PREVENTING CHILDHOOD OBESITY THROUGH INCREASED
PHYSICAL ACTIVITY AND PARENTAL INVOLVEMENT:
A RETROSPECTIVE STUDY

by
Tara A. Tribe

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SUPERVISORY COMMITTEE APPROVAL

of a thesis submitted by

Tara A. Tribe

This thesis has been read by each member of the following supervisory committee and by majority vote has been found to be satisfactory.

James C. Hannon

Julie M. Metos
To the Graduate Council of the University of Utah:

I have read the thesis of Tara A. Tribe in its final form and have found that (1) its format, citations, and bibliographic style are consistent and acceptable; (2) its illustrative materials including figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the supervisory committee and is ready for submission to The Graduate School.

Durrant
Chair, Supervisory Committee

Approved for the Major Department

Leslie K. Chatelain
Chair

Approved for the Graduate Council

David S. Chapman
Dean of The Graduate School
ABSTRACT

Childhood obesity and lack of physical activity among children and adolescents are national concerns because of their epidemic prevalence. This study examined the correlation between parental physical activity upbringing and current physical activity patterns, adult weight status, and current parenting habits. This investigation is the first study conducted to determine if there is a correlation between a strong, encouraging, physically active upbringing and adult physical activity patterns. Five hundred fifty-eight adults completed the questionnaire. The questionnaire identified general demographics, retrospective analysis of individuals’ physical activity upbringing, current physical activity patterns, physical activity parenting habits, and body mass index level. The questionnaire was developed from multiple constructs of social cognitive theory, including reciprocal determinism, observational learning, reinforcement, environment, and behavioral capability. A series of statistical correlations were conducted to determine direction, strength, and significance of the relationships.

Analyses showed that a strong physical activity upbringing was characterized by positive role models, rewards, communication, and encouragement. These characteristics promoted participation in vigorous physical activities as adults. No significant correlation was found between physical activity upbringing and participation in moderate walking or sitting activities. A significant
correlation revealed that participants who had a strong physical activity upbringing had lower adult body mass index levels. Three hundred seventy-two participants were included in the correlation. Only participants who had children were included in this correlation. Parents who were raised with a strong physical activity upbringing tended to emphasize physical activity when raising their children. A series of additional exploratory analyses were performed. Results from this study show that a strong physical activity upbringing is important in promoting weight maintenance, long-term physical activity patterns, and intergenerational parenting habits. The implications for childhood obesity prevention, health education, and suggestions for future research are discussed.
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CHAPTER 1

INTRODUCTION

Background and Significance

Childhood obesity trends and prevalence have more than tripled since 1980 and have become one of the primary health challenges of the 21st century (Centers for Disease Control and Prevention, 2006c). Childhood obesity is a nationally recognized epidemic that currently affects the lives of more than 9 million children of all ages, races, genders, and geographic regions. The prevalence of childhood obesity between the ages of 2 and 19 years has increased 182% since 1980 (Centers for Disease Control and Prevention). Current data show that more than 30% of children are at risk for being overweight with a body mass index (BMI) above the 85th percentile, and 15% are overweight with a BMI above the 95th percentile. Obesity-related health-care costs have reached $117 billion annually due to weight-related disorders, illnesses, and diseases. An obese individual pays 37% higher annual medical costs than someone of normal weight (Sightline Institute, 2005). Obesity is caused by interactions among nutrition, physical activity, and genetic factors. The focus of the current research was on the relationship between childhood obesity and physical activity in combating the growing epidemic.

"Today’s youth are considered the most inactive generation in U.S. history" (Weight Awareness, 2004, ¶ 2), which creates a difficult challenge for health
professionals. More than 52% of children are not physically active on a regular basis (Annie E. Casey Foundation, 2004). In Utah, if the physical inactivity trends continue to rise at the current rate, more than 30.3% of Utah children will be overweight or obese in the next 10 years (Utah Department of Health, 2007). Healthy People 2010, a government publication, identified a lack of physical activity as the leading health concern. Healthy People 2010 published multiple child and adolescent goals with regard to increasing moderate and vigorous physical activity and decreasing television viewing (Centers for Disease Control and Prevention, 2000). Unfortunately, the year 2010 is quickly approaching, and the nation is not attaining the recommended goals.

The barriers to childhood physical activity are a complex interaction among many personal, social, and environmental factors. Parental involvement as a role model (i.e., a source of reinforcement, support, and authority) is the overlapping determinant for childhood physical activity. Studies have shown that parental communication, physical activity role modeling, family cohesion, and physical activity reinforcement increase childhood physical activity levels (Cleland, Venn, Fryer, Dwyer, & Blizzard, 2005; Ornelas, Perreira, & Ayala, 2007).

Among the various techniques implemented to increase physical activity levels among children are the constructs from Bandura's (1986) social cognitive theory; these constructs have been shown to be the most effective in behavior change. The social cognitive theory is the triadic model that shows interactions among an individual, his or her environment, and the target behavior (Glanz,
Rimer, & Lewis, 2002). Intervention studies that have applied the social cognitive theory constructs to parents and their children have been more influential than interventions targeting children alone. Intervention studies indicate that parents are important agents for physical activity behavior change on a short-term, immediate time frame (Epstein, Wing, Koeske, & Valoski, 1987; Golan & Crow, 2004; Harvey-Berino & Rourke, 2003). Little or no research has been conducted to determine if parental involvement has long-term maintenance effects on physical activity participation.

**Purpose of the Study**

The primary purpose of the study was to determine how physical activity upbringing (i.e., role modeling, encouragement, and communication) correlates to current adult physical activity patterns and weight status. The secondary purpose of the study was to determine if there was a relationship between physical activity upbringing and how parents or guardians raise their children.

**Research Questions and Hypotheses**

In order to achieve the purposes of the study, the following research questions and hypotheses were identified. The research questions for the study were the following:

1. Is there a relationship between parental role modeling, encouragement, and communication in physical activity participation and current adult physical activity levels?
2. Is there a relationship between physical activity upbringing and current adult weight status as measured by BMI levels?

3. Is there a relationship between an individual’s physical activity role modeling, reinforcement, and encouragement and how an individual raises his or her children?

The hypotheses for the study were the following:

1. Participants who were raised with strong parental role modeling, encouragement, and communication in physical activities will have higher current activity levels compared with participants who were raised with less supportive environments.

2. Participants who were raised with strong physical activity upbringing will show lower current weight status compared with participants who were raised with less supportive upbringing.

3. Parents who were raised with strong physical activity upbringing will raise their children with similar activity principles compared with parents who were raised with less supportive upbringing.

Limitations of the Study

The following limitations for this study were identified:

1. The sample of adults was a convenience sample from various facilities across Utah. Participants in the research study were voluntary, not randomly selected.
2. The measures utilized in the questionnaire were modified to reflect a childhood recall of physical activity events. Therefore, the questionnaire was neither a valid nor reliable tool.

3. All information collected from the participants, including demographics, physical activity upbringing, current physical activity patterns, and parenting practices, were based on self-report. Bias or cognitive difficulties may be a threat to validity.

4. The study questionnaire was self-administered. Although participants received a detailed description of the purpose and protocol, it is possible that some participants did not completely understand questionnaire items, thus providing inaccurate responses.

5. The previously mentioned limitations can greatly influence study results. Therefore, the findings from the current study may not be generalized.

**Delimitations of the Study**

The following delimitations for this study were identified:

1. The study sample included participants from various geographic areas of Utah. The participants were from both urban and rural communities and from varying socioeconomic status.

2. The participants came from different ethnic backgrounds and employment levels such as mechanics, food workers, chief executive officers, and administrative support.
3. As the health promotion specialist for the Apple Program, I had previously established relationships with many participants. This relationship may have influenced the participants' willingness to take part in the study.

4. Each participant who participated in the study received a small incentive prize. The incentive may have influenced participation in the research study.

5. Prior to official administration of the Apple Program assessments, questionnaires were administered to 43 University of Utah students to determine comprehension and ease-of-use. This administration clarified questionnaire items and general understanding.
CHAPTER 2

LITERATURE REVIEW

The Childhood Obesity Epidemic

Childhood Obesity in the United States

Childhood obesity has become one of the primary health challenges of the 21st century. The alarming rate of childhood obesity affects more than 9 million children nationwide, touching all ages, genders, races, ethnic groups, and geographic regions (Centers for Disease Control and Prevention, 2006b). Obesity has been described as a “three-legged stool” (Weight Awareness, 2004, ¶ 2): (a) genetics, (b) nutrition, and (c) physical activity. These factors contribute to the growing obesity statistics. Nutrition and physical activity can be controlled through knowledge, guidance, and opportunity. The “physical activity” stool leg was the focus of this research. The Annie E. Casey Foundation (2004) explained that 52% of the children and adolescents in the United States do not exercise on a regular basis. Weight Awareness published similar findings, stating, “Today’s youth are considered the most inactive generation in U.S. history” (¶ 2). These statistics, specific to physical activity, emphasize the necessity of physical activity behavior changes.

Beginning in the 1960s, a series of nationally representative surveys were developed by the Centers for Disease Control and Prevention (2006c) to document
the prevalence and trends of childhood obesity. The surveys included cycles of the National Health Examination Survey and the National Health and Nutrition Examination Survey. Over the years, results of the National Health Examination Survey and the National Health and Nutrition Examination Survey have identified that the prevalence of childhood obesity between the ages of 2 and 19 years old has increased 182% (Centers for Disease Control and Prevention). The rates of childhood obesity (i.e., 2 to 5, 6 to 11, and 12 to 19 years old) have more than tripled since 1980. Current data show that among children and adolescents more than 30% are at risk for being overweight and more than 15% are overweight (Centers for Disease Control and Prevention). The history and current trends of childhood obesity clearly explain why childhood obesity is considered an epidemic.

Obesity rates for Utah are lower than the rest of the country; however, they still show a similar upward trend (Utah Department of Health, 2007).

Childhood Obesity in Utah

Today, the number of overweight or obese children in Utah is at a record high (Utah Department of Health, 2007). According to a phone survey conducted between 2003 and 2005 by the Department of Health and Human Services, Utah has the lowest childhood obesity rate on the National Survey of Children’s Health compared with 49 other states. In 2003-2004, the childhood obesity rate (ages 10 to 17 years old) in Utah was 21% compared with 12 states with childhood obesity rates above 33% (Annie E. Casey Foundation, 2004). In 2006, the Utah Department of Health conducted an analysis of the actual prevalence of childhood
obesity in Utah. The sample consisted of first-, third-, and fifth-grade students in 69 randomly selected public schools. Utah Department of Health representatives and local partners physically weighed and measured 4,310 children in their schools. Of those children, there were more overweight boys than girls across all grades. The percentage of overweight and at-risk for overweight children was significantly higher for fifth-grade children compared with first-grade children.

The rates for childhood obesity in Utah have also continued to increase, which is similar to the national trends for childhood obesity. Among third-grade students in 1994, 6% of the boys and girls were considered overweight. The boys' results showed higher rates of obesity than girls' (11.1% compared with 10.6%, respectively). In 2006, 10.6% of boys and 9.4% of girls were considered overweight. Results showed that 11.9% of boys and 11.6% of girls were considered obese. In 1994, 16.9% of third-grade students were at an unhealthy weight; in 2006, it increased to 21.8%. This rise represents a 29% increase in 12 years. An estimated 22.5% of the 261,089 elementary school students or approximately 58,745 students were overweight or at risk of becoming overweight in 2006. More boys than girls were overweight. Alarmingly, if the number of elementary school students at an unhealthy weight continues to increase at the current rate, in 10 years, 30.3% of elementary school students will be at an unhealthy weight (Utah Department of Health, 2007).

The Centers for Disease Control and Prevention’s (2006a) National Survey of Children’s Health examined the amount of physical activity in which Utah
children engage in a typical week. Among the sample of 902 parents, 9% of Utah children do not engage in any vigorous physical activity compared with 11.4% nationwide. The results for days of vigorous physical activity among Utah children compared with children nationwide were the following: (a) 1 to 3 days, Utah 37.5% compared with 29.5% nationwide; (b) 4 to 6 days, Utah 37.8% compared with 33.0% nationwide; and (c) 7 days, Utah 15.7% compared with 26.0% nationwide. In general, Utah’s youth are engaging in more vigorous physical activity than the nationwide averages, except for daily participation. These statistics have the potential for identifying a correlation between lower rates of childhood obesity and higher levels of vigorous physical activity in Utah compared with other states where obesity rates are higher and activity levels are lower.

Consequences of Childhood Obesity

Harper (2006) explained that obesity-related costs are traveling in the same direction as the prevalence of childhood obesity. Obesity accounts for between 4.3% and 9.1% of total direct health-care costs in the United States. According to the Department of Health and Human Services, an obese individual pays 37% higher annual medical costs than those of a normal-weight person. In 2003, estimates of the total direct and indirect health-care costs were between $69 billion and $117 billion, respectively (Sightline Institute, 2005). It can be assumed that the obesity-related health-care costs in 2007 were higher than the 2003 estimates because of the continual rise in obesity prevalence.
Health-Care Costs

Obesity-related health-care costs can be a combination of one or many weight-related conditions or diseases. The International Diabetes Federation (2005) stated, “A new generation is entering adulthood with unprecedented levels of obesity. This [statement] . . . reinforces the concern that weight-related chronic diseases will be the most significant public health concern throughout the 21st century” (¶ 1). Numerous physical, emotional, and social health concerns are attributed to the prevalence of childhood obesity. Many weight-related disorders lead to other disorders, resulting in a cyclical spiral. Some examples of physical health consequences are type 2 diabetes, hypertension, sleep disorders, menstrual abnormalities, and severe orthopedic complications (Centers for Disease Control and Prevention, 2006c).

Type 2 Diabetes

Type 2 diabetes is a disorder in which the body does not produce enough insulin or the cells ignore the insulin that has been produced. Insulin is necessary for the body to process the carbohydrates ingested in the diet. During digestion, carbohydrates are broken down into glucose molecules. Insulin gathers glucose from the blood and carries it to the cells where it is the primary source of energy for the body. In type 2 diabetes, blood glucose builds up in the blood, which can cause a series of short- and long-term complications. The cells are deprived of energy due to the lack of glucose delivery. Over time, high blood glucose levels can damage the eyes, kidneys, nerves, and heart (American Diabetes Association,
Of the children who are diagnosed with diabetes, 45% have type 2 or “adult onset diabetes” (International Diabetes Federation, 2005). An at-risk or overweight child is 12.6 times more likely to have high blood glucose levels than an average-weight child. The American Obesity Association (2006) found that if a child exercises for 30 minutes 3 times per week and loses 5% to 10% of his or her overall weight, the result is a 58% reduction in type 2 diabetes risk factors.

**Hypertension**

Hypertension is a common comorbidity of diabetes that affects 20% to 30% of diabetics (American Diabetes Association, 2007). The prevalence of hypertension is 1.3 to 2 times higher for a diabetic than a nondiabetic. Hypertension is marked by a blood pressure above 140/90. Systolic pressure (i.e., 140) refers to the pressure in the arteries as the heart contracts and pumps blood forward into the arteries. Diastolic pressure (i.e., 90) refers to the pressure in the arteries as the heart relaxes after the contraction. The diastolic pressure reflects the lowest pressure to which the arteries are exposed. The consequences of persistent hypertension are organ damage, heart attack, hardening of the arteries (i.e., arteriosclerosis), and stroke (American Heart Association, 2007). Children who are overweight are 9 times more likely to show signs of hypertension than a normal-weight child (American Obesity Association, 2006).
Sleep Apnea

A common sleep disorder associated with obesity and overweight is sleep apnea. Sleep apnea is characterized by severe snoring and can cause a person to stop breathing for short periods of time while sleeping. These symptoms result in frequent awakenings, daytime drowsiness, headaches, and dizziness. Obesity is the most significant predictor of sleep apnea due to excess neck or chest adipose tissue that constricts the airway and lungs. Obstructive sleep apnea has been linked to other weight-related disorders such as hypertension, heart attack, and stroke (University of California San Francisco Medical Center, 2007).

Beyond the physical consequences, children often report emotional and social troubles, including weight-related teasing, name-calling, self-esteem problems, and depression—all leading to serious health conditions and seeking medical attention (National Institute of Health, 2002). Small increases in physical activity can help to reduce or eliminate some of these weight-related conditions.

Childhood Obesity Link to Adult Obesity

The consequences of childhood obesity and weight-related conditions are of great importance in order to combat this growing epidemic. Not only do obese and overweight children battle various health conditions, but there is also a growing body of research showing that childhood obesity can also correlate and predict adult obesity levels. Guo, Roche, Chumlea, Gardner, and Siervogel (1994) clearly identified the predictive effect of childhood obesity to adulthood. Guo et al. took a sample of 277 White males and 278 White females from the National Health and
Nutrition Examination Survey II data (1929 to 1960). The data examined ages between 1 and 35 years old. Through complex analyses of predictive values and odds ratios, they found that the probability of being overweight, depending on childhood values, increases with childhood age. The probability that an adult will be obese or overweight because of his or her childhood weight status was higher among males than females. The odds of becoming overweight in adulthood for those with childhood BMI levels in the 85th percentile were between 1 and 10 times greater than those children who were of normal BMI levels. Therefore, Guo et al. showed that being overweight in childhood is an important risk factor in being overweight at 35 years old.

Wright, Parker, Lamont, and Craft (2001) conducted a similar study examining 932 individuals from a 1947 cohort study. Four hundred twelve individuals at age 50 returned for this clinical examination study. Wright et al. found that childhood BMI levels showed a significant correlation with adult BMI levels. At age 50, those who had a BMI level above the 90th percentile between the ages of 9 and 13 were 5 and 9 times more likely to be obese, respectively. Specifically, among children in the top quarter of weight at age 9, 73% were overweight or obese at age 50. Among children in the top quarter of weight at age 13, 82% were overweight or obese at age 50. A strong association was shown between high childhood BMI levels and high adult BMI levels.

Childhood obesity research has increased in the last 30 years due to the growing trends and rising obesity-related medical costs. In 1976, prior to the
childhood obesity epidemic, Rimm and Rimm examined the link between childhood and adult obesity levels. Even though the study is 30 years old, the results are analogous to recent studies. In a sample of 13,537 women, Rimm and Rimm found that severely obese women were 2.4 times more likely to have been obese as a child than normal-weight women. There is strong evidence that childhood obesity is related to many serious weight-related disorders, but it is also a strong predictor of adult obesity or overweight status.

Definitions of Childhood Obesity Measures

Body Mass Index

The definition of childhood obesity must be clearly stated in order to understand the severity of this problem. Childhood obesity is most commonly measured using the BMI. This measure is an individual’s weight in relation to his or her height. The equation used to calculate BMI is:

$$\left( \frac{\text{weight in pounds}}{\text{height in inches}^2} \right) \times 703.$$  

Unique to children, the BMI is plotted on a BMI-to-age percentile growth chart. The BMI-to-age growth charts consider the size and growth patterns for children based on their particular gender and age (American Obesity Association, 2006). If a child falls within the 85th percentile, the child is considered to be at risk for the overweight zone. An example of a child who is in the 85th percentile would be a 14-year-old boy with a BMI of 22. Similarly, if a child is in the 95th percentile, the child would be considered overweight. A 4-year-old boy with a BMI of 20
would be considered overweight. Although BMI measures are not the only way to
test for obesity levels in children, it is considered the gold standard method
because of its age and gender specificity, time efficiency, and accuracy (M. S.
Nanney, personal communication, April 4, 2006).

Alternate Body Composition Measures

Alternate measurement tools for body composition are skinfold calipers,
bioelectrical impedance, underwater weighing, dual x-ray absorptiometry, and
BOD POD® (Life Measurement Incorporated, 2007). Skinfold calipers require
taking three to eight measurements at different sites of the body (e.g., tricep,
bicep, shoulder, abdomen, oblique abdomen, lower back, and upper thigh) and
then plugging these numbers into a formula. There may be a 7% to 8% error in
this measurement because of the type of calipers, skill level of the professional
taking the measurements, statistical formula used, and inaccuracies with morbidly
obese individuals. This measurement is difficult for children as it is more invasive
than BMI tests, and it is not based on the growth charts for age and gender.

Bioelectric impedance is measured on a series of devices from hand-held to scale
models. The devices send an electrical impulse through the body. The device
measures the body fat by how easily the impulse is transmitted. Readings can be
easily affected by hydration status, food intake, obesity, and muscle mass.

Underwater weighing requires that an individual be completely submerged in a
tank of water. While underwater, an individual must breathe out all air from his or
her lungs and hold for 10 to 15 seconds. This process is often repeated 10 times
for accuracy. Dual x-ray absorptiometry requires specialized equipment and highly trained technicians. When performed correctly, dual x-ray absorptiometry has less than a 2% error rate; however, it is not a method used for youth or children. Dual x-ray absorptiometry is easy to use but requires expensive equipment typically found only in hospitals and research centers. Dual x-ray absorptiometry takes an x-ray of the body that shows fat, muscle, and bone mass based on differing densities. Dual x-ray absorptiometry can be used on children dependent upon their age, maturity, and location of the equipment. Finally, BOD POD® is fairly new to body composition measures but seems to have great accuracy and promise for future research. Studies show BOD POD® to be comparable with underwater weighing and dual x-ray absorptiometry. The major advantages are that the equipment is fairly inexpensive; it requires little training to operate; it is comfortable for people of all ages, shapes, and sizes; and it is quick and easy. The individual sits in an “egg-shaped” pod and then computer sensors determine how much air the body displaces. Since the BOD POD® is still new to the market, BMI measurement is still the most widely used for children and youth.

**National Priorities**

The skyrocketing prevalence of childhood obesity, soaring health-care costs, and weight-related disorders has established obesity in youth as a national priority of the U.S. government. Healthy People 2010 (Centers for Disease Control and Prevention, 2000) identified 10 leading health indicators that reflect the major health concerns of the 21st century. Interestingly, the top 2 leading health
indicators are physical activity and overweight/obesity. Healthy People 2010 has a series of specific objectives correlating physical activity and childhood obesity. The first aim of childhood obesity for Healthy People 2010 is to reduce the proportion of children and adolescents (i.e., ages 6 to 19 years old) who are overweight or obese from 11% to 5%. A series of objectives have been identified in relation to increasing physical activity levels among children and adolescents. Healthy People 2010 aims to increase the proportion of children and adolescents who engage in moderate exercise (i.e., 30 minutes for 5 or more days per week) from 27% to 35%. The second aim of physical activity is to increase the proportion of adolescents who engage in vigorous physical activity that promotes cardiorespiratory fitness (i.e., 3 or more days per week for 20 or more minutes per occasion) from 65% to 85%. A third aim of physical activity is to increase the proportion of children and adolescents who view 2 or fewer hours of television on a school day from 57% to 75%. Other physical activity objectives identified by Healthy People 2010 are specific to school activity levels and physical education classes. However, they are not consistent with the purpose of this literature review and research; thus, they will not be covered in-depth. Childhood obesity and increasing physical activity levels are of utmost importance for the nation and for individuals whose lives are affected by obesity-related conditions.

Determinants of Childhood Physical Activity

In order to begin the process of preventing childhood obesity, the barriers to physical activity must be identified. The Centers for Disease Control and
Prevention (2008a) defined moderate-intensity physical activity as activities that cause small changes in breathing and heart rate such as vacuuming, brisk walking, gardening, or bicycling. The national recommendation for moderate-intensity physical activity is 30 minutes for 5 days per week. The Centers for Disease Control and Prevention defined vigorous-intensity physical activity as activities that cause larger increases in breathing and heart rate such as running, performing aerobics, or doing strenuous yard work. Vigorous-intensity physical activity should be performed 20 minutes for 3 days per week. Children throughout the nation are not meeting these national physical activity recommendations. The lack of childhood physical activity is due to the complex interaction among many personal, social, and environmental determinants.

**Leisure-Time Preferences**

The personal determinants inhibiting physical activity are unique to each person; however, a few factors show strong significance and generalizability. The first personal determinant is the child’s leisure-time preference. In a review conducted by Philippas and Lo (2005), sedentary behaviors such as television viewing, computer time, and video games have been associated with the increases in a child’s obesity risk. This review concluded that the risk of obesity increased by 530% in adolescents who watched 5 hours of television per day (Philippas & Lo). Their research also emphasized the reason why Healthy People 2010 is striving to decrease the hours of television watched to 2 or fewer. Other personal determinants include time, energy, age, developmental stage, and gender.
Social and Family Influences

Self-esteem is an important overlapping personal and social determinant for physical activity. In a recent study by Ornelas et al. (2007), the parental/social determinants and childhood self-esteem were examined. This study was conducted with a sample of 13,246 7th- to 12th-grade students. All youth were administered at-home interviews and questionnaires regarding family cohesion, parental monitoring, parent-child communication, parental engagement, self-esteem, and depression at baseline and 1 year later. Family cohesion was measured by (a) how much people in their family understand one another, (b) how much fun they have together, and (c) how much attention the family pays to one another. Parental monitoring included items such as curfews, friendships, time and type of television-watching, food choices, and clothing selection. Parent-child communication examined three categories: (a) dating, (b) personal problems, and (c) schoolwork. Parental engagement covered a wide range of activities, including shopping, playing sports, going to movies, playing, visiting museums, attending religious events, and eating meals with their children. In addition to the multifaceted questionnaire, a 7-day moderate-to-vigorous-physical-activity recall was collected. Data showed that family cohesion, parent-child communication, and parental engagement were all significant predictors of five or more bouts of moderate-to-vigorous-physical-activity recall. Parental monitoring was not associated with increases in physical activity. By focusing on self-esteem and depressive symptoms, research showed that family cohesion, parent-child
communication, and parental engagement were all significantly associated with increased adolescent self-esteem and decreased depressive symptoms (Ornelas et al.).

Parental Physical Activity Participation

Parental inactivity is a strong predictor of childhood physical activity levels. Cleland et al. (2005) collected data from 8,484 schoolchildren ages 7 to 15 years old. Children completed a questionnaire regarding their parents’ exercise involvement and their own sports or extracurricular activities. Two measures of cardiorespiratory fitness were collected: (a) a physical work capacity test on an ergonomic bicycle as measured by heart rate and workload and (b) timing of a 1.6-kilometer run/walk. Results revealed that parental exercise showed a positive correlation with a child’s extracurricular sports participation. Children who had two active parents participated in 0.6 more sports than those with two inactive parents. If only one parent was active, the number of sports in which the children participated was significantly higher than if neither parent was active. Children who had two physically active parents completed the 1.6-kilometer run/walk 18 seconds faster for boys and 24 seconds faster for girls compared with children who had two physically inactive parents. Parental exercise was associated with higher physical work capacity scores for girls but not for boys. Girls who had two active parents had a physical work capacity of .76 greater than girls who had two inactive parents. Girls achieved greater scores if only their mother was active than if only their father was active. These results show the importance of having parental
support, communication, and cohesion as well as having parental engagement and modeling for physical activity behaviors (Cleland et al.).

Eriksson, Nordqvist, and Rasmussen (2008) compared children's physical activity participation with the activity patterns of their parents. Results showed that the participation of girls and boys in sport activities was strongly associated with their parents' sport participation. The mothers' participation in sport activities was more strongly associated with girls' participation. Inversely, the fathers' participation more significantly impacted boys' sport participation. Gustafson and Rhodes (2006) supported these findings by stating that parents who are physically active are more likely to support their children in physical activity, both of which show the importance of parental role modeling of physically active lifestyles.

Beets and Foley (2008) explored the impact of joint parent and child physical activity participation. Beets and Foley stated that one of the primary influences of child physical activity levels is direct parental participation with their children in physical activities. The sample of 10,694 kindergarten students and their fathers showed that the amount of time fathers reported spending with their children correlated positively with the amount of physical activity their children received. In the 33 out of the 34 reviewed studies, Gustafson and Rhodes (2006) found a strong correlation between parental support (directly or indirectly) and child physical activity levels. Therefore, parents serve as role models and support networks, both of which can significantly impact the physical activity and sports participation of their children.
The third level of determinants is the environment. A primary environmental barrier is the safety, accessibility, and convenience within the built environment. The built environment encompasses walking paths or trails, cycling roads, public open spaces, parks, and recreation facilities (Dehghan, Akhtar-Danesh, & Merchant, 2005). A second environmental determinant is the mode of transportation that ties the environmental determinants to the social/parental determinants. Parents often make the decision about which mode of transportation children will use. Frank, Andresen, and Schmid (2004) studied 10,878 adults in Atlanta, Georgia, to determine if the mode of transportation influenced weight status. Participants were asked to complete multiple 2-day travel diaries, focusing on the time spent in the car and the distance walked. Their BMI was collected over a 2-year period. Results showed that for each additional kilometer walked, there was a 4.8% decrease in the odds of becoming obese. In contrast, for each additional 60 minutes spent per day in a car, there was a 6% increase in the odds of being obese. Although this study was conducted using adult recall, results could be generalized to children and adolescents since parents make the transportation choice for their children. It can be concluded that the complex interactions among personal, parental, and environmental barriers are important in increasing childhood physical activity levels.
Measurements of Childhood Physical Activity Levels

The measurements of physical activity are numerous; however, a limitation to the majority of the research about measurements is the absence of psychometric data. Reliability, validity, and practicality are important psychometric data to determine the best methods for measuring child and adolescent activity. Appropriate measures for child physical activity levels are direct observation, pedometers and accelerometers, and self-report.

Direct Observation

Direct observation is considered the gold standard for measuring child and adolescent physical activity (Sirard & Pate, 2001). Direct observation is a good tool for measuring physical activity as it examines when, where, and who was participating. Direct observation instruments need to be carefully selected for the age and location of data collection (e.g., preschool-aged children compared with elementary-aged children or physical education classes compared with leisure-time activities). Direct observation has some limitations, including time-intensive data collection and observer training and the possibility for individual reactivity to observers. Despite limitations to the direct observation method, data attained are valuable (J. Hannon, personal communication, September 17, 2007). Extensive studies have used direct observation as the primary measuring tool. Epstein conducted a series of direct-observation studies starting in 1981 with continual research through 1994. In the first direct-observation study, Epstein, Wing, Koeske, Andrasik, and Ossip (1981) developed the Activity Patterns and Energy
Expenditure measure. Observers utilized this instrument to record multiple 15-second intervals of children's activity levels, from sedentary to highly active. Eight trained observers examined 19, 5-year-old to 9-year-old girls. All subjects wore a heart-rate monitor, which was used as the control measure. The interrater reliability between observers was from 86% to 99%, showing strong agreement about the girls' physical activities. When analyzing the criterion validity between the direct observation (i.e., Activity Patterns and Energy Expenditure) measure and the heart-rate control measure, the $r$ value was from .72 to .91 (Epstein et al.).

The System for Observing Fitness Instruction Time is another direct observation instrument that is both reliable and valid. The System for Observing Fitness Instruction Time instrument records three phases: (a) level of physical activity, (b) teacher behavior, and (c) lesson content. In a study conducted by McKenzie, Sallis, and Nadar (1992), the System for Observing Fitness Instruction Time instrument was analyzed using 88 third-, fourth-, and fifth-grade physical education classes. Six System for Observing Fitness Instruction Time-trained individuals observed the various classes. Interrater reliabilities among the observers were above 88%, which is a strong relationship. Strong construct validity was shown among multiple variables. McKenzie et al. concluded that the System for Observing Fitness Instruction Time instrument is both reliable and valid for analyzing children's physical activity levels in a physical education class setting.

The Observational System for Recording Physical Activity in Children-Preschool is a direct observation tool that examines leisure-time activities among
preschool-aged children. The psychometric data for the Observational System for Recording Physical Activity in Children-Preschool tool were researched by Brown et al. (2006). They identified interobserver agreement among four observers at 80%. This direct observation measure is a reliable instrument specific to preschool-aged children in leisure-time activities.

**Pedometers and Accelerometers**

A second tool effective in measuring childhood physical activity is the pedometer and accelerometer. Both devices are small, water-resistant, and typically worn on the right hip located on the midauxiliary line. Pedometers, when worn correctly, can collect steps, distance, and calories. Pedometers are fairly inexpensive and noninvasive. The limitations to pedometer measures are inaccuracies with jogging or running; an inability to detect cycling, lifting, or hill climbing; no intensity or duration specificity; and a high probability of participant tampering (J. Hannon, personal communication, November 5, 2007).

Accelerometers are similar to pedometers; however, accelerometers collect additional physical activity measures. Accelerometers are capable of collecting how active children are, periods of day or week of activity, duration of physical activity, and intensity of physical activity (Le Masurier & Tudor-Locke, 2003).

In a comparison study by Le Masurier and Tudor-Locke (2003), pedometer and accelerometer accuracies were determined. Two conditions were examined in this study: (a) treadmill walking at five speeds and (b) riding in a motorized vehicle. Results showed that at slow walking speeds (54 m*min\(^{-1}\)), the pedometer
detected fewer steps than were actually taken (75.4% compared with 98.9%). Both the pedometer and accelerometer were accurate at detecting activity during quicker walking speeds (i.e., 67 m\(\text{min}^{-1}\), 80 m\(\text{min}^{-1}\), 94 m\(\text{min}^{-1}\), and 107 m\(\text{min}^{-1}\)). In the second study, the accelerometer detected 17 times more erroneous activity than the pedometer when riding in the motorized vehicle. The inaccuracies during slow-walking speeds are not likely an important threat when analyzing children in a leisure setting; that is, children rarely walk at slow speeds not recorded by the pedometer. The researchers concluded that both instruments are reliable and valid instruments based on the results.

Pfeiffer, McInver, Dowda, Almeida, and Pate (2006) studied 18 preschool children 3 to 5 years old. The children were assessed using calorimetry (i.e., control measure) over the course of three visits (i.e., resting session, walking session, and running session). Calorimetry measures the breath-by-breath gaseous composition (i.e., oxygen and carbon dioxide) of expired gases and the total oxygen consumed during exercise. The children were then examined doing their choice of unstructured indoor or outdoor activities at their preschool while wearing the accelerometer. Following measurement, analysis showed that the Spearman correlation coefficient between the two measures was .80. The percentage agreement for interrater reliability was .73 for moderate exercise and .85 for vigorous exercise. Based on the Pfeiffer et al. study, the accelerometer alone is a valid and reliable tool for measuring physical activity levels among children.
Self-Report

Self-report is another method for measuring children's physical activity levels. Various types of self-report methods include (a) diaries, (b) questionnaires, and (c) proxy reports. The most popular type of self-report is questionnaires. Questionnaires are inexpensive, quick to administer, and quantitative or qualitative. Questionnaires have the ability to collect physical activity type, intensity of activity, frequency of activity, and duration of activity. The limitations to questionnaires are cognitive-recall difficulties and overreporting of actual physical activity (J. Hannon, personal communication, September 10, 2007). Telford, Salmon, Jolley, and Crawford (2004) examined both the reliability and validity surrounding the Children's Leisure Activities Study Survey and proxy reports. Two hundred eighty children and their parents were examined. Children completed the Children’s Leisure Activities Study Survey at baseline and after 7 days. The parents of the children completed a proxy report at baseline and again after 14 days. The test-retest reliability between the two measures was from 62% to 94%, respectively, which researchers reported as substantial to perfect agreement. Convergent validity showed a 70% agreement between the two measures; however, low correlations were found between both measures when assessing actual physical activity duration. This study suggested combining the self-report measures with an objective measure such as pedometers and accelerometers for maximum validity (Telford et al.).
The International Physical Activity Questionnaire is a widely used self-report measure. The International Physical Activity Questionnaire has (a) a short version, (b) a long version, (c) a self-administered version, and (d) a telephone version. Craig et al. (2003) determined the psychometrics of this instrument. The International Physical Activity Questionnaire was administered in 12 countries throughout the world. The International Physical Activity Questionnaire produced repeatable data with an $r = .8$. Criterion validity showed an $r = .30$, which was comparable to other self-report instruments. No significant differences were found between the self-report or telephone administration; both were valid measures. To date, the International Physical Activity Questionnaire is one of the most widely used and accepted self-report instruments. Other measures of children's physical activity levels are available, including doubly-labeled water and indirect calorimetry; however, these measures are more invasive, more difficult to use with youth populations, and more difficult to administer in leisure-time activity settings.

Theoretical Perspective

Extensive research has been conducted on the various ways to promote and maintain physical activity in children and adolescents. Valid, reliable, and effective family approaches to increasing childhood physical activity are published and serve as a basis for future research. A key component to successful and convincing interventions is the theoretical perspective. The majority of the interventions completed in the areas of childhood obesity and physical activity is not theoretically derived. Although not clearly applied, the social cognitive theory is
the best link for many family-approach interventions. The social cognitive theory is
the best fit for parent and child physical activity interventions because of its triadic
model in which behavior, personal factors or cognitions, and environmental
influences interact (Glanz et al., 2002). In the case of childhood obesity through
increased physical activity, the behavior of interest is physical activity, personal
determinants such as self-efficacy and rewards are explored, and the parental-
environmental influences all interact to create behavior change.

Social Cognitive Theory

Based on social learning and imitation principles, Bandura (1962) developed
the social learning theory. Bandura soon discovered that children have the ability to
learn behaviors without being directly rewarded through modeling and vicarious
reinforcement. The social learning theory explains that behavior change is due to
behavioral learning through modeling and reinforcement. In 1986, Bandura
renamed the social learning theory to the social cognitive theory, signifying a
change in the behavioral ideology of the theory. Behavior change is not solely
behavioral learning but is also cognitive learning. Over the course of many years,
Bandura continued to publish new frameworks and constructs for the theory,
including the addition of his well-known theory of self-efficacy (Glanz et al.,
2002).

The social cognitive theory “addresses both the dynamics of individual
behavior but also incorporates the external environment, people, and behaviors that
might influence behavior change” (Glanz et al., 2002, p. 181). Bandura (1986)
developed a series of social cognitive theory constructs that are important to understand and implement in behavior change interventions.

**Reciprocal determinism.** Reciprocal determinism is the continuous, dynamic interaction among the three elements of the social cognitive theory: (a) behavior, (b) person, and (c) environment. These elements are constantly influencing one another. A change in the environment will also promote a change in the person and in the behavior.

**Environments and situations.** The environment refers to factors that affect an individual’s behavior, external from an individual (Glanz et al., 2002). In the example of childhood obesity through increased physical activity, the parents would be environmental factors. The parents could be utilized as opportunities for social support. The environment could also include the built environment for physical activities. Situation refers to an individual’s perception of the environment, including real, distorted, or imagined factors (Glanz et al.). A child may perceive the parents’ yelling and hollering at his or her sporting events as negative and unsupportive; however, the parents are trying to encourage and promote activity.

**Observational learning.** Observational learning is often described as modeling. This construct was one of Bandura’s (1962) original constructs: Individuals can learn behaviors by watching others. Individuals can learn the processes associated with the behavior as well as the reinforcements they receive from this behavior. An example of observational learning would be for a child to observe his or her parents’ physical activities so as to learn the necessary skills but
also to learn that the activities are enjoyable. Bandura explained that observational learning is why many people in the same family have common behavior patterns such as eating, smoking, drinking, or wearing seat belts (Glanz et al., 2002).

**Behavioral capability.** Behavioral capability explains that an individual must know what the target behavior is and how to perform that behavior. For a child to engage in soccer for physical activity, the child must know what soccer is and how to manipulate the soccer ball.

**Reinforcements.** Reinforcements are responses to a person’s behavior that increase or decrease the likelihood the behavior will reoccur. There are three types of reinforcements: (a) positive, (b) negative, and (c) punishment. An example of positive reinforcement would be a reward given to a child who plays in a soccer game by treating the child to a day at the swimming pool. The positive reinforcement would increase the likelihood that the child will play in another soccer game. Negative reinforcement also increases the likelihood a behavior will reoccur by withdrawal of a negative stimulus such as removal of the television which will increase the likelihood the child will turn to active play (Glanz et al., 2002). The last type of reinforcement is punishment, which ultimately decreases the likelihood of behavior occurrence. An example of punishment would be a child who is punished for watching 5 or more hours of television after school; this reinforcement will decrease the occurrence of this behavior while attempting to increase other health-promoting behaviors.
Outcome expectations and expectancies. A person learns that certain events are likely to occur in response to one’s behavior. Expectations can be learned in a series of ways: (a) from sharing previous experiences, (b) from observing others, (c) from hearing about others, or (d) from expressing emotional or physical responses to behaviors (Glanz et al., 2002). A child develops an expectation that anytime he or she plays in an organized sport, the child will get a trophy at the end of the season. The child has “learned” to expect the trophy, which promotes physical activity. Expectancies differ from expectations; that is, they are the “values” a person puts on the outcome—either positive or negative. For children in physical activity, they would be more likely to play soccer if they viewed trophies as success and achievement compared with children who do not view trophies as success and achievement.

Self-efficacy. Bandura (1986) defined self-efficacy as “the confidence a person feels about performing a particular activity, including confidence in overcoming barriers to perform that behavior” (as cited in Glanz et al., 2002, p. 173). Self-efficacy affects how much effort is put into a particular activity. Through successful performance of a particular activity, self-efficacy promotes persistence, initiation, and endurance for behavior change. An example of self-efficacy would be a preschool child examining the slide on a playground jungle gym. The preschool child must have confidence about traveling down the slide and the advantages to the slide must outweigh the barriers for the child to perform the sliding behavior. Following the child’s first slide, the child will have higher self-
efficacy to perform the behavior repeatedly.

**Self-control.** Self-control includes monitoring one’s own behavior and gaining control over the performance and completion of goals (Glanz et al., 2002). Goal setting, self-monitoring, problem solving, and confidence building are effective techniques to self-control.

**Emotional arousal.** “Bandura recognized that excessive emotional arousal inhibits learning and performance” (as cited in Glanz et al., 2002, p. 174). Fear, anxiety, hostility, and anger are all signals of excessive emotional arousal. Similar to self-control, techniques such as problem solving and stress management help to control excessive emotional arousal. An example of emotional arousal would be if a child fears playing on the playground with other classmates due to fear of injury. The child is less likely to play on the playground because of this fear. The child must utilize problem-solving and emotional-coping techniques to realize that there is little threat of injury on the playground if care and safety are exercised.

The social cognitive theory has a few limitations. Any measurement tool for testing the constructs of the social cognitive theory lacks reliability and significant correlations among variables, which might explain why there are few studies in the areas of childhood obesity, physical activity, and parental involvement that directly apply the constructs of social cognitive theory. Second, Bandura’s (1986) constructs are extensive and all-encompassing. Glanz et al. (2002) suggested that researchers and health educators specify which constructs apply to a particular behavior, person, and environment.
Social Cognitive Theory Interventions

As mentioned previously, few intervention studies have directly applied constructs from the social cognitive theory. The principles taught during the intervention sessions incorporate some of Bandura’s (1986) social cognitive theory constructs, although they are not explicitly stated. Researchers of the following studies focused on a few of the social cognitive theory constructs rather than trying to examine the entire list of constructs.

Parents compared with children and the social cognitive theory. Golan and Crow (2004) targeted parents as the sole agents of physical activity behavior change. This 7-year longitudinal, randomized, control trial examined the effects of interventions on 50 children ages 14 to 19 and their parents. The participants were randomly assigned to either a parent-only group or a child-only group. The parent-only group received 14, 1-hour sessions that included nutrition and physical activity education (i.e., behavioral capability); behavior modification; parental modeling (i.e., observational learning); problem solving (i.e., self-control); coping (i.e., emotional arousal); and authoritative parenting styles. The child-only group received 30, 1-hour sessions that included nutrition and physical activity education (i.e., behavioral capability); self-monitoring; and problem-solving (i.e., self-control) skills. Height and weight measures were taken at 1, 2, and 7 years. The results of the study indicated that children in the parent-only group showed a significant decrease in the percentage overweight compared with the child-only group (14.6% compared with 8.43%) for all collection periods (Golan & Crow).
Golan and Crow concluded that interventions targeting parents as influential role models and authority figures for physical activity change are more influential than reaching children alone.

**Parent-child teams and the social cognitive theory.** Another intervention worked with similar principles (Golan & Crow, 2004). Epstein et al. (1987) added an experimental group composed of a parent and child team. Epstein et al. predicted that having a parent-child group would show better maintenance of weight than children who were treated without their parents. Subjects in this longitudinal, randomized, control trial included 67 families; children were between the ages of 6 and 12 years old. Weight and height measurements were recorded at 2, 8, 21, and 60 months. Subjects were randomized to a child-only group, a parent-child combination, and a nonspecific control group—which was composed of the general public in a nonhealth-related focus group. The intervention for the two experimental groups consisted of 14 sessions over 8 months, focusing on nutrition and exercise education (i.e., behavioral capability); self-monitoring (i.e., self-control); social reinforcement (i.e., reinforcement); and self-determination goal setting (i.e., self-control). All groups showed a decrease in percentage overweight from 0 to 8 months because of the intervention being administered for 8 months. All groups showed an increase in percentage overweight after 8 months; however, at 60 months, the parent-child team was the only team that maintained their weight below the baseline levels (Epstein et al.). Results from the Epstein et al. study showed that beyond the parent-only group (Golan & Crow), the parent-child team
interventions promote and maintain behavior changes.

**Obesity prevention and behavioral capability construct.** Harvey-Berino and Rourke (2003) examined maternal participation in obesity prevention among Native American preschool students. A sample of 43 mother-child pairs was randomly selected. The children were between 9 months and 3 years of age. All children were able to walk; thus, pedometer data collection was attained. The subjects were randomly assigned to one of two treatment groups. The first group was a parenting support group. Intervention curriculum for the parenting support group included goal setting (i.e., self-control); consequences (i.e., outcome expectations); mutual respect; and encouragement techniques (i.e., reinforcements). The first group was not educated on nutrition or physical activity principles. The second intervention group consisted of obesity prevention plus parenting support. Curriculum for the obesity prevention plus parenting support group included nutrition and physical activity education (i.e., behavioral capability) as well as parenting principles that the parenting support group received. Both intervention groups met for 16 weeks in each participant’s home. Height and weight measurements were taken at baseline and after the 16-week interventions. Parents for all groups were asked to record 3-day food logs. All parents and children wore TriTrac (TriTrac-R3D Research Ergometer; Hemokinetics, Inc., Madison, WI) accelerometers for the same 3 days as the food log recording. Results from the study showed that the BMI for the obesity prevention plus parenting support group significantly decreased over the 16-week intervention compared with increases in the parenting support group’s
BMI. Children in the obesity prevention plus parenting support group decreased their overall energy intake and children in the parenting support group increased their overall energy intake. The researchers concluded that home-visiting interventions focused on changing parenting behaviors and that lifestyle behaviors show promise for obesity prevention among Native American children. It is important to implement behavioral capability techniques in order to change physical activity behaviors.

Increasing physical activity through environment construct. Davison, Cutting, and Birch (2003) emphasized the importance of family-approach research and the parental role in behavior change. The goals of their study were to (a) determine differing parenting styles, (b) link these parenting styles to physical activity, and (c) determine the influence of parental role modeling and encouraging children’s physical activity levels. Subjects included 180 9-year-old girls and their mothers and fathers. A questionnaire was administered to the parents of the girls in order to assess their parenting styles—either logistical or explicit support. Logistical support is enrolling the child in sports, supporting the child at sporting events, and enabling the child to be active. Explicit support uses the parents’ own behavior to encourage child activity (i.e., parents who enjoy being active) and also uses sport as a family activity. Internal consistency among the questionnaire items was between .61 and .75. Girls’ physical activity was measured using the Children’s Physical Activity scale and activity checklists. Weight and height measures were also collected to determine changes in the girls’ BMI. Results
showed that mothers use more of the logistical parenting style, whereas fathers use explicit support methods. Mothers tend to enable the girls to engage in physical activities, whereas fathers show active interactions with the girls. The more parental support the girls received, the more likely they would increase vigorous activity levels (Davison et al.). Therefore, Davison et al. concluded that it is important to have both parents supporting physical activities in their children, independent of their differing parenting styles, as both are effective.

In summary of the interventions to date, parents play an influential role in promoting and maintaining physical activity behaviors in their children and adolescents. The various roles that parents play in physical activity promotion tie into the social cognitive theory constructs of observational learning, environment, outcome expectations, reinforcements, and self-control. The different roles that are important for parents to fill are as role models, support networks, and authority figures. As role models, parents engage in active lifestyles and establish active family structures. As support networks, parents enroll their children in sports, communicate with their children about physical activities, and show their children active interactions. Finally, as authority figures, parents reinforce behaviors, establish ground rules, and help with goal setting and attainment. Successful interventions have shown that the roles parents play are effective in increasing and maintaining physical activity and in decreasing weight gain during childhood.
Limitations of the Current Literature

The research focusing on childhood obesity through increased physical activity is extensive and diverse. In the literature examined for this review, a series of limitations were addressed and uncovered in the areas of population selection, theoretical background, and interventions. In the area of population selection, a majority of studies conducted in the United States used Caucasian children as participants. Davison et al. (2003) stated that more diverse samples (i.e., ethnic groups) and families with alternative living situations (i.e., single-parent families, low socioeconomic status, or children being raised by grandparents) should be examined to determine if different conditions exist for diverse populations. In the studies examined for this review, the largest sample size used for interventions was 67 families. Harvey-Berino and Rourke (2003) stated that recruiting larger sample sizes would facilitate the detection of change among groups. Larger sample size is a control measure that would be effective in increasing both reliability and validity measures while also giving the option of comparing different ethnic groups or family structures.

There is also a lack of research that is theoretically based. Various intervention studies have incorporated constructs from the social cognitive theory; however, these studies did not prove that the social cognitive theory construct changed the behaviors. Cole, Waldrop, D'Auria, and Garner (2006) stated that successful interventions for childhood obesity should consider the principles of the social cognitive theory: “The social cognitive theory stresses assessment of the
cognitive skills of children and the need to provide children with the opportunity to
rehearse, organize, and recall new behaviors” (p. 176). Cole et al. echoed the
importance of directly using and applying the social cognitive theory to physical
activity interventions.

A majority of the interventions addressed are in school settings. Schools
provide an optimal environment for the recruitment of children and families.
Lindsay, Sussner, Kim, and Gortmaker (2006) suggested that new interventions
should replace those that are based in the school alone with strategies that affect
diverse settings such as the community, neighborhood, health care, home, or
recreation. A majority of the interventions are knowledge based. The intervention
curriculum is effective in providing children and families with nutritional and
physical activity information, strategies to cope, goal-setting strategies, modeling
strategies, and problem-solving strategies. However, it has been hypothesized that
“knowledge does not always equate to behavior change” (L. Durrant, personal
communication, August 29, 2006). Alternative methods should be employed to test
retention and practice of behavior change knowledge and skills.

A final gap in the current literature motivated the current research: the
long-term influences of parental involvement. It is clear that parents are positive
influences upon immediate increases in children’s physical activities. However,
there is little or no research to date that examines if parental influence has long-
term effects on physical activity patterns.
Summary

The strong association between increasing children’s immediate physical activity participation and parental involvement is well documented. Children’s physical inactivity increases the risk for becoming overweight or obese. Obesity is correlated to many weight-related diseases, including type 2 diabetes, hypertension, sleep apnea, depression, and adult obesity. Possible reasons for childhood inactivity levels are the complex interactions among many personal, social, and environmental determinants. One overlapping determinant in the three categories is parental involvement. Recent research suggests that family support, cohesion, and communication are important factors in promoting childhood physical activity. Similarly, parents play important roles as role models, supporters, reinforcers, and authority figures—all of which are important in increasing physical activities among children.

The social cognitive theory, although not directly applied to physical activity interventions, has been shown to increase physical activity among children when implemented with parental support. The social cognitive theory is extensive and all-encompassing; however, select constructs have appeared in multiple intervention curriculums, including behavioral capability, self-control, observational learning, outcome expectations, reinforcements, and emotional arousal. The motivation for the current research was that little or no research to date has examined if parental influence has long-term power on children’s physical activity levels.
The purpose of this study was to determine the relationship between parental involvement during childhood and current physical activity levels. A questionnaire developed from the social cognitive theory constructs of observational learning, behavioral capability, reinforcement, and self-control was used to achieve the purpose of this study.
CHAPTER 3

METHODOLOGY

Purpose

The primary aim of this study was to determine how physical activity upbringing (i.e., role modeling, encouragement, and communication) correlates to current adult physical activity patterns and weight status. The secondary aim of this study was to determine if there is a relationship between physical activity upbringing and how parents or guardians raise their children.

Study Design

A cross-sectional, retrospective study design utilizing a self-administered 32-question survey was used. This type of design was selected in order to provide one-time measurement of numerous variables, including demographics, BMI, recall of parental physical activity upbringing, assessment of current physical activity levels, and parenting styles. Obtaining one-time measurements of these variables allowed for examination of the associations among variables. One disadvantage of the study design was that cause-and-effect relationships among variables could not be identified.
Population and Sample

The convenience sample consisted of employees working at local corporations located in Utah. The questionnaires were administered in various facilities located in 20 counties throughout Utah. The facilities where the questionnaires were administered were not randomly selected; rather, they were selected based on procedures given by the Apple Program. The facilities were selected because they had a large number of employees and because there were multiple locations throughout Utah.

The Apple Program is an organization that implements corporate wellness and disease management programs for companies throughout the United States. The Apple Program utilizes personal health coaches, health education, and behavior modification skills to help participants engage in healthy lifestyles such as nutrition, diet, and tobacco cessation. I was employed as the health promotion specialist by the Apple Program, which is why this population was selected to administer the questionnaire.

The Apple Program conducts annual biometric assessments for all of the contracted facilities. The Apple Program personnel travel to each facility location and assess baseline measures for all employees who participate in the wellness or disease management program. The assessments analyze blood pressure, total cholesterol, high-density and low-density lipoproteins, triglycerides, blood glucose, BMI, percentage body fat, tobacco usage, and other chronic disease markers. I chose to administer the survey at these annual assessments because they provide
access to a large and diverse sample from Utah. In 2007, the facilities under contract with the Apple Program covered a wide range of industries: (a) car maintenance and sales, (b) Internet sales and marketing, (c) state and county employees, (d) food, (e) health and fitness equipment, (f) youth residential facilities, (g) health care, and (h) various types of manufacturing plants. Five hundred fifty-eight questionnaires were collected from the various facilities. The population included full- or part-time employees of the facility, with sample age ranges from 18 to 70 years. Male and female ratios were determined by statistical analysis.

**Measures**

The questionnaire had four parts. Part I collected basic demographic information (e.g., county residing in Utah, age, gender, education level, ethnicity, and occupation). Part II was designed to recall parental physical activity upbringing. This part of the survey was composed of a collection of previous surveys. The first selection was from the Social Support and Exercise Survey (Sallis, 1986). This survey was composed of a list of items that an individual might say or do to someone who was trying to exercise regularly. The questions were altered from a 3-month recall period to a recall of their childhood. The second selection of questions was from a dissertation entitled “Using the Social Cognitive Theory to Investigate Physical Activity in Middle-Aged and Older Married Couples: A Dyadic Perspective” (Ayotte, 2007). These questions specifically addressed family support for physical activity set on a Likert-type scale. These
questions were also altered from a 12-month recall to that of the participants’ childhood.

For the purpose of this study, 14 recall questions were selected. The question topics included (a) parental physical activity role modeling; (b) parental physical activity encouragement (e.g., sports enrollment, transportation, watching participation, and rewards); and (c) parental communication. The structure of all the recall questions was on a Likert-type scale, ranging from 0 (never) to 5 (very often) during childhood.

Part III of the questionnaire addressed the participants’ current physical activity levels. The International Physical Activity Questionnaire—Short Self-Administered Format was selected for data collection. The International Physical Activity Questionnaire was originally developed in Geneva, Switzerland, in 1998. The International Physical Activity Questionnaire has endured vigorous reliability and validity testing in more than 12 countries, which has proved the instrument to be acceptable and suitable for population-based studies of physical activity participation (Craig et al., 2003). The International Physical Activity Questionnaire was designed for use on young and middle-aged adults between 15 and 69 years old (International Physical Activity Questionnaire, 2002). This short version of the International Physical Activity Questionnaire was comprised of four generic items of analysis: (a) vigorous physical activity, (b) moderate physical activity, (c) walking, and (d) sitting. These items were recalled over the past 7 days, including any activities participated in at work; in one’s house or yard; to get from
place to place; and in recreation, exercise, or sport. In general, questions asked the participants to recall how many days they participated in these types of activities and how many hours and minutes they engaged in the activity.

Participants who were currently parents or guardians completed the final part of the questionnaire. If the participants were not parents or guardians at the time of administration, they were not required to fill out Part IV of the questionnaire. These questions focused on current parenting habits. These items were selected from a survey used by Davison et al. (2003) and focused on activity-related parenting practices. The questionnaire items were simplified so that one Likert-type scale was utilized, which is in contrast to the multiple Likert-type scales in the Davison et al. study. These items addressed the importance of physical activity role modeling, encouragement, and communication in the participants’ children’s physical activity participation. The final question addressed whether the participants’ physical activity upbringing impacted how they raised their children.

An “administrator only” textbox was located on the final page of the questionnaire. Before the questionnaire was distributed to the participants, the Apple Program specialist who was conducting the assessment filled out this section. Information completed by the administrator included height in inches and weight in pounds, which are the two standard protocol measures examined by the Apple Program assessments; therefore, data were current and accurate. The Apple Program staff submitted a letter to me, permitting participant weight and height to
be collected, documented, and used for research purposes following the assessments. The Apple Program permission letter was submitted to the Institutional Review Board prior to questionnaire administration.

Prior to administration of the surveys at the various locations, a series of sample questionnaires were administered to assure clarity and ease-of-use. Forty-three University of Utah students were selected to examine and complete the questionnaire. Following completion of the questionnaire, students were asked whether they understood all of the questions, whether they would change or clarify any items, and whether the questionnaire was easy to use. Minimal changes were made to the questionnaire following this sample set.

**Procedure**

Before questionnaire administration, all of the facilities were contacted at which the participants' information would be gathered. All facilities received a copy of the questionnaire as well as a letter of authorization to conduct research at the facility. Each facility was notified of the study protocol and confidentiality agreements. Following notification, the facilities were asked to copy, print, and sign two letters of authorization on their company letterhead. One copy of the letter was submitted to me and the second copy was kept for the facility's records. As an incentive for all facilities to participate in the research study, I agreed to implement an educational component (i.e., seminars, classes, or newsletters) following data analysis and conclusion. I also agreed to use the research to educate all Apple Program participants on childhood obesity statistics, childhood obesity
links to adulthood, physical activity benefits, and any correlations between physical activity participation and parental involvement. All letters were submitted to the University of Utah Institutional Review Board for review and approval prior to questionnaire administration.

At the Apple Program assessments, the questionnaires were administered to the participants at the final stage of the assessment or check-out. The Apple Program specialist checking-out the participants distributed the questionnaires to each participant. The questionnaire cover page was an informed consent for the research, specifying collection of BMI data and utilization of questionnaire data for research purposes only. The informed consent outlined procedures for privacy, anonymity, and confidentiality. The participants gave their consent to participate by returning the completed survey to me. After completion of the questionnaire, each participant received a water bottle as an incentive prize.

Analytical Plan

The following factors were used as variables in the analysis: (a) age, (b) BMI, (c) education level, (d) occupation, (e) physical activity and parental involvement recall codes, (f) current physical activity level, and (g) current parenting practices. Statistical analyses were performed using SPSS 14.0 for Windows (Chicago, IL). Descriptive statistics were calculated to determine population characteristics. Frequencies were calculated to determine mean responses and response percentages among all participants. Finally, bivariate correlations calculated Pearson product-moment correlation coefficients and $p$
values to determine significance, extent, and direction of the associations among parental physical activity upbringing and weight status, current adult physical activity levels, and how parents raise their children.
CHAPTER 4

RESULTS

Data Analysis

Three procedures were selected for statistical analysis. Descriptive statistics were computed to determine participant demographics, including geographic area, age, gender, education level, ethnicity, and occupation. Frequencies were performed to determine participant responses to physical activity upbringing and current parenting habits survey questions. Correlational analyses were conducted to assess relationships among the following factors: (a) physical activity upbringing and current physical activity levels, (b) physical activity upbringing and current adult weight status, and (c) physical activity upbringing and current parenting habits for those participants who had children. Composite scores were calculated for physical activity upbringing variables and current parenting habits in order to simplify statistical analyses. A composite score for parental physical activity upbringing was computed by averaging the 13 scores for all of the parental physical activity upbringing correlations. The current parenting habits composite score was calculated by averaging the 4 current parenting habit scores. A series of exploratory variables were analyzed to determine relationships between demographic data and physical activity outcomes. All statistics were calculated using SPSS 14.0 for Windows (Chicago, IL) with an alpha level of .05 for
Participant Demographics

Five hundred fifty-eight adults working in various facilities throughout Utah completed the study questionnaire. Participants who failed to complete the questionnaire in its entirety \( n = 52 \) were discarded from all analyses. From this population, 372 participants had children; therefore, they completed the current parenting habits section (Part IV) of the questionnaire. The sample consisted of participants from 10 counties in Utah. Four (.7%) participants were from Box Elder County, 42 (7.5%) from Davis County, 1 (0.2%) from Morgan County, 297 (53.2%) from Salt Lake County, 4 (0.7%) from Summit County, 9 (1.6%) from Tooele County, 1 (0.2%) from Uintah County, 82 (14.7%) from Utah County, 60 (10.8%) from Washington County, and 58 (10.4%) from Weber County. The sample consisted of 221 females and 337 males. The average age among participants was 37.86 ± 12.04 years. The majority of the population was Caucasian \((N = 522, \, 93.5\%)\), and the remaining 6.5% of the population included a wide range of nationalities. One participant was Asian (0.2%), 3 were African American (0.5%), 7 were Pacific Islander (1.3%), 23 were Hispanic (4.1%), and 2 were Native American (.4%).

Participants reported their level of education in Part I of the questionnaire. As illustrated in Figure 1, 44.8% of the population completed some college and the other 55.2% of the population created a bell curve for education level. The demographic data for occupation show that this study examined a large number and
Figure 1. Participant demographic data for education level.
range of employers. As displayed in Figure 2, a significant number of the participants worked in the professions of administration (11.0%), finance (12.0%), food (13.4%), maintenance (21.1%), and sales (19.2%). A small number of the participants covered the additional 11 categories of occupations.

A probing question asked the participants to identify the level of difficulty recalling their parental physical activity upbringing in Part II of the questionnaire. The purpose of this question was to determine if memory recall would bias the results of this study. Of the participants, 37% stated the recall was very easy, 42.1% thought it was easy, 18.3% reported the recall to be moderate, and 1.6% stated the recall was hard. No participants thought the information recall was very hard.

In Part II of the questionnaire, the participants were asked to identify their weight status as a child. Among the 558 participants, 102 (18.3%) reported being underweight, 352 (63.1%) reported being normal weight, 81(14.5%) reported being slightly overweight, and 23 (4.1%) reported being overweight. In addition to child weight status recall, participant BMI was computed. Prior to distributing the questionnaire, Apple Program personnel completed the participants' weight status section of the questionnaire. The participants' height, weight, and BMI were completed in order to correlate findings with current weight status. The mean BMI for the population was 27.61 ± 6.05. The average BMI of 27.61 placed this population in the overweight category as defined by the Centers for Disease Control and Prevention (2008b). The range of BMI scores was from 17 to 55.
Figure 2. Participation demographic data for occupation.

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (n=16)</td>
<td>2.9%</td>
</tr>
<tr>
<td>Student (n=3)</td>
<td>0.5%</td>
</tr>
<tr>
<td>Sports (n=4)</td>
<td>0.7%</td>
</tr>
<tr>
<td>Sales (n=107)</td>
<td>2.5%</td>
</tr>
<tr>
<td>Other (n=14)</td>
<td>1.3%</td>
</tr>
<tr>
<td>Marketing (n=27)</td>
<td>4.8%</td>
</tr>
<tr>
<td>Management (n=27)</td>
<td>1%</td>
</tr>
<tr>
<td>Maintenance (n=118)</td>
<td>0.4%</td>
</tr>
<tr>
<td>Legal (n=2)</td>
<td>1.8%</td>
</tr>
<tr>
<td>Information technology (n=10)</td>
<td>4.5%</td>
</tr>
<tr>
<td>Health care (n=25)</td>
<td>12.0%</td>
</tr>
<tr>
<td>Food (n=75)</td>
<td>1%</td>
</tr>
<tr>
<td>Finance (n=67)</td>
<td>2.3%</td>
</tr>
<tr>
<td>Executive (n=13)</td>
<td>11.1%</td>
</tr>
<tr>
<td>Arts (n=9)</td>
<td>2.4%</td>
</tr>
<tr>
<td>Administration (n=62)</td>
<td>19.2%</td>
</tr>
<tr>
<td>Management (n=27)</td>
<td>21.1%</td>
</tr>
</tbody>
</table>
Current Adult Physical Activity Patterns

Part III of the questionnaire assessed the participants' current physical activity patterns based on their participation in vigorous, moderate, walking, and sitting activities. Vigorous activities were defined by hard physical effort that makes the participants breathe much harder than normal. Examples of vigorous physical activities are heavy lifting, digging, participating in aerobics, or fast bicycling. Among the 558 participants, they averaged 2.34 ± 1.83 days of vigorous activity on those days averaging 70.25 ± 88.35 minutes of activity.

Moderate physical activity was defined as activities that take moderate physical effort and make participants breathe harder than normal (e.g., carrying light loads, bicycling, and playing doubles tennis). Participants engaged in 2.96 ± 2.15 days of moderate physical activity. On those 2.96 days, the participants engaged in 98.98 ± 125.26 minutes of moderate activity.

Walking activities were separated from both vigorous and moderate activities. Walking activities could involve activities at home, work, travel, recreation, sport, exercise, or leisure. Participants walked for more than 10 minutes on 4.78 ± 2.39 days, and they walked an average of 2.27 hours or 136.38 ± 172.23 minutes on those days. Amount of time sitting during the weekdays was the final activity analyzed in Part III of the questionnaire. Participants spent an average of 298.05 minutes ± 201.82 or almost 5 hours sitting on an average weekday, including time sitting at work and during leisure time.
Research Questions

Research Question 1

The composite score for physical activity upbringing was used for these analyses. Results identified significant relationships between parental physical activity upbringing and current physical activity patterns. The physical activity levels were categorized into vigorous, moderate, walking, and sitting activities. Days and minutes for all categories were identified except for days spent sitting.

As shown in Table 1, weak yet significant relationships were shown between parental physical activity upbringing and days of vigorous physical activity as well as minutes of vigorous physical activity and days of moderate physical activity. No correlation was found between physical activity upbringing and

Table 1

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pearson</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days of vigorous physical activity*</td>
<td>0.138</td>
<td>0.001</td>
</tr>
<tr>
<td>Minutes of vigorous physical activity*</td>
<td>0.093</td>
<td>0.028</td>
</tr>
<tr>
<td>Days of moderate physical activity*</td>
<td>0.114</td>
<td>0.007</td>
</tr>
<tr>
<td>Minutes of moderate physical activity</td>
<td>0.053</td>
<td>0.213</td>
</tr>
<tr>
<td>Days spent walking for more than 10 minutes</td>
<td>0.073</td>
<td>0.087</td>
</tr>
<tr>
<td>Minutes spent walking</td>
<td>0.048</td>
<td>0.262</td>
</tr>
<tr>
<td>Minutes spent sitting on a weekday</td>
<td>-0.045</td>
<td>0.291</td>
</tr>
</tbody>
</table>

*Statistically significant, alpha = .05.
minutes of moderate physical activity, days spent walking, minutes spent walking, or time spent sitting during the weekday.

Research Question 2

In order to determine whether there was a relationship with parental physical activity upbringing and current adult weight status, Pearson product-moment correlation coefficients were calculated. In order to simplify the physical activity upbringing results, a single composite score was utilized. Results showed a weak negative relationship between physical activity upbringing and current adult weight status ($r = -0.210$, $p < 0.001$) that was significant. The correlation showed an inverse relationship between physical activity upbringing and current adult weight status. The stronger the physical activity upbringing, the lower the current adult weight as determined by current BMI scores.

When specific physical activity upbringing questions in Part II of the questionnaire were analyzed, in contrast to the composite score, interesting data were revealed. Survey questions 1 through 11 were all positively phrased questions such as my parents participated, planned, encouraged, enrolled, praised, or rewarded my physical activity participation. All of these questions showed a weak yet significant relationship with current adult weight status ($r = -0.111$ through $-0.229$, $p < 0.01$). Survey questions 12 and 13 were negatively phrased questions such as my parents criticized or forced my physical activity participation. These questions showed no significant relationship with current adult weight status ($r = -0.41$ and $0.063$, $p > 0.137$).
Research Question 3

Composite scores for physical activity upbringing and current parenting habits were calculated and analyzed to answer this research question. A significant relationship was found between physical activity upbringing and how parents raised their children ($r[337] = .355, p < .001$). This correlation is a moderate positive relationship between parental physical activity upbringing and current parenting habits. A strong physical activity upbringing increases the strength of how parents encourage physical activity among their children.

In examining the specific physical activity upbringing scores rather than the composite scores, again, all positively phrased questions showed a significant relationship with current parenting habits ($r[337] = .186$ through $r[337] = .319, p < .01$) and the negatively phrased questions showed no significant relationship ($r[337] = -.013$ through $r[337] = .057, p > .493$).

Exploratory Analyses

Several exploratory analyses were conducted to define other correlations and significant relationships among variables. Four correlations were conducted using BMI. A weak yet significant and positive correlation was shown between age and BMI ($r[558] = .241, p < .001$) and between child weight status and BMI ($r[558] = .380, p < .001$). A weak, significant, and inverse correlation was shown between education and BMI ($r[558] = -.098, p = .021$). In looking at the relationships between current physical activity patterns and BMI, a number of significant correlations were revealed. As shown in Table 2, the only correlation
Table 2

Correlations Between Body Mass Index and Current Physical Activity Patterns

<table>
<thead>
<tr>
<th>Activity</th>
<th>Pearson</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days of vigorous physical activity*</td>
<td>-0.120</td>
<td>0.005</td>
</tr>
<tr>
<td>Minutes of vigorous physical activity*</td>
<td>-0.115</td>
<td>0.007</td>
</tr>
<tr>
<td>Days of moderate physical activity*</td>
<td>-0.890</td>
<td>0.036</td>
</tr>
<tr>
<td>Minutes of moderate physical activity*</td>
<td>-0.112</td>
<td>0.008</td>
</tr>
<tr>
<td>Days spent walking for more than 10 minutes*</td>
<td>-0.155</td>
<td>0.000</td>
</tr>
<tr>
<td>Minutes spent walking</td>
<td>-0.069</td>
<td>0.105</td>
</tr>
<tr>
<td>Minutes spent sitting on a weekday*</td>
<td>0.093</td>
<td>0.029</td>
</tr>
</tbody>
</table>

*Statistically significant, alpha = .05.

that was not significant was the number of minutes spent walking and BMI 

time spent sitting during the weekday had a positive correlation to BMI.

One of the questions in Part II of the questionnaire asked participants to rate
the level of difficulty answering the retrospective physical activity upbringing
questions. The composite score for physical activity upbringing was compared with
the participants’ perceptions of difficulty. A weak yet significant relationship was
shown between physical activity upbringing and level of difficulty answering the
questions (r[558] = -.203, p < .001). The correlation showed an inverse
relationship between the composite score and level of difficulty answering the questions.
CHAPTER 5

DISCUSSION

This study analyzed the relationship between parental physical activity upbringing and current physical activity patterns, current BMI, and how parents raise their children. Five hundred fifty-eight surveys were completed to determine these three relationships and various demographic variables, including county, age, gender, occupation, education level, and ethnicity. Additional exploratory results were examined to expand the scope and findings of the study. The results and methodology of the study are discussed in this section. This summary highlights the strengths and limitations of the study and also provides recommendations for future research focusing on physical activity and childhood obesity prevention.

Major Findings

The population characteristics and demographic information reported by the 558 surveys were comparable to national statistics. In Utah, 84.9% of the population is Caucasian (Centers for Disease Control and Prevention, 2006a), and the sample for the current research study was 93.5% Caucasian. Similarly, Utah is 0.5% African American, and the current study was 0.4% African American. The percentages of Hispanic, Asian, and other ethnic groups were not consistent with the Centers for Disease Control and Prevention’s data of Utah’s ethnicity. The
research population was more educated than Utah’s averages, as provided by the Centers for Disease Control and Prevention’s Behavioral Risk Factor Surveillance System (Centers for Disease Control and Prevention). The Behavioral Risk Factor Surveillance System reported that 7.7% of Utah’s population earned less than a high school degree, and the current research showed that only 2.5% of the 558 participants did not receive a high school degree. The college graduate group was consistent with the Centers for Disease Control and Prevention’s Behavioral Risk Factor Surveillance System data; that is, 28.3% of the research population were high school graduates compared with 29.4% in Utah. Of the research population, 64.5% continued their education into college, and only 31.5% of Utah’s population obtained education beyond the high school level. Finally, few in the research population continued to pursue a postcollegiate degree (4.7%) compared with Utah’s postcollegiate data of 31.4% (Centers for Disease Control and Prevention). Data show that the sample population compiled for this study was similar to Utah’s demographic information.

The participants’ weight status identified an interesting comparison with nationwide and Utah statistics. The Centers for Disease Control and Prevention (2006a) reported that adults between the ages of 20 and 74 (i.e., the prevalence of obesity as measured by the BMI) had increased from 15.0% to 32.9% in the last 30 years. The increasing trend of adult obesity rates is consistent with the increasing prevalence of childhood obesity. The adult BMI scale is as follows: (a) less than 18.5% are underweight, (b) 18.5% to 24.9% are normal, (c) 25.0%
to 29.9% are overweight, and (d) greater than 30.0% are obese. Research shows that the mean BMI for the population was 27.61. The BMI shows that the population, on average, is considered to be overweight as measured by the adult BMI scale. Utah reports that 42.1% of the population has a BMI of less than 25, 35.6% are between 25 and 29.9, and 22.4% have a BMI greater than 30 (Centers for Disease Control and Prevention). Research also shows that 35.5% of the sample have a BMI of less than 25, 33.6% were between 25 and 29.9, and 30.9% have a BMI greater than 30; these statistics show that the research sample was consistent with Utah’s obesity rates. However, slightly larger percentages were in the overweight and obese categories. This finding could be based upon the fact that the Behavioral Risk Factor Surveillance System is a self-reported analysis, and the weight status in the current study was measured by BMI. Based on the demographic comparisons with Utah’s data and nationwide Centers for Disease Control and Prevention data, the research sample was a good representation of the general population.

The exploratory findings indicate that older adults have higher BMI levels. This finding can be attributed to differences in lifestyles, as many individuals become sedentary in their older age. Individuals who had lower education levels showed higher BMI levels. This result can be attributed to a lack of knowledge about the health benefits of physical activity or ways to make more health-conscious decisions. The level of difficulty in answering the retrospective questions was analyzed to determine possible correlations, with a correlation between the
parental physical activity upbringing responses and the degree of difficulty answering the questions. Therefore, participants who had a weaker physical activity upbringing had a more difficult time answering the questions, which could be a threat to the validity of these results due to memory recall problems. Because of cognitive difficulties in recalling their childhood, the participants may have erroneously reported their physical activity upbringing.

Current Adult Physical Activity Patterns

The research sample completed the International Physical Activity Questionnaire, which examined their current participation in vigorous, moderate, walking, and sitting activities. The American College of Sports Medicine (2007) provides the gold standard recommendations for vigorous and moderate physical activity participation. The American College of Sports Medicine recommends that adults under the age of 65 and void of chronic conditions should engage in 20 minutes of vigorous intensity physical activity on 3 or more days of the week. Research shows that the sample population engaged in an average of 70.25 minutes of vigorous physical activity on 2.34 days of the week. Similarly, the American College of Sports Medicine recommends that adults participate in 30 minutes of moderate intensity physical activity on 5 or more days of the week. The research population participated in 98.98 minutes of moderate activity on 2.96 days of the week.

These comparisons with the recommendations of the American College of Sports Medicine (2007) show that the sample population engaged in longer bouts of
moderate and vigorous physical activity but did not meet the recommended days per week in either moderate or vigorous physical activity. The longer bouts of physical activity can be correlated with the occupations of the majority of the population. Twenty-one percent of the population were in maintenance occupations and an additional 19.2% were in sales positions. Both occupations are active in nature in which employees are typically standing, walking, lifting, stocking, repairing, or performing other similar duties. The sample population may not have met the recommended number of days in either moderate or vigorous physical activity due to the majority of their physical activity participation during work hours. The physical activities during work hours contribute to the overall participation; however, findings suggest that participants do not participate in enough leisure-time physical activities outside of the work setting. The fact that adults do not participate in enough leisure-time physical activity is evident by one of the Healthy People 2010 objectives: to decrease the number of adults who incorporate no leisure-time physical activity from 40% to 20% (Centers for Disease Control and Prevention, 2000).

The exploratory analyses examining current physical activity patterns and BMI identified significant correlations. Individuals who had high levels of vigorous, moderate, and walking activities all correlated with lower BMI levels. This finding is supported by multiple studies, showing that an increase in physical activity results in a lower BMI (Deghan et al., 2005; Philippas & Lo, 2005). Similarly, participants who spent more time sitting showed higher BMI levels,
Research Question 1

In examining the correlation between parental physical activity upbringing and current physical activity patterns, a few correlations were found to be significant. Weak but significant relationships were found between the composite physical activity upbringing score and vigorous days, vigorous minutes, and moderate days of physical activity; all other correlations were weak or not significant. Adults who had stronger physical activity upbringing participated in significantly more vigorous physical activity than those with weak upbringing. These correlations can be attributed to two variables. First, due to the occupation of the majority of the sample population, vigorous physical activities are part of their daily working routine, whereas moderate walking or sitting activities are not as prevalent. The lack of participation in moderate walking activities is due to people in these occupations not engaging in leisure-time physical activities. A majority of their physical activities are vigorous and during work hours. Second, research indicates that adults who are raised with a strong physical activity upbringing are more apt to engage in vigorous intensity activities. It is understandable that adults who have active parental involvement in physical activities and sports during childhood will have higher fitness levels and motivation to participate in higher intensity activities.

It is difficult to compare these results with previous research because there is no research that looks at long-term relationships. Ornelas et al. (2007) showed
that parental physical activity upbringing correlates with physical activity participation during childhood, but this is the only study that has examined the relationship between physical activity upbringing and adult physical activity patterns. They also found that family cohesion, parent-child communication, and parental physical activity engagement showed a positive correlation with children participating in five or more bouts of moderate to vigorous physical activity. Cleland et al. (2005) looked at the relationship among parental exercise involvement and child participation and fitness. They showed that parents who participated in physical activities with their children performed at higher work capacities and could run faster than children who did not have active parents. The findings of this study add to the current research, showing that parental physical activity upbringing, including parental engagement, communication, and cohesion, all contribute to long-term participation in vigorous physical activities.

A strong physical activity upbringing is important because of the long-term consequences it has upon adults’ physical activity preferences and patterns. Adults who are raised with a strong physical activity pattern have the ability to choose more active leisure-time activities. Sedentary activities such as watching television, having computer time, and playing video games contribute to the high incidence of childhood obesity (Philippas & Lo, 2005). Adults with a strong physical activity upbringing are more likely to choose physical activities over these electronic, sedentary activities due to role modeling, enrollment, and reinforcement of physical activity. Parents have the ability to influence how children travel to and
from school, events, and activities. Frank et al. (2004) found that the more time spent in automobiles significantly increases child overweight and obesity due to inactivity. Similarly, adults with a strong physical activity upbringing will more often choose to walk, run, or bike for transportation because of routine, learned behavior, or personal preferences.

Research Question 2

Results showed that a strong physical activity upbringing significantly influences the current adult weight status. Adults who were raised with a stronger physical activity upbringing had lower current BMI values. This finding can be attributed to the fact that children are more active because of parental role modeling, receiving reinforcements, and participating in opportunities that in turn help them as adults to maintain active lifestyles, thus keeping their BMI levels at a healthy range.

To explore the relationship between childhood obesity and adult obesity, the childhood weight status was compared with the current adult BMI level. Results showed that there is a moderate and significant correlation between self-reported child weight status and adult BMI ($r[558] = .380, p < .001$). Findings suggested that people who are overweight or obese as children tend to have higher adult BMI levels. These findings are consistent with the explorations of Guo et al. (1994) and Wright et al. (2001). Guo et al. showed that the likelihood of becoming overweight at age 35 is dependent on the BMI percentile during childhood. Similarly, Wright et al. reported that obese children are five to nine times more likely to be obese as
adults. The findings support the previous research by showing the importance to encourage physically active children in order to maintain healthy weights and high physical activity participation levels as adults.

**Research Question 3**

Interpreting the results based on the relationship between physical activity upbringing and current parenting habits is unique from previous research. No research has been conducted to determine if parental physical activity upbringing correlates to how parents raise their children. The findings show that adults who were raised with a strong physical activity upbringing are more likely to raise their children with similar physical activity principles, including active involvement, role models, encouragement, and reinforcement.

No studies have examined why parents raise their children in similar ways to their upbringing, but research from a similar research area shows some possible explanations. Adults often mimic the behaviors of their parents. In analyzing mimicked behaviors, feeding-and-eating behaviors show the consequences of parenting and role modeling for long-term habit adoption. Savage, Fischer, and Birch (2007) reported that children learn what, when, and how much to eat based on familial beliefs, attitudes, and practices surrounding food and eating. Children learn about food through direct experiences and observing the eating behaviors of their parents, which is similar to observational learning of physical activity. Savage et al. specifically stated that girls who reported seeing their fathers consume milk had higher calcium intakes than children who did not have fathers who drank milk.
Similar findings were reported with fruit juice and vegetable intake. Children adopt early preferences and eating habits that in turn create long-term practices. Although physical activity differs from eating behaviors, determinants for why parents raise their children in similar ways as their upbringing can be correlated.

It should be noted that there are various parenting styles. Based on the Davison et al. (2003) study, there are two parenting styles: (a) logistical support and (b) explicit support. Mothers tend to use logistical support; that is, they enroll their children in sports, they watch their child at events, and they enable their children to be active. Fathers tend to use explicit support; that is, they use their own physical activity behavior to encourage their children, they participate with their children, and they enjoy being active with their children. Even though parents are able to express both types of parenting styles, Davison et al. found that both types of parenting styles are effective in promoting physical activity in children. As reported in previous literature, parental support increases both childhood physical activity levels. Based on the findings in the current study, parental support also promotes intergenerational physical activity habits. Evidence in the current study showed that it is important to raise children in a physically active environment; in turn, this will decrease their children's adult weight status, increase their children's long-term physical activity patterns, and impact how their children will eventually raise their children.
Conclusion

Adults taking part in this Utah-based study filled many gaps previously noted in the literature. Based on the retrospective analysis of the 558 completed questionnaires, results showed that there is a weak but significant positive correlation between parental physical activity upbringing and current vigorous physical activity levels. An insignificant correlation was found between physical activity upbringing and moderate walking or sitting activities. These weak correlations were due to the lack of leisure-time physical activity participation. A majority of physical activities are vigorous and during work hours. These findings can also be attributed to the importance and participation in physical activities learned as children. Children raised with higher intensity and importance placed on physical activities are more apt to maintain these physical activity behaviors as adults. This analysis is the first of physical activity upbringing and its long-term relationship to current physical activity, showing a need for future research in this area.

Research Question 2 asked whether there was a correlation between physical activity upbringing and current adult weight status. Results from this study showed that a strong physical activity upbringing positively correlates to a lower adult BMI. Participants who were raised with physical activity role models, encouragement, reinforcement, and communication had lower BMI levels in adulthood than those who were not raised with physically active childhoods. In addition, child weight status was positively correlated with adult BMI levels, which
was also supported in the studies by Guo et al. (1994) and Wright et al. (2001). Adults who were raised with a strong physical activity upbringing reported that they would raise their children in similar physically active ways. Although no research has been conducted to determine the factors for why parents mimic their upbringing, some potential factors could be modeling, parental observation, direct experience, familial preferences, and family attitudes toward sports or activity—all elements identified in the research questionnaire (Savage et al., 2007). The current study showed the importance of promoting and supporting a strong physical activity upbringing because of its connection to adult physical activity patterns, adult BMI levels, and intergenerational parenting habits. Raising children in a physically active environment may help combat the growing trends of childhood and adulthood overweight and obesity.

**Implications for Childhood Obesity Prevention**

The findings of the current study can benefit parents, children, health education professionals, and future researchers. From the results of this study, parents can understand that their parental role modeling, encouragement, reinforcement, and communication influence their children’s immediate and long-term future. A physically active lifestyle learned at an early age can affect a child’s weight and overall health. A strong physical activity upbringing can significantly correlate with a child’s current and later physical activity patterns, weight status, and intergenerational parenting habits. Children can benefit from the evidence and results of this study in learning about childhood and adult obesity, reasons why it is
important to be active parents, and how parents can encourage child physical activity. In turn, teaching children these components may cause them to tell or teach their parents this valuable information.

Health education professionals can utilize the findings of this study in multiple educational settings. In school settings, children can learn about the determinants of physical activity participation and the importance of parental physical activity involvement. A majority of studies regarding child physical activity have been examined in the school setting; unfortunately, children are not getting enough physical activity during school hours (Lindsay et al., 2006). Therefore, showing children the importance of being physically active at home and with family will help them achieve the physical activity recommendations.

Information provided in the current study could be implemented in parenting classes. Since parents are learning the best ways to raise their children and tips to keep their families happy and healthy, emphasis on physical activity could be discussed. The short- and long-term benefits of physical activity could be addressed in order to prevent childhood-obesity and adult-obesity rates from rising. Primary, secondary, and collegiate health education classes should also address the topic of childhood obesity prevention. The results could contribute to physical activity behavior changes in children, teenagers, college students, and adults.

The current study found that a strong physical activity upbringing correlates with participation in vigorous physical activities. Participants who were in active occupations took part in more physical activities than those with less active jobs.
These data could be used to emphasize the importance of maintaining active lifestyles while in the workplace. Findings could be used to support changes in the school or workplace settings in promoting physical activities (e.g., workplace fitness facilities, walking breaks, school-sponsored events, or standing meetings).

Evaluating the findings of the current study could help the U.S. population meet the Centers for Disease Control and Prevention’s (2000) Healthy People 2010 objectives. The rates of obesity and physical activity participation are the two leading indicators for Healthy People 2010 among children and adults (Centers for Disease Control and Prevention). Three objectives of Healthy People 2010 focus on decreasing obesity rates, increasing moderate physical activity, and increasing vigorous physical activity among children and adults. If all families tried to improve or maintain physically active family structures, all three of the national recommendations would be attainable. An additional national priority is to decrease the television viewing of children and adolescents. Previous evidence and results of this study show that parental role modeling and physical activity participation will influence the behaviors of their children today and in the future. Children who grow up in a physically active environment will be less prone to watch numerous hours of television, thus increasing their physical activity participation.

Limitations

Limitations in the current study were addressed in previous chapters and are summarized in this section. This study was comprised of a convenience sample. The sample population was not randomly selected so as to capture a representation
of the general population. Although many of the demographic characteristics support the general Utah population, random selection would have strengthened the overall validity of the current study (Centers for Disease Control and Prevention, 2006a). The sample population was predominantly Caucasian and working in maintenance occupations. Davison et al. (2003) stated that more diverse samples (i.e., ethnic groups) should be examined to determine if different conditions exist for different populations. The current study could not generalize to other ethnic groups and individuals who work in a wide variety of occupations. The maintenance and sales occupations are middle- to lower-class jobs; data could differ with upper-middle-class examinations.

The research questionnaire was not a validated or reliable instrument. The questionnaire was developed for the purpose of the current study from other validated questionnaires (Ayotte, 2007; Craig et al., 2003; Davison et al., 2003; Sallis, 1986). The wording and scope of the questions were altered from their original version to reflect childhood recall with simple Likert-type scale responses. The data from this study questionnaire were useful in defining key correlations; however, intensive questionnaire development and testing should be explored. The majority of the study questionnaire was based on self-report. The limitations to questionnaires are cognitive-recall difficulties and overreporting of actual values (J. Hannon, personal communication, September 10, 2007). Cognitive-recall difficulties may have impacted the results if the participants had difficulty recalling their parental physical activity upbringing and physical activity patterns in the last
7 days. It should also be noted that participants tended to overreport their physical activity patterns or child weight status on self-report questionnaires (Hannon). All of these limitations should be addressed and considered before future research or study replications are performed.

**Recommendations for Study Replication**

A few methods should be employed to enhance the validity and reliability of the current study. Most importantly, methods should be implemented to strengthen the self-reporting of participants’ physical activity upbringing and current physical activity patterns. The questionnaire could be administered in an interview format so as to allow for question clarification, language barriers, or memory prompting. An additional advantage to interview administration would be the addition of qualitative questioning. Qualitative exploration would allow participants to describe any special circumstances or to elaborate about their physical activity upbringing or environment. For example, 1 participant stated in casual conversation that he grew up on a farm, which he believed significantly affected his daily physical activity patterns, but it was not directly correlated to parental involvement or support. Participants should be allowed more time to complete the questionnaire, which would decrease inaccuracies or distractions. Alternatively, administering questionnaires by the Internet or postal mail could tie into the leisure time of individuals rather than reaching them during work hours. However, Internet or postal mail administration has the possibility of low response rates and a decrease in the sample size.
In order to increase generalizability, random selection should be implemented. Convenience sampling was selected for the current study in order to attain a large sample size. Conducting this study in states outside of Utah would allow for a more diverse sample. Utah is almost 85% Caucasian, which limits generalizability (Centers for Disease Control and Prevention, 2006a). Similarly, the population was a convenience sample of similar local facilities across Utah. The facilities were selected due to multiple locations throughout the state. This method limited the range of occupations and industries. The selection of industries and occupations should be identified prior to questionnaire administration in order to sample ethnically and occupationally diverse groups.

Recommendations for Future Research

The results of this study suggest several options for future research. First, even though significant correlations were found among the retrospective analysis, a longitudinal study design would solidify and verify the findings of this study. Taking a longitudinal perspective of the actual parents’ physical activity upbringing would allow for accurate and valid findings. In addition, examining how parents raise their children with encouragement, role modeling, reinforcement, and communication with physical activities would provide more accurate results than the retrospective or self-report data analysis in the current study. A direct observation method would be a valid instrument in examining physical activity upbringing and current parenting habits. The objective measurement of current physical activity levels would also provide more accurate findings. Le Masurier
and Tudor-Locke (2003) studied the validity and reliability of pedometers and accelerometers. They found that both instruments were valid and reliable in assessing physical activity levels. Having all participants wear the pedometer or accelerometer for 1 week would substitute the information attained from the International Physical Activity Questionnaire section of the questionnaire. A combination of self-report and an objective measure such as a pedometer or accelerometer would be the optimal methodology for future research (Telford et al., 2004). Future analysis should be conducted to determine specific reasons why parental physical activity upbringing is significantly correlated to vigorous physical activities, adult weight status, and parenting habits. Assumptions and previous literature have been referenced in the current study; however, further analysis would assist in verifying these statements.

Social Cognitive Theory

Numerous studies have alluded to constructs from the social cognitive theory but few have directly related these constructs to its findings. Golan and Crow (2004) used the ideas behind behavioral capability, observational learning, self-control, and emotional arousal in their intervention study. Similarly, Epstein et al. (1987) indirectly used behavioral capability, self-control, and reinforcement to show weight changes among children. Finally, Harvey-Berino and Rourke (2003) applied the basics of self-control, outcome expectations, reinforcement, and behavioral capability in their treatment interventions. These three studies do not mention Bandura’s (1986) social cognitive theory or its constructs; however, they
do apply similar principles to their intervention studies.

The development and findings of the current study tie directly into multiple constructs from Bandura’s (1986) social cognitive theory. The concept of reciprocal determinism was implemented into the questionnaire of the current study. The complex interaction among the child, the parents, and physical activity were examined in the current study. Glanz et al. (2002) stated that all three components continuously influence one another. Findings from their study show that the child, the parents, and their physical activity upbringing influence adult physical activity patterns. The construct of reinforcement was shown to be a strong indicator of adult physical activity participation. Adults who were raised with a strong upbringing by parents who encouraged, showed praise, rewarded, or were proud of their physical activities showed lower adult weight status, higher physical activity levels, and stronger parenting habits.

The construct of observational learning was also a strong component of physical activity participation. Glanz et al. (2002) stated that observational learning is why people in the same family often have similar behavioral patterns. They found that physical activity role modeling (i.e., observational learning) significantly impacts child and adult physical activity patterns based on Bandura’s (1986) construct. Results showed that the environment is another important construct for physical activity participation. The environmental construct was the parents and their support in physical activity participation, including enrollment in sports, planning for physical activities, and transportation choices. These components
influence the environment for physical activities, all of which show a strong relationship with the research questions in the current study.

The construct of behavioral capability was acquired through observational learning. A child who has a strong physical activity role model will not only learn the skills needed to be physically active but will also learn how to perform the particular behavior (Glanz et al., 2002). Behavioral capability was shown in this study by examining the strong correlation between physical activity upbringing and physical activity patterns. The adults learned what physical activity is and how to be active from their upbringing (i.e., behavioral capability), thus influencing their adult participation. The other constructs from Bandura's (1986) social cognitive theory (i.e., situations, outcome expectancies/expectations, self-control, self-efficacy, and emotional coping responses) were not examined in this study but could be the foundation for future research.

In conclusion, the methodology in support of this research study was developed from multiple constructs from the social cognitive theory. Findings show that parental role modeling, reinforcement, and promotion of physical activities significantly correlate with adult physical activity participation. Stronger correlations were evident for vigorous physical activity; however, these correlations are because of limited leisure-time physical activity participation among the population. Results of this study showed that a strong physical activity upbringing correlates with lower adult BMI levels. Adults who were raised with parental support and encouragement had lower BMI levels as adults because of
physical activity participation. Finally, this study identified a correlation between parental physical activity upbringing and how parents raise their children. Parents tend to raise their children in ways similar to their upbringing, which is possibly due to behavioral capability. The results of this study provide strong evidence to promote child and adult health and parent education as well as to assist the nation in reaching its goal to stop the growing trends of childhood obesity.
APPENDIX

PHYSICAL ACTIVITY AND PARENTAL INVOLVEMENT QUESTIONNAIRE

Part I. Demographics

1. County (e.g., Salt Lake, Utah, Davis, Washington, and Tooele): _______

2. Age: _____ Years

3. Gender (check one):
   □ Male
   □ Female

4. Education level (check one):
   □ No high school
   □ Some high school
   □ High school graduate
   □ Some college
   □ College graduate
   □ Master’s or doctorate

5. Ethnicity: ______________________

6. Occupation: ______________________

Part II. Physical Activity and Parental Involvement Recall

Instructions: Answer each of the questions below to the best of your ability. Signify answer by writing ONE number corresponding to the scale noted below. Do not write ranges (e.g., 3 to 4) or decimals (e.g., 3.5).

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<tr>
<td>1</td>
<td>Never</td>
<td>Rarely</td>
<td>A few times</td>
<td>Often</td>
<td>Very often</td>
</tr>
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Utilize the following definitions to answer all questions:

*Physical activity* is defined as any form of exercise or movement. Physical activity may include planned activity such as walking, running, playing basketball, or participating in other sports. Physical activity may also include other daily activities such as performing household chores, doing yard work, and walking the dog.

*Sports* is defined as an activity that is governed by a set of rules or customs and is often engaged in competitively.

During your childhood (prior to age 18), my parents or guardians:

1. Did physical activity or sports with me

2. Participated in regular physical activity or sports (3+ days per week)

3. Planned for sports or physical activity on recreational outings (e.g., bike riding, hiking, skiing, and ice skating)

4. Changed their schedule to do physical activity or sports with me

5. Provided transportation to a place where I could do physical activity or sports

6. Encouraged me to do physical activity or sports

7. Enrolled me in sports or physical activities

8. Watched me participate or attended my physical activities or sports

9. Told me that I should be proud of my physical activity or sport skills

10. Praised me that my physical activity or sports skills were superior to that of other children my age

11. Rewarded me for participation in physical activity or sport

12. Forced me to do physical activities or sports that I disliked
13. Criticized me for low skill in physical activities or sports

14. As a child, I was considered to be (check one):
   ______ Underweight
   ______ Normal weight
   ______ Slightly overweight
   ______ Overweight

15. What was your level of difficulty recalling the information in this section (circle one):
   Very easy    Easy    Moderate    Hard    Very hard

Part III. Current Physical Activity Levels,
International Physical Activity Questionnaire

Instructions: Answers should be ONE number only, no ranges (e.g., 4 to 5 hours).

Think about the vigorous activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those activities that you did for at least 10 minutes at a time.

1. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, doing aerobics, or fast bicycling?
   ______ Days per week

2. How much time do you usually spend doing vigorous physical activities on 1 of those days?
   ______ Hours per day
   ______ Minutes per day

Think about all of the moderate physical activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those activities you did for at least 10 minutes.

3. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or playing doubles tennis? Do not include walking.
   ______ Days per week
4. How much time do you usually spend doing moderate physical activities on 1 of those days?
   _____ Hours per day
   _____ Minutes per day

Think about the time you spent walking in the last 7 days. This time includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the last 7 days, on how many days did you walk for at least 10 minutes at a time?
   _____ Days per week

6. How much time do you usually spend walking on 1 of those days?
   _____ Hours per day
   _____ Minutes per day

The last question of this section is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work, and during leisure time. This time may include time spent sitting at a desk, visiting friends, reading, or lying down to watch television.

7. During the last 7 days, how much time did you usually spend sitting on a weekday?
   _____ Hours per day
   _____ Minutes per day

IF YOU ARE A PARENT/GUARDIAN TO CHILDREN, CONTINUE TO PART IV. IF YOU ARE NOT A PARENT/GUARDIAN, THIS IS THE END OF THE QUESTIONNAIRE.

Part IV. Current Parenting Habits

Instructions: Answer each of the questions below to the best of your ability. Signify answer by the number noted below.

1. I think it is important to be actively involved in my child’s physical activities or sports.
   _____
2. I think it is important to participate in physical activities myself and to encourage my child to be physically active.

3. I think it is important to reward or reinforce my child’s physical activity or sport.

4. I think my physical activity upbringing has affected how I raise my children.

IF COMPLETE, TURN SURVEY INTO THE PRINCIPAL INVESTIGATOR.
REFERENCES


