-mail to recruit for study participation and the Internet as a data collection procedure in this type of study. This approach tested the feasibility of such an approach in order to minimize participant burden (i.e., no face to face, mail, or phone contact with the participants was made).

#### Future Directions

There are several directions with which this line of research should follow. Future studies should assess all caregivers and siblings living in the same house or where the child spends most of his or her time. This would enable a comparison of behavioral and anthropometric characteristics both within and between families, and would provide further insight into which family members contribute the most to the type of home environment (i.e., toxic or healthy) and which of the family members appear to be the most affected by the environment (e.g., overweight/obese status). Furthermore, data should be collected on more than one occasion. This would provide a more accurate picture of the home environment that would be more sensitive to any changes that may occur over time. Additionally, it would be valuable to examine trends and relationships between weight, physical activity, and dietary variables in caregivers and their children over time. Finally, although expensive and time consuming, home visits may be the most promising method of data collection and brief intervention for home-based environmental change.

Following the identification of significant longitudinal relationships between family members, a weight gain prevention/ health promotion program should be designed that involves both caregivers and their children, in addition to the school system. While this could be a program that is implemented at school and eventually maintained at home, there should be group meetings periodically to increase accountability, to report progress, and to problem-solve and resolve obstacles with other parents. The success of this type of program could be assessed in a similar way to the current study, except that questionnaire data could be completed via the Internet or in-person, and examination of the home environment and anthropometric data should be collected in-person. Furthermore, findings from the Wise Mind study indicate that examination of children's eating and physical activity behaviors at home may be an important addition to a school based program.

In order to increase participation and accountability for similar projects in the future, it would be ideal to have all caregivers meet with the research staff as part of the school PTA meeting, prior to initiation of both the children's intervention and the parent's Internet portion of the study. If the caregivers are more informed about the purpose and their role in the study, and are able to feel that they are part of an important study and a larger societal movement to improve the health of their children, then perhaps a larger proportion would have been willing to participate in the current study.

The primary contribution of the current study is that it has extended previous research by testing whether parental BMI, behavioral, and psychosocial cross-sectional variables can also serve as predictors of children's weight change over time. Several significant relationships were found cross-sectionally; however, these significant cross-

sectional correlates did not also serve as significant predictors of weight change over two years. This finding dictates the need for further longitudinal examination of environmental and familial associations, and contributors to childhood overweight and inactivity.

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APPENDIX A: IRB APPROVAL

**EXPEDITED APPROVAL  
PENNINGTON BIOMEDICAL RESEARCH CENTER  
(Assurance Number M1543)**

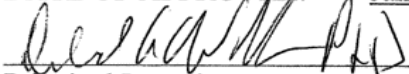
**FROM:** PBRC Institutional Review Board  
**TO:** Emily York-Crowe  
**RE:** Grant Application: "Wise Mind" Sub-study: "Mediators of Weight and Quality of Life"  
IRB #PBRC22032 Sub-study  
**DATE:** January 29, 2004

This is to document review of the above research proposal. In the judgment of this Board, the procedures delineated in said application conform to the pertinent DHHS and FDA rules and regulations regarding use of human subjects. Records regarding action of the Board, referable to said project, are on file in the IRB Office. This study is expedited through the expedited review procedure authorized in 45CFR46.110 Specifically, category #7 applies to this study (revised list published in the Federal Register, Vol. 63, No. 216, Monday, November 9, 1998).


**THE INVESTIGATOR** agrees to report to the Committee any emergent problems, serious adverse reactions, or procedural changes that may affect the status of the investigation, and that no such change will be made without Board Approval, except where necessary to eliminate apparent immediate hazards. The Investigator also agrees to periodic review of this project by the Board at intervals appropriate to the degree of risk to assure that the new project is being conducted in compliance with the Board's understanding and recommendation.

- \*PLEASE NOTE:**
1. Any advertisement to recruit subjects for this study must be approved by the IRB prior to posting, publication and/or distribution.
  2. Other institutional approvals may be required before the study can be initiated.
  3. Written notification (at the time this study is completed/canceled) must be sent to the IRB Office.

DATE OF APPROVAL: January 29, 2004

  
\_\_\_\_\_  
Principal Investigator

DATE: 2-6-04

  
\_\_\_\_\_  
Paula J. Geiselman, Ph.D., Chairman

DATE: 2-29-04

**USER NAME:**

**PASSWORD:**

By logging into this website, I agree to be a participant in the Wise Mind Internet Program. This program is part of an NIH-sponsored research project at Pennington Biomedical Research Center. I understand that the research team, headed by Donald A. Williamson, Ph.D., will monitor my participation on this website, and that my identity will remain anonymous. Information gathered via the website may be used in research papers and presentations.

If you have any questions, please contact Leslie Lewis at 225-763-3138.



[Problems logging in? Click here](#)

[SITE INDEX](#)

**Hi Eric!**  
(If you are not Eric, then click here.)

[LOGOUT](#)

## WELCOME TO THE WISE MIND HEALTHY EATING & EXERCISE WEBSITE

Please fill out your assessments and get a prize! You have 7 days left!



[HOME](#)

[FAMILY  
ACTIVITIES](#)

[NEWS &  
CALENDAR](#)

[WISE  
QUESTIONS](#)

[KIDS'  
CORNER](#)

[ARCHIVES](#)

[MENUS](#)

### FAMILY ACTIVITIES

### Healthy Eating and Exercise Lifestyle Assessments

In the original consent form for the Wisemind project, it was mentioned that you may be invited to participate as a research volunteer at a later time. By filling out the following questionnaires, you will have provided your consent to participate in this portion of the study.

There may be some questions that are sensitive and require some personal disclosure; however, this is a minimal risk study. All data will be collected in a confidential manner.

The research team headed by Donald A. Williamson, Ph.D., will monitor participation and will collect the questionnaire data, which may be used in research papers and presentations. Your identity will remain anonymous.

If you have any questions, please contact Emily York at 225-763-0939 or Leslie Lewis at 225-763-3138.

I Agree

I Disagree



CURRENT PHYSICAL ACTIVITY FOCUS • CURRENT NUTRITION FOCUS

Parents: For a Limited Time Only...  
Complete the Short Lifestyle Assessments  
on the  
**WISE MIND** website  
and Get a Reward!

<http://health.pbrc.edu/wisemind>



These short, easy quizzes will help us identify strengths and weaknesses in your family's lifestyle. Once you've taken all of them, you'll receive an online gift certificate!

**A parent must fill out the quizzes, but the whole family can participate!**

Don't miss out... visit the Wise Mind website now to complete the assessments and get your gift certificate!

## Have you lost your Wise Mind login & password?



Your login is:

Your password is:

<http://health.pbrc.edu/wisemind>

Do you want to win a prize by logging on and  
another prize by completing 8 short assessments  
on the website?

For a limited time only:

- Log onto the Wise Mind website and win a gift certificate to Target!
- Win an additional gift certificate to Target by completing 8 short assessments on the website (last day is March 22<sup>nd</sup>)!

Use your login & password to access the Wise Mind website today.  
See reverse side for possible internet locations near you!!

## Parents:

If you have completed some but not all of the 8 short Lifestyle Assessments on the WISE MIND website, then you still haven't Won your Prize!

<http://health.pbrc.edu/wisemind>



You must take all 8 of the short assessments to win an on-line gift certificate...but time is running out, so log onto the Wise Mind website today and finish them!!!

You won't have this opportunity for another 6 months or more!!

**Remember, a parent must fill out the assessments, but the whole family can participate!**

By taking these short assessments you will not only get a great prize, but you will also be contributing to very important research!!! Just by filling out 8 short assessments, you can make a difference!

Don't miss out... visit the Wise Mind website now to complete the assessments and get your gift certificate!

## VITA

Emily York-Crowe was born in Southampton, England, and moved to Baton Rouge, Louisiana, in 1990. She attended Louisiana State University, graduating in 2000 with a Bachelor of Science degree in psychology. Following graduation, she began the doctoral program in clinical psychology at Louisiana State University, under the supervision of Dr. Donald Williamson, Ph.D. She is currently completing her pre-doctoral internship under Dr. James Blumenthal, Ph.D., at Duke University Medical Center. After graduating from Louisiana State University in August, 2006, she will begin a post-doctoral fellowship with Dr. James Blumenthal at Duke University Medical Center. Her research and clinical interests surround the development of innovative approaches to the prevention and treatment of obesity in various populations, with particular emphasis on the promotion of environmental change.