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The Relationship Between Maternal Employment and Children's Physical Activity

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THE RELATIONSHIP BETWEEN MATERNAL EMPLOYMENT AND
CHILDREN'S PHYSICAL ACTIVITY

by

Michael Scott Parker

A thesis submitted to the faculty of

Brigham Young University

in partial fulfillment of the requirements for the degree of

Master of Science

Department of Exercise Sciences

Brigham Young University

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BRIGHAM YOUNG UNIVERSITY

GRADUATE COMMITTEE APPROVAL

of a thesis submitted by

Michael Scott Parker

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

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As chair of the candidate's graduate committee, I have read the thesis of Michael Scott Parker in its final form and have found that (1) its format, citations, and bibliographical style are consistent and acceptable and fulfill university and department style requirements; (2) its illustrative materials including figures, tables, and charts are in place; and (3) the final manuscript is satisfactory to the graduate committee and is ready for submission to the university library.

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ABSTRACT

THE RELATIONSHIP BETWEEN MATERNAL EMPLOYMENT AND CHILDREN'S PHYSICAL ACTIVITY

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Master of Science

The purpose of this study was to determine children's and parents' activity levels, examine the relationship between mothers' and children's mean step counts, and fathers' and children's mean step counts, and determine if there are differences in physical activity levels among children with mothers who work full time, work part time, or are not employed. Fifty-eight families participated in this 12-day study. Each family member wore a Walk4Life LS 2525 or a Walk4Life LS 2505 pedometer to measure daily step counts. Additionally, all participants completed the pedometer step count logs each night, and parents completed a short demographic form.

In looking at all children, males averaged more steps per day than females in all three age categories (5-10 years, male = 12,555 to female = 10,729; 11-13 years, male = 13,749 to female = 10,373; 14-18 years, 11,849 to female = 9,795). Additionally, fathers were more active than mothers (fathers' mean step counts averaged 9,490 and

mothers' mean step counts averaged 8,715).

Pearson correlations revealed that parents' physical activity levels were significantly correlated with children's activity levels (mothers to their children = .247, $p = .003$ & fathers to their children = .316, $p = .000$). Further analysis using Pearson correlations showed significant correlations between mothers and their female children (.291, $p = .022$) and between fathers and their male children (.342, $p = .002$).

ANOVA (mothers' employment status x mean daily step count) was used to determine differences among the three groups (full time, part time, and not employed). No significant differences in children's mean step counts were found among any of the groups ($F(2, 141) = 2.545, p = .082$).

Key Words: *Pedometer, Steps, Children, Maternal Employment, Activity*

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THE RELATIONSHIP BETWEEN MATERNAL EMPLOYMENT AND
CHILDREN'S PHYSICAL ACTIVITY

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Abstract

The purpose of this study was to determine children's and parents' activity levels, examine the relationship between mothers' and children's mean step counts, and fathers' and children's mean step counts, and determine if there are differences in physical activity levels among children with mothers who work full time, work part time, or are not employed. Fifty-eight families participated in this 12-day study. Each family member wore a Walk4Life LS 2525 or a Walk4Life LS 2505 pedometer to measure daily step counts. Additionally, all participants completed the pedometer step count logs each night, and parents completed a short demographic form.

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Introduction

In the United States, obesity related disease accounts for 300,000 deaths annually, second only to tobacco related deaths (Dietz, 2002). More than 32% of the adult population in the United States is obese, or approximately 60 million adults (Ogden, Carroll, Curtin, McDowell, Tabak, Flegal, 2006). Additionally, approximately 17.1% of U.S. children and youth are overweight (Ogden et al., 2006). As if these results are not staggering enough, the increase in prevalence rates among children and youth is astounding. Childhood and youth obesity prevalence rates have almost tripled over the past three decades (Ogden et al., 2006). The picture is even bleaker for non-Hispanic blacks and Mexican Americans where prevalence rates are 2%-8% higher than for non-Hispanic white children (Dietz, 2002).

The causes of overweight and obesity are well understood. Taking in more energy than one expends leads to a gain in weight; burning more energy than one takes in leads to weight loss (Anderson, Butcher, & Levine, 2003). Anderson et al. (2003) caution that the determinants of energy consumption and expenditures across individuals are less clear. Equally unclear, is the rapid increase in obesity prevalence rates over the last 30 years. Dietz (2002) states, "The rapidity with which obesity has increased can only be explained by changes in the environment that have modified caloric intake and energy expenditure" (p. 6).

Over the last 30 years the availability of high-fat foods at low cost fast food restaurants has contributed to the trend in overweight (Welk & Blair, 2000).

Expenditures on foods prepared outside the home now account for over 40% of a

family's food budget (Dietz, 2002). Soft drink consumption supplies the average teenager with over 10% of their daily caloric intake (Dietz, 2002). The variety of foods available has multiplied, and portion size has increased dramatically (Dietz, 2002).

The other side of the energy formula is energy expenditure, commonly described as physical activity. The same unhealthy trends found in childhood and youth obesity and caloric intake are also seen in physical activity prevalence rates. According to the Surgeon General's Report on Physical Activity and Health (United States Department of Health and Human Services [USDHHS], 1996), 14% of young people aged 12-21 years report no physical activity at all. Additionally, just 27% of students in grades 9-12 engaged in moderate physical activity five or more days per week for longer than 30 minutes (USDHHS, 2000). Adult participation in physical activity is also low. *Healthy People 2010* (USDHHS, 2000) states that only 23% of U.S. adults engage in vigorous physical activity for longer than 20 minutes three or more days per week. A mere 15% of adults participate in moderate physical activity five days a week for longer than 30 minutes. Adults reporting no physical activity increased from 25% in 1994 to 40% in 1997 (USDHHS, 2000).

Social Learning Theory states that most behavior is learned from observing others, and this information serves as a guide for action on future occasions (Bandura, 1986). The majority of children remain in the family environment for many years, which provides many opportunities for parental influence. Bandura suggests that the family, and in particular parental influence, is significant in the behavior of its members. Many studies have substantiated that family members, particularly parents, exert strong

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influences on children's physical activity (Brustad, 1996; Freedson & Evenson, 1991; Moore, Lombardi, White, Campbell, Oliveria, & Ellison, 1991; Sallis, Patterson, Mckenzie, & Nader, 1988).

As stated earlier, over the last 30 years, the United States has seen a dramatic increase in obesity prevalence rates in adults and children. Over that same time period there has been a similar increase in maternal employment. From 1970 to 1999 the number of married women with children under six who participate in the labor force doubled, rising from 30% to 62%. Married women with children ages 6-17 dramatically increased their labor force participation as well, rising from 49% to 77% over this period (U.S. Bureau of the Census, 2000).

There has been limited research specifically examining the link between maternal employment and childhood overweight. The Toyama Study determined that a mother's full-time work status significantly influenced obesity rates in 3-year-old children (Takahashi, Yoshida, Sugimori, Miyakawa, Izuno, Yamagami, et al., 1999). Anderson et al. (2003) examined whether a causal link exists between maternal employment and childhood overweight. The study found maternal employment was causally linked to childhood overweight, indicating that increased maternal employment could explain 6%-11% of the increase in childhood overweight.

Maternal employment may impact both sides of the energy formula which lead to overweight and obesity. The increase in childhood overweight may have been caused by an imbalance due to overeating, lack of physical activity, or a combination of both.

Regarding a lack of physical activity, with a mother working outside the home, children

may choose to view more television and spend more time on the computer. This leads to fewer opportunities to be physically active. Likewise, children who are asked to care for themselves are often asked to stay indoors. Children who are asked to stay indoors may miss many opportunities for outdoor playtime activities. Additionally, by participating in the workforce, mothers may miss many opportunities to be active with their children. There may be a relationship between maternal employment and children's physical activity.

To date, there has been no research examining the relationship between maternal employment and children's physical activity using objective measurement tools. This study will examine maternal employment as a determinant of children's physical activity. The purpose of this study is to (a) determine children's and parents' activity levels, (b) examine the relationship between the mothers' and the children's mean step counts, and the fathers' and the children's mean step counts, and (c) determine if there are differences in physical activity levels among children with mothers who work full time, work part time, or are not employed.

Methods

Participants

Sixty-three families were recruited for this study. Five families (8%) dropped out of the study. One family attended the informational meeting and began the study, however, parents stated that the study was too difficult for their children to record accurate daily step counts. Another family began the study, however found it too difficult to continue while on a family vacation. Two families returned their pedometers

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to the researcher's home with no explanation as to why they chose not to participate. One family completed the study, however, all of the pedometer step count logs were lost. Fifty-eight families (92%) were involved in this study, lasting a period of twelve days. Participants in this study were 58 mothers, 58 fathers, 88 male children, and 63 female children. However, after reviewing the data, one father (2%), six male children (7%), and one female child (2%) did not have a sufficient number of days recorded for analysis.

The study was broken down into three separate collection periods beginning in October and continuing until mid November. The families were recruited through personal recruitment and referral. Families consisted of a mother, father, and at least one child between the ages of 5-18 years old. All members of the family were asked to participate in the study.

Parents ranged in age from 28-60 years old. They were predominately Caucasian (98%); of those who reported an annual income range (97% reported), the majority (96%) had an annual household income greater than \$40,000; 98% of the population were religiously affiliated with The Church of Jesus Christ of Latter-day Saints; 97% of the fathers worked full time outside the home; 22 mothers were not employed outside the home (38%); 19 mothers were employed part time outside the home (33%); 17 mothers were employed full time outside the home (29%); 37 fathers (64%) and 25 mothers (43%) held a bachelors degree or higher; the fathers' mean body mass index (BMI) was 27.07, the mothers' mean BMI was 23.42 (see Table 1 for demographic frequencies of the children). This data implies that this population is extremely homogenous, and results of this study should be generalized only to similar populations. The parents and

the children completed informed consent and assent forms prior to participation in the study. The Human Subjects Review Board approved all procedures prior to data collection.

Instruments

Pedometer: A Walk4Life LS 2525 (Walk4Life, Plainfield, Illinois) pedometer was used to measure step counts (an objective indicator of physical activity levels) of every child (between the ages of 5 and 18) and parents who reside in the same home.

Walk4Life pedometers have been tested for objectivity, reliability, and validity. The Walk4Life LS 2525 model was tested for accuracy, and proved to be accurate within $\pm 1\%$ of actual steps taken (Crouter, Schneider, Karabulut, & Bassett, 2003). Another study of the Walk4Life 2505 model found intraclass correlations between average steps and actual steps (at or above $67\text{m}\cdot\text{min}^{-1}$) above 0.946 at the 95% confidence interval (Beets, Patton, & Edwards, 2005). Pedometers are not without limitations. Pedometers are only sensitive to locomotor forms of movement and they are not able to record the intensity of movement. Despite these limitations, many tests have shown that pedometers are valid assessments of total volume of physical activity (Troost, 2001) which is the intent of this study.

The pedometer was to be worn on the waistband of shorts or pants on the front side of the body, over the left knee. If a participants' clothing did not allow them to wear the pedometer properly, they were asked to record the amount of time the pedometer was not worn on the pedometer step count log. Pedometers were taken off while sleeping,

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showering/bathing, swimming, and during any activity where a pedometer was not allowed. Some examples include football games, soccer games, and school plays.

Demographic Form: A demographic form was completed by either the mother or father at the time the family received the pedometers. The form asked for information on all family members regarding age, educational levels of father and mother, ethnicity, family income, height, gender, weight, religious affiliation, and maternal employment status. During the first data collection period, height and weight statistics were to be taken by the researcher. However, many families were hesitant to participate under those conditions. The researcher decided to alter the collection of height and weight statistics by allowing each family the choice of self-reporting this information on the demographic form. A stadiometer to measure height, and a digital scale to measure weight were available to each family at the time the demographic form was completed. Height and weight information was used to calculate BMI. Spencer, Appleby, Davey, & Key (2002) found that self-reported height data was overestimated by a mean of 1.23 cm in men, and .60 cm in women. Self-reported weight data was underestimated by a mean of 1.85 kg in men, and 1.40 kg in women. Spencer et al. conclude that self-report height and weight data is a valid tool in identifying BMI. Additionally, one category was added to the demographic form. All information from the demographic form was coded for statistical analysis.

Pedometer Step Count Log: Each participant was given the pedometer step count log on which to record daily step counts. During the informational meeting, participants were given instructions on how to complete the log. Instructions included recording the

day of the week and the date, recording daily step counts, the importance of wearing the pedometer all day, recording length of time pedometer was not worn (if any), and recording types and length of time of activities. Pedometer step counts were recorded at the end of each day. Parents were asked to help their children in the recording process.

Procedures

The pedometers, consent forms, assent forms, demographic form, and the pedometer step count log were delivered to the participants' home by the researcher, or distributed at biweekly informational meetings. All members of the family were encouraged to attend biweekly meetings. The researcher visited the homes of those families unable to attend the meetings and provided the same information given at the meetings. At the time of the meeting, families were instructed on how to complete the demographic form and the pedometer step count log. These meetings were held on Monday afternoons or evenings before each 12-day testing period began. A 12-day testing period was selected in order to ensure that a sufficient number of days would be recorded by each family member. Between 8 and 9 days of monitoring are required in adolescents to achieve a reliability of 0.80 (Troost, Pate, Freedson, Sallis, & Taylor, 2000). A 12-day testing period allows for lost or unusable data. Additionally, weekend activity levels and weekday activity levels vary according to age and gender (Troost et al., 2000). A 12-day testing period allows for 3 weekend days and 9 weekdays.

Before each meeting, the researcher performed a shake test (Vincent & Sidman, 2003). Fifty pedometers were placed in a shake box before the test. The researcher

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shook the box 100 times. If a pedometer did not read accurately within three steps, the pedometer was not dispersed to research participants.

Additionally, during each meeting, instructions for using the pedometer were reviewed with each family. Each family was encouraged to continue with normal living patterns, and to complete the step count log honestly and accurately. Instructions were given on pedometer placement, opening and closing the pedometer, the pedometer modes, and resetting the pedometer. Each family member was asked to place the pedometer on their waistband, and take 100 steps. If the number of steps shown on the pedometer were within three steps of the 100 steps actually taken, it was concluded that the pedometer was placed correctly. If the number of steps shown on the pedometer was greater than three steps from 100, participants were asked to slide the pedometer closer to the midpoint (belly button) of the body and try the activity again. Participants were asked to wear the pedometer in the same correct location each day.

Participants wore the pedometer from the time they awoke at the beginning of the first monitored day to the time they retired at the end of that day. Pedometer step counts were recorded at the end of the day. Participants began the study on a Tuesday morning, and continued over a 12 day period, ending on Saturday night. Each family received an e-mail (if available) and a phone call at the midpoint of the study to remind them of the importance of the study and the importance of accurate physical activity information.

Activity was monitored on up to 150 participants (16-21 families) per testing period. At the end of each 12-day testing period, the researcher picked up the pedometers and the pedometer step count logs from each family at the participants' home.

Design and Statistical Analysis

Mean daily step counts were calculated. Cronbach's Alpha was used to determine the number of days of data necessary to calculate a reliable mean daily step count. An intraclass correlation of at least .80 or higher was the cut-point for determining the minimum number of days of data necessary for inclusion in the study (Troost et al., 2000).

Pearson correlations were computed between mothers' mean daily step counts and their children's mean daily step counts, and between fathers' mean daily step counts and their children's mean daily step counts. Significance was set at $p < .05$.

A one-way ANOVA was conducted on children's mean daily step counts based on maternal employment categories. All statistical analyses were performed using Statistical Package for the Social Sciences (SPSS Incorporated, Chicago, Illinois).

Results

Treatment of the Data

Data from days in which the pedometer was off for more than one hour were not included in the analysis. Two participants recorded hours of horseback riding on the pedometer step count logs. Step counts from these days varied drastically from their daily routines and were not included for analysis. Daily step counts of participants were considered outliers if they fell outside of two standard deviations from the mean for their age and gender. During this process three mothers' days, 8 fathers' days, and 8 children's days were lost, however these participants were still able to be included in analysis. Mean daily step counts were then broken down into two subgroups, weekday

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and weekend. Children's mean daily step counts were calculated based on gender and age.

Reliability

Cronbach's Alpha values (see Table 2) revealed that a minimum of six days of pedometer data were necessary for inclusion in the study. The data from seven children (6 male, 1 female) were lost after analysis. Mothers' values revealed a minimum of three days was necessary for analysis. Fathers' values also revealed a minimum of three days was necessary for analysis. Mothers' and fathers' data appear to be much more stable from day to day than their children. It was decided by the researcher to use five days as a minimum for both fathers and mothers due to recommendations from literature (Trost et al., 2000) and the nature of the data set. The data from one father was dropped after the reliability analysis.

Mean Daily Step Counts

Table 3 illustrates mean daily step counts of the father, mother, and children. In looking at all children, males averaged more steps per day than females in all three age categories (5-10 years, male = 12,555 to female = 10,729; 11-13 years, male = 13,749 to female = 10,373; 14-18 years, 11,849 to female = 9,795). Additionally, fathers were more active than mothers (fathers' mean step counts averaged 9,490 and mothers' mean step counts averaged 8,715).

Parent to Child Relationships

Pearson correlations were calculated to analyze relationships between parents' activity levels and children's activity levels. Analysis revealed small but significant

correlations between both the mothers and their children (.247, $p = .003$), and fathers and their children (.316, $p = .000$). Further analysis identified small but significant correlations between fathers and male children (.342, $p = .002$), and mothers and female children (.291, $p = .022$). Table 4 illustrates these relationships. These correlations show that mothers' activity levels as identified by mean daily step counts, accounts for 6% of the shared variance in their children's step counts. Fathers' activity levels account for 10% of the shared variance in their children's step counts.

Maternal Employment

A one-way ANOVA was conducted to determine potential relationships between a mothers' employment status (Full Time, Part Time, and Not Employed) and children's mean daily step counts. Results from the one-way ANOVA revealed no significant differences in children's step counts based on maternal employment ($F(2, 141) = 2.545$, $p = .082$).

Discussion

A close look at the data reveals that both mothers and fathers achieved the recommended 8,500 steps a day as stated by The President's Council on Physical Fitness and Sports (2007). The mothers' mean daily step counts were 8,715 while the fathers' mean daily step counts were 9,490. Tudor-Locke and Bassett (2004) offer adults the following categories for physical activity determined by pedometer: (1) <5,000 steps/day ("sedentary life index"); (2) 5,000-7,499 steps/day ("low active"); (3) 7,500-9,999 ("somewhat active"); (4) 10,000-12,499 steps/day ("active"); (5) >12,500 steps/day

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("highly active"). According to these guidelines, the adults in this study would be considered somewhat active.

The President's Council on Physical Fitness and Sports (2007) also recommends that 6-17-year-old girls and boys get at least 11,000 and 13,000 steps/day, respectively. Vincent and Pangrazi (2002) also agree with the recommendation of 11,000 and 13,000 steps/day for girls and boys age 6-12. In this study, male children averaged 12,698 steps/day while female children averaged 10,409 steps/day. Neither the male nor the female children met the recommendations, and a general trend of decline was noticed in females from childhood throughout the teenage years. This finding is consistent with other research that suggests children in grades 1-6 achieve more steps than adolescents in grades 7-12 (Le Masurier, Beighle, Corbin, Darst, Morgan, Pangrazi, et al. (2005).

This study was conducted in October and November. According to weather.com (2006), the average daily high temperature range for October through November is 71° in early October and 53° in mid November. Actual high temperatures during the study were slightly below average on most days. Rain occurred on nine collection days, and totaled .80 inches. The weather was typical fall weather for Utah County, and did not appear to alter regular physical activity patterns during these months.

The results of this study indicate that there is a small but significant relationship between parents' and children's physical activity. This supports most of the work examining parent and child physical activity levels (Brustad, 1996: Freedson & Evenson, 1991: Moore et al., 1991: Sallis et al., 1988). Specifically, fathers' activity levels as identified by mean daily step counts, were small but significantly correlated to male

children ($p = .002$) and mothers' activity levels were small but significantly correlated to female children ($p = .022$). This might be explained by the nature of the community in which the study was performed. The community is very traditional and conservative in nature. It could be that the male children are most influenced by their fathers. Meaning, an active father would tend to have more active male children and an inactive father would tend to have inactive male children. Likewise, female children may be most influenced by their mothers and behave accordingly. It is worth noting again, these correlations show that mothers' activity level accounts for 6% of the shared variance in children's step counts. Fathers' activity levels account for 10% of the shared variance in children's step counts. It appears that parents' activity levels do contribute in a small way to their children's physical activity.

Results from the ANOVA conducted to determine potential relationships between a mother's employment status (Full Time, Part Time, and Not Employed) and children's mean daily step counts revealed no significant differences ($p = .082$). There may be several causes for this result. The demographic form used in this study simply asked each mother her current working status. The form did not ask how long the mother had worked over the lifetime of her children. Anderson et al. (2003) state this potential weakness as it relates to youth overweight/obesity, "overweight is a condition that develops over time, not instantaneously in response to changes in a child's environment" (p. 38). The Anderson study also revealed that it is the intensity of the mothers' work over the child's lifetime that is positively related to the child's likelihood of being overweight. It may be that an analysis of the intensity of the mothers' work over the

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child's lifetime would similarly reveal different outcomes in regards to children's physical activity.

This study was conducted during the traditional school year. Children's daily step counts may vary drastically based on maternal employment categories during the summer. Without the influence of school; walking to and from school, recess, physical education, after school activities, etc., greater daily step count differences may have occurred. It may be that because full time working mothers are only absent from their children for a couple of hours a day during the school year, daily step count differences are minimal between groups.

These children may be active regardless of their mothers' employment status for several reasons. Twelve of the mothers (21%, 6 Full Time, 6 Part Time) earn their employment as nurses at a local hospital. These mothers may be more concerned with the activity levels of their children due to their work in the healthcare field. This in turn may guide these children to lead a more active lifestyle, negating the effect of their mothers' employment status. In fact a trend was noticed. Children whose mothers worked as nurses averaged 12,334 steps, whereas children whose mothers did not work or were not employed as nurses averaged 11,611 steps. Additionally, these six full time nurses perform shift work in which full time working status is achieved in 3 working days. Because these mothers work two days short of a typical five day full time work week, they are afforded more days to influence their children at home. An additional sixteen families were recruited for the study through their participation in their child's

club soccer team. These families may be much more active than an entirely random sampling of the local population.

An overwhelming majority (98%) of the sample population reported a religious affiliation with The Church of Jesus Christ of Latter Day Saints. The belief structure of this group may impact the way in which the family spends time together. Parents are encouraged often to play an active role in their child's life. Families maintain that the overall health of the body is an essential tenet to their religion. Each local church building contains a hall that is equipped with a wood gym floor, basketball hoops, and volleyball standards. Many of the local churches host a sports activity program. The sample group has many opportunities to remain active that might not be available in many areas outside this community.

Of families who reported an annual household income, 96% reported an income greater than \$40,000. These families are able to provide many recreational opportunities that might not be afforded to families in lower economic brackets. Additionally, the proximity to outdoor recreational opportunities in this community is immense. This community is geographically situated at the foothills of the Wasatch Mountains, and is within five hours of five National parks.

This study was conducted in a small rural town with a population of 5,000 people. Many families participate in the local recreation program offerings. Youth team sports are an extremely popular activity in the community. Many children participate in youth sports programs to play with their friends. These opportunities may not be available, or may not be as appealing to parents in different communities.

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The average age of the mothers in this study was 39. This relatively young age may have influenced the amount of physical activity in which these families participated in. Younger mothers may tend to participate in a more active lifestyle (Centers for Disease Control and Prevention, 2007).

There were eight limitations to this study.

1. Because the recruitment process involves convenient sampling, inactive families may have chosen not to participate in the study.
2. Due to the fact that pedometers only measure vertical movement, there was not a way to account for physical activities such as biking, swimming, and weightlifting.
3. Participants recorded their own pedometer data (parents helped with young children). This is a limitation due to inaccuracies in recording pedometer step counts and/or activity time.
4. Participants may have had changes in activity levels because they were aware that they were being measured (reactivity).
5. Participants may have experienced burnout during the study period and forgot to record their pedometer step counts and/or activity time.
6. Participants may not have followed all instructions for wearing the pedometer for the designated time.
7. Pedometers may have been removed for special performances such as athletic events, ceremonies, pageants, etc.

8. Physical activities were limited to those not involving water. The pedometer was to be removed before entering the water.

Conclusion

In summary, this study indicates that parental physical activity plays a small role in their children's physical activity. In this study, fathers' activity levels most influenced their male children, and mothers' activity levels most influenced their female children's activity levels. The effect of maternal employment on children's physical activity was not statistically significant.

Hilde Bruch (1975) summarized the role of the family environment stating: "To understand the obese child, one needs to remember that he accumulated his extra weight while living in a family that, wittingly or unwittingly, encouraged overeating and inactivity" (p. 92). The causes of childhood obesity are numerous. Hundreds of variables related to physical activity have been considered as contributors to this epidemic. Many of these variables, in some small part, play a role in this truly complicated disease. It would seem that there is no single variable that if eliminated will help to eradicate the problem. It is equally clear that the problem will not simply disappear as quickly or quietly as it entered.

Future research should focus on longitudinal studies. Studies such as the National Longitudinal Survey of Youth (NLSY), used in the Anderson et al. (2003) study, offer researchers hundreds of variables to examine. By looking at only a few determinants, other determinants are not considered. When this occurs, the dynamics of how they relate to each other are missing. Research should continue to focus on the influence the

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family unit has on children's activity levels. Anderson & Butcher (2006) sum up the challenge to policy makers: "The challenge in formulating policies to address children's obesity is not necessarily to determine what changed to create the current epidemic, but rather what is the most effective way to change children's environment and restore their energy balance going forward" (p. 38). It falls upon the researcher to establish research based conclusions, in order to influence family dynamics.

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Table 1.

Demographic Frequencies (Number of children)

Gender	Male	Female		
	88	63		
Father's Education	HS Graduate	Some College	Bachelors Degree	Graduate Degree
Male	5	25	23	25
Female	5	16	20	19
Mother's Education	HS Graduate	Some College	Bachelors Degree	Graduate Degree
Male	3	41	25	9
Female	1	32	19	8
Annual Household Income	\$30,000-\$40,000	\$40,000-\$60,000	\$60,000-\$90,000	> \$90,000
Male	0	33	33	12
Female	4	28	23	5
Father's Employment Status	Full Time	Part Time	Not Employed	
Male	86	2	0	
Female	63	0	0	
Mother's Employment Status	Full Time	Part Time	Not Employed	
Male	28	31	29	
Female	14	20	29	
Ethnicity	White	African American	Mixed	
Male	87	0	1	
Female	58	2	3	
Religious Affiliation	Latter-day Saint	None		
Male	86	2		
Female	63	0		

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Table 2.

Reliability: Cronbach's Alpha for Daily Mean Step Counts

N (number of days)	**ICC Fathers	ICC Mothers	ICC Children
2	0.779	0.759	0.631
3	0.845*	0.834*	0.641
4	0.885	0.871	0.711
5	0.893	0.886	0.773
6	0.916	0.903	0.801*

* An Intraclass Correlation of at least .80 or higher was the cut point for determining the minimum number of days necessary for inclusion in the study.

**ICC = Intraclass Correlation

Table 3.

Demographic and Descriptive Statistics

	Male			Female		
	N	Mean	SD	N	Mean	SD
Adults						
Age (y)	57	41.23	6.35	58	39.3	6.32
Height (in)	39	71	2.79	36	66	2.69
Weight (lbs)	39	197	32.94	36	144	21.12
BMI	39	27.07	3.50	36	23.42	3.84
Weekday Daily Step Count	57	9,972	5,135	58	9,081	4,768
Weekend Daily Step Count	57	8,671	4,673	58	8,376	4,450
*MDSC	57	9,490	3,553	58	8,715	3,478
Children						
Age (y)	82	11.07	3.72	62	10.84	3.45
Height (in)	48	60	8.42	41	57	7.94
Weight (lbs)	48	101	40.61	41	87	33.46
BMI	48	18.59	3.34	41	18.44	3.64
MDSC (5-10 years)	34	12,555	3,870	29	10,729	2,764
MDSC (11-13 years)	24	13,749	2,537	19	10,373	2,302
MDSC (14-18 years)	24	11,849	2,541	14	9,795	2,833
MDSC (All)	82	12,698	3,211	62	10,409	2,630

* MDSC = Mean Daily Step Count

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Table 4.

*Correlations between Children's Mean Daily Step Counts (CMDSC)
and Covariates: Mother's Mean Daily Step Counts (MMDSC)
and Father's Mean Daily Step Counts (FMDSC)*

		MMDSC	FMDSC
CMDSC			
	Pearson Correlation	0.247	0.316
	Sig. (2-tailed)	0.003**	0.000**
	N	144	141

Male CMDSC			
	Pearson Correlation	0.206	0.342
	Sig. (2-tailed)	0.063	0.002**
	N	82	81

Female CMDSC			
	Pearson Correlation	0.291	0.233
	Sig. (2-tailed)	0.022*	0.073
	N	62	60

** Correlation is significant at the $p < 0.01$ level

* Correlation is significant at the $p < 0.05$ level

Appendix A

Prospectus

Chapter 1

Introduction

In the United States, obesity related disease accounts for 300,000 deaths annually, second only to tobacco related deaths (Dietz, 2002). More than 32% of the adult population in the United States is obese, or approximately 60 million adults (Ogden, Carroll, Curtin, McDowell, Tabak, Flegal, 2006). Additionally, approximately 17.1% of U.S. children and youth are overweight (Ogden et al., 2006). As if these results are not staggering enough, the increase in prevalence rates among children and youth is astounding. Childhood and youth obesity prevalence rates have almost tripled over the past three decades (Ogden et al., 2006). The picture is even bleaker for non-Hispanic blacks and Mexican Americans where prevalence rates are 2%-8% higher than for non-Hispanic white children (Dietz, 2002).

The causes of overweight and obesity are well understood. Taking in more energy than one expends leads to a gain in weight, burning more energy than one takes in leads to weight loss (Anderson, Butcher, & Levine, 2003). Anderson et al. caution that the determinants of energy consumption and expenditures across individuals are less clear. Equally unclear, is the rapid increase in prevalence rates over the last 30 years. Dietz (2002) states, "The rapidity with which obesity has increased can only be explained by changes in the environment that have modified caloric intake and energy expenditure."

Caloric intake is a part of the energy formula. Over the last 30 years the availability of high-fat foods at low cost fast food restaurants has contributed to the trend

in overweight (Welk & Blair, 2000). Expenditures on foods prepared outside the home now account for over 40% of a family's food budget (Dietz, 2002). Soft drink consumption supplies the average teenager with over 10% of their daily caloric intake. The variety of foods available has multiplied, and portion size has increased dramatically (Dietz, 2002).

The other side of the energy formula is energy expenditure, commonly described as physical activity. The same unhealthy trends found in childhood and youth obesity and caloric intake, are also seen in physical activity prevalence rates. According to the Surgeon General's Report on Physical Activity and Health (United States Department of Health and Human Services [USDHHS], 1996), 14% of young people aged 12-21 years report no physical activity at all. Additionally, just 27% of students in grades 9-12 engaged in moderate physical activity five or more days per week for longer than 30 minutes (USDHHS, 2000). Adult participation in physical activity is also low. *Healthy People 2010* (USDHHS, 2000) states that only 23% of U.S. adults engage in vigorous physical activity for longer than 20 minutes three or more days per week. A mere 15% of adults participate in moderate physical activity five days a week for longer than 30 minutes. Adults reporting no physical activity has increased from 25% in 1994 (USDHHS, 1996) to 40% in 1997 (USDHHS, 2000).

Social Learning Theory states that most behavior is learned from observing others, and this information serves as a guide for action on future occasions (Bandura, 1986). The majority of children remain in the family environment for many years, which provides many opportunities for parental influence. This suggests that the family, and in

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particular parental influence, is significant in the behavior of its members (Bandura). Many studies have substantiated that family members, particularly parents, exert strong influences on children's physical activity (Brustad, 1996; Freedson & Evenson, 1991; Moore, Lombardi, White, Campbell, Oliveria, & Ellison, 1991; Sallis, Patterson, Mckenzie, & Nader, 1988b). It is parents who greatly influence most aspects of their children's lives.

As stated earlier, over the last 30 years, the United States has seen a dramatic increase in obesity prevalence rates in adults and children. Over that same time period there has been a similar increase in maternal employment. From 1970 to 1999 the number of married women with children under six who participate in the labor force doubled, rising from 30 % to 62%. Married women with children ages 6-17 dramatically increased their labor force participation as well, rising from 49% to 77% over this period (U.S. Bureau of the Census, 2000).

There has been only limited research specifically examining the link between maternal employment and childhood overweight. The Toyama Study determined that a mother's full-time work status significantly influenced obesity rates in 3-year-old children (Takahashi, Yoshida, Sugimori, Miyakawa, Izuno, Yamagami, et al., 1999). Anderson et al. (2003) examined whether a causal link exists between maternal employment and childhood overweight. The study found maternal employment was causally linked to childhood overweight, indicating that increased maternal employment could explain 6%-11% of the increase in childhood overweight. Additionally, Johnson, Smiciklas-Wright, Crouter, & Willits (1992) studied the relationship between maternal

employment and the quality of young children's diets. This study found no significant effect of maternal employment on nutrient intake.

To date, there has been no research examining the relationship between maternal employment and children's physical activity. This study will examine maternal employment as a determinant of children's physical activity.

Problem Statement

The purpose of this study is to (a) determine children's and parents' activity levels, (b) examine the relationship between the mother's and the children's mean step counts, and the father's and the children's mean step counts, and (c) determine if there are differences in physical activity levels among children with mothers who work full time, work part time, or are not employed.

Hypotheses

1) Null: There is no relationship between maternal employment and children's physical activity.

Alternative: A relationship exists between maternal employment and children's physical activity.

2) Null: There is no significant difference in activity levels between children with mothers who work full time, work part time, or are not employed.

Alternative: There is a significant difference in activity levels between children with mothers who work full time, work part time, or are not employed.

Assumptions

1. Participants will respond accurately to the demographic form.

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2. Participants will wear the pedometer as instructed for the duration of the study.
3. Participants will record physical activity information accurately.
4. Participants will continue typical patterns of physical activity during the study period.
5. Participants' step counts will not significantly increase (reactivity) because the subject is wearing a pedometer (Vincent & Pangrazi, 2002).

Limitations

This study is limited to the following factors:

1. Because the recruitment process involves convenient sampling, inactive families may choose not to participate in the study.
2. Due to the fact that pedometers only measure vertical movement, there will not be a way to account for physical activities such as biking, swimming, and weightlifting.
3. Participants will record their own pedometer data (parents will help with young children). This is a limitation due to inaccuracies in recording pedometer step counts and/or activity time.
4. Participants may have changes in activity levels because they are aware that they are being measured (reactivity).
5. Participants may experience burnout during the study period and forget to record their pedometer step counts and/or activity time.
6. Participants may not follow all instructions for wearing the pedometer for the designated time.

7. Pedometers may have to be removed for special performances such as athletic events, ceremonies, pageants, etc.
8. Physical activities will be limited to those not involving water. The pedometer must be removed before entering the water.

Delimitations

This study is delimited to the following:

1. Families that include a mother, father, and at least one child between the ages of 5-18.
2. Participants reside in Utah County, Utah.

Operational Definitions

Family A mother, father, and at least one child who reside together.

Maternal Employment Mothers participating in the labor force outside of the home.

Full Time At least 40 hours/week of work outside of the home.

Part Time 1-39 hours/week of work outside of the home.

Not Employed Not employed outside of the home.

Overweight Body mass index (BMI) expressed as weight/height² (kg/m²) will be used to classify overweight and obesity.

Adult's Weight Status Classification Adults (20 + years) are categorized as over weight when a BMI of 25.0-29.9 is calculated. Adults with a BMI above 30.0 are categorized obese (Centers for Disease Control, 2006b).

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Children's Weight Status Classification Children with BMI values \geq the 95th percentile of the sex-specific BMI growth charts are categorized as overweight. Children with BMI values at or above the 85th percentile are categorized as at risk for overweight (Centers for Disease Control, 2006a).

Pedometer A small (matchbox size) electronic device that attaches to the waistband of a pair of shorts or pants and measures the number of steps a person takes (Morgan, Pangrazi, Beighle, 2003). Many pedometers have multiple functions including activity time.

Physical Activity any bodily movement produced by skeletal muscles that results in energy expenditure (Casperson, Powell, & Christenson, 1985).

Significance of the Study

To date, there has been no research examining the relationship between maternal employment and children's physical activity. Childhood obesity prevalence rates have tripled over the last 30 years. During the same time period, the percentage of married women with children under six who participate in the work force has doubled. This study will examine maternal employment as a determinant of children's physical activity, as well as use an objective physical activity assessment to examine the relationship of parents and children's physical activity.

Chapter 2

Review of Literature

The purpose of this study is to determine children's and parent's activity levels, examine the relationship between the mother's and the children's mean step counts, and the father's and the children's mean step counts, and determine if there are differences in physical activity levels among children with mothers who work full time, work part time, or are not employed. This chapter is a review of the research that serves as the foundation for this study. This chapter is organized into six sections. The review will discuss (a) current trends in overweight and obesity; (b) physical activity determinants; (c) parents' and children's physical activity levels; (d) assessment methodology in physical activity; (e) parental influences on children's physical activity; and (f) the relationship between maternal employment and children's physical activity.

Current Trends in Overweight and Obesity

The causes of overweight and obesity are well understood. Taking in more energy than one expends leads to a gain in weight, burning more energy than one takes in leads to weight loss (Anderson et al., 2003). Anderson et al. caution that the determinants of energy consumption and expenditures across individuals are less clear.

The most recent prevalence rates of overweight children in the United States are 13.9% among children aged 2-5 years, 18.8% among children aged 6-11 years, and 17.4% among children aged 12-19 years. These rates were generated using weight and stature measurements collected in the 2003-2004 National Health and Nutrition Examination Survey (NHANES) (Ogden et al., 2006). These rates represent increases of

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6.7% for children aged 2-5 years, 7.5% for children aged 6-11 years, and 6.9% for children aged 12-19 years, compared with data gathered during the 1988-1994 NHANES III Survey (Ogden et al., 2006). Current estimates reflect increases between 13% and 15% during the past three decades among children aged 6-11 years (Ogden et al., 2006). Dietz (2002) states, "The rapidity with which obesity has increased can only be explained by changes in the environment that have modified caloric intake and energy expenditure."

Additionally, prevalence rates widely differ between ethnic subgroups. Overweight prevalence rates are 2%-8% higher for non-Hispanic black and Mexican Americans than for non-Hispanic white children aged 2-19 years (Ogden et al., 2006).

Obesity rates in adults have increased by more than 100% over the last three decades. More than 32% of the adult population in the United States is obese, or approximately 60 million adults (Ogden et al., 2006). Obesity in the United States is truly epidemic (Dietz, 2002). Being overweight or obese has immediate and long term consequences for individuals, as well as for society.

The increase in childhood overweight has been accompanied by a large increase in the number of children developing type 2 diabetes (American Obesity Association, 2006). Studies have shown that overweight children are much more likely to become overweight adults than normal weight children (Bouchard, 1997; Dietz, 1997). Being overweight may be accompanied by serious health consequences including coronary heart disease, atherosclerosis, colorectal cancer (Power, Lake, & Cole, 1997), hypertension, dyslipidemia, gall bladder disease, respiratory diseases, osteoarthritis, and

various cancers (Pi-Sunyer, 1999). Being overweight may also have social and economic consequences. Studies have shown that obesity is negatively related to level of education and earnings (Averett & Korenman, 1996; Cawley, 2005; Gortmaker, Must, Perrin, Sobol, Dietz, 1993).

The burden placed on our society by obesity and related chronic diseases is enormous. Recent estimates suggest that obesity accounts for 300,000 deaths annually, second only to tobacco related deaths (Dietz, 2002). Hospitalization rates for the complications of obesity in children and adolescents have tripled. Obesity and its complications cost the United States \$117 billion annually. The rapid increases in obesity across the population and the burden of costly diseases that accompany obesity indicate that we can no longer afford to ignore current trends (Dietz, 2002).

The most common explanation for these trends in society is that environmental and behavioral influences have made it more difficult for individuals to maintain healthy weight levels (Welk & Blair, 2000). The availability of high-fat foods at low cost fast food restaurants (Welk & Blair, 2000) is another large contributor to the trend in overweight. Expenditures on foods prepared outside the home now account for over 40% of a family's food budget (Dietz, 2002). A large majority of adults and children in the United States are not physically active. Dietz (2002) states, "Hectic work and family schedules allow little time for physical activity."

Most adults and children are not participating in regular physical activity. According to the Surgeon General's Report on Physical Activity and Health (USDHHS, 1996), 14% of young people aged 12-21 years report no physical activity at all.

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Additionally, just 27% of students in grades 9-12 engaged in moderate physical activity five or more days per week for longer than 30 minutes (USDHHS, 2000). Adult participation in physical activity is also low. *Healthy People 2010* (USDHHS, 2000) states that only 23% of U.S. adults engage in vigorous physical activity for longer than 20 minutes three or more days per week. A mere 15% of adults participate in moderate physical activity five days a week for longer than 30 minutes. Adults reporting no physical activity has increased from 25% in 1994 (USDHHS, 1996) to 40% in 1997 (USDHHS, 2000).

Physical Activity Determinants

Several studies have researched who and what exerts the most powerful influences on children's behavior. Regarding children's physical activity, behavioral studies have determined there are numerous variables that can determine physical activity. These determinants can be biological, psychological, psychosocial, cultural, or environmental (Sallis, Alcaraz, Mckenzie, Hovell, Kolody, & Nader, 1992a).

Specifically, researchers have studied location of play (outdoor recreation or indoor), climate, and degree of prompting (Sallis, Nader, Broyles, Berry, Elder, Mckenzie, & Nelson, 1993). Ethnic differences (Mckenzie, Sallis, Nader, Broyles, & Nelson, 1992), the amount of time spent outdoors (Johns & Ha, 1999; Klesges, Klesges, Senson, & Pheley, 1985; Sallis et al. 1993), and parental beliefs (Kimiecik, Horn, & Shurin, 1996) can also affect the levels of activity in which children engage (Sallis, Patterson, Buono, Atkins, & Nader, 1988a). Additionally, peers, community, coaches, teachers, school,

media, and family are all determinants of physical activity (Anderssen & Wold, 1992; Sallis et al., 1988a).

The Social Learning Theory helps to explain some of these determinants. This theory emphasizes general principles of behavior change. Because of this emphasis, the social learning theory has been a guiding principle in many realms of behavior research. The primary tenant of the Social Learning Theory is human beings can learn from watching the behavior of others. Of most importance to the current study is the notion that most behavior is learned from observing others, and this information serves as a guide for action on future occasions (Bandura, 1986). The majority of children remain in the family environment for many years, which provides many opportunities for parental influence. This suggests the family and parental influence, is significant in the behavior of its members (Bandura, 1986).

Parents' and Children's Physical Activity Levels

Recent research has established a relationship between the physical activity levels of parents and their children, yet the individual components of parental socialization influence have not been closely examined (Brustad, 1996). Studies through the early 1990s consistently substantiated that family members, particularly parents, exert strong influences on children's physical activity (Freedson & Evenson, 1991; Sallis et al., 1988b). Several studies have demonstrated familial similarities of physical activity habits with children ranging from preschool ages (Moore, et al., 1991) through the early teenage years (Sallis et al., 1988a). Other determinants within the family include socioeconomic status, sibling placement, and religious beliefs (Pennington, 2002). In addition to

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physical activity determinants, parental influence has also been suggested as critical for children in setting health values and in learning to make health related decisions (Petchers, Hirsch, & Bloch, 1987).

The Framingham Children's Study (Moore et al., 1991) used accelerometers to objectively measure parent and children's activity patterns. Results from this research found parent and children's activity patterns to be related. Data were collected from 100 children ages 4-7 years old, and their parents (99 mothers, 92 fathers). The relationship between parents' and children's activity levels were analyzed and results showed that children with two active parents were almost six times more likely to be active than those children with sedentary parents. This implied support for the parental role-modeling hypothesis (Moore et al., 1991). In a similar study, Freedson and Evenson (1991) examined thirty 5-9-year-old children and their biological parents. Each subject wore an accelerometer for three consecutive days (including one weekend day). Children's physically active or inactive behavior resembled their parents' and occurred in 67% of the father-child relationships and 73% of the mother-child relationships. Additional studies have shown strong relationships between parental behaviors and children's physical activity (Brustad, 1996; Sallis, Simons-Morton, Stone, Corbin, Epstein, Faucette, et al., 1992b). Brustad also found strong relationships between parental behaviors and children's enjoyment of physically active games and sports.

However, not all the research has pointed to such a strong relationship between parental physical activity and children's physical activity. Sallis et al. (1992a) found that parental activity had no significant correlation to their children's physical activity. They

stipulate that these findings may lack validity because of the limited (subjective) assessment completed by the children. Similarly, Dempsey, Kimiecik, & Horn (1993) did not find a correlation between parental physical activity and children's activity. The method employed in this study was a self-report of physical activity. In this study, children completed a questionnaire indicating their typical weekly physical activity. This procedure is highly subjective and may not be entirely accurate due to the depth of recall required (Dempsey et al., 1993). The subjectivity of this method is a concern with all populations, however, it is even greater with preadolescent children due to the difficulty in accurate recall and/or recording of physical activity (Pennington, 2002). Several researchers share the concerns with recall as found in the Sallis et al. (1992a) and Dempsey et al. (1993) studies. Researchers further question the reliability of both studies due to the methodology employed (Epstein, Paluch, Coleman, Vito, & Anderson, 1996; Freedson, 1989; Janz, 1994; Janz, Witt, & Mahoney, 1995; Simons-Morton, Taylor, & Huang, 1994). In order to eliminate problems with recall and/or recording, the current study will employ the use of pedometers to objectively assess physical activity.

Assessment Methodology in Physical Activity

In order to collect accurate data and to reliably interpret the data collected, it is vital to use measures that correctly assess physical activity. In general, studies using self-report physical activity measures have found nonsignificant or weak correlations between parents' physical activity and children's physical activity (Dempsey et al., 1993; McMurray, Bradley, Harrell, Bernthal, Frauman, & Bangdiwala, 1993; Sallis et al., 1993; Sallis et al., 1992a). Conversely, studies using objective assessment measures such as

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accelerometers, have found moderate-to-strong correlations between parent-child physical activity patterns (Brustad, 1996; Freedson & Evenson, 1991; Moore et al., 1991; Sallis et al., 1988b).

Some commonly used measures of children's physical activity are subjective in nature. This includes self-reports, interview-administered recalls, and diaries. Freedson (1989) suggests that questionnaire methodology is the most practical method for assessing physical activity in research. However, in addition to the difficulty in recall and or recording, classifying one's level of activity is also difficult (Pennington, 2002). Freedson (1989) adds that individual differences in the perception of one's activity may affect the outcome measure. Eliminating these limitations becomes vital when researching physical activity patterns in preadolescent children. Children in particular have difficulty recalling and/or recording activity accurately, and their patterns of activity are more irregular than those of an adult (Freedson, 1989). To evaluate physical activity patterns of children it is necessary to employ physical activity assessment measures that are accurate and practical to administer (Freedson, 1989).

Researching with practical and accurate measures can be extremely difficult because objective methods require special equipment and training. This equipment is often times costly and/or not readily available. Accurate measures that have been developed to reduce errors associated with self-report methodology include motion sensors (i.e., pedometers and accelerometers) and heart rate monitors (Ekelund, Sjostrom, Yngve, Poortvliet, Nilsson, Froberg, Wedderkopp, & Westerterp, 2001). Accelerometers are practical (can monitor large groups at one time), unobtrusive (do not have leads

hooked up to subject chests and do not require constant supervision by the researcher) and are small in size (about the size of a beeper) (Basset, Ainsworth, Swartz, Strath, O'Brien, & King, 2000). Likewise, pedometers share these same benefits and are significantly less expensive than accelerometers.

Over the past decade, there have been many advances in the area of youth physical activity assessment measures. As with most technological advances, expense and difficulty of use is reduced with time. This is true of most of the motion sensors on the market today, like the accelerometer and the pedometer (Welk, Differding, Thompson, Blair, Dziura, & Hart, 2000). The current study will use Walk4Life pedometers (Walk4Life, Plainfield, Illinois) to assess physical activity. Walk4Life pedometers have been tested for objectivity, reliability, and validity. The Walk4Life LS 2525 model was tested for accuracy, and proved to be accurate within $\pm 1\%$ of actual steps taken (Crouter, Schneider, Karabulut, & Basset, 2003). Another study of the Walk4Life 2505 model found intraclass correlations between average steps and actual steps (at or above $67\text{m}\cdot\text{min}^{-1}$) above 0.946 at the 95% confidence interval (Beets, Patton, & Edwards, 2005). Pedometers are not without limitations. Pedometers are only sensitive to locomotor forms of movement and they are not able to record the magnitude of movement. Despite these limitations, many tests have shown that pedometers are valid assessments of total volume of physical activity (Trost, 2001).

Parental Influences on Children's Physical Activity

Brustad (1993) investigated relationships among parental socialization processes, gender, and attraction to physical activity in fourth-grade children. Parental socialization

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is the process by which parents influence their children's behavior through their beliefs, actions, values, and attitudes. Parental beliefs, actions, values, and attitudes are impacted by a variety of components, including employment. Four specific determinants were examined: parents self-reported enjoyment of physical activity, perceived fitness levels, beliefs about the importance of physical activity, and levels of encouragement of their children's physical activity. The findings from this study suggest that parental beliefs about physical activity may be a more important determinant in role-modeling physical activity than the level of physical activity (Brustad, 1993).

Kimiecik and Horn (1998) assessed parental beliefs through four specific areas: a description of parental beliefs about moderate-to-vigorous physical activity (MVPA), the role of child and parent gender in these beliefs, the relationship between parent and child MVPA levels, and the relationship between child MVPA levels and parental beliefs. Eighty-one children and their parents participated in this study. Of particular interest, no correlation existed between parent and child self-reported MVPA levels, but parents who held higher fitness competency beliefs about their children had more physically active children than those who held lower perceptions. The authors caution that these findings are correlative in nature, and the direction of the relationships cannot be determined (Kimiecik & Horn, 1998). Again, this research was performed using subjective methodology on measuring MVPA.

Gaumont (2000) examined six different parental determinants and how they related to adolescents' physical activity motivation and physical activity behavior. However, his research was done with subjective assessment measures. Of particular

interest, this study found that perceived parental expectations with regard to physical activity were significant predictors of children's physical activity behavior. Additionally, Gaumond suggests that future research on the influence of parenting styles on children's physical activity be examined. The current study will focus on the relationship between maternal employment and children's physical activity.

Barry (2000) researched parental influences on children's activity, specifically (a) parent prioritization of activity for themselves, (b) parent ranking of the importance of physical activity, (c) parent perceived family activity/recreation environment, and (d) parent total activity measured by using accelerometers. Additionally, children's perceived athletic competence was evaluated. Each of these determinants was explored to assess possible interaction between ethnicity and socioeconomic status. This study revealed that the fathers' data did not relate to children's physical activity levels or perceived competence. Barry suggests that future research might include physical environmental variables, hours of television viewing, and exercise behavior of peers and siblings to reveal additional factors that interact with parental variables. Additionally, occupational physical activity may affect parents' response to questions pertaining to prioritization and valuation related to physical activity. Barry states that self selection bias may have altered the respondent's beliefs about physical activity. This is a difficult research obstacle to overcome.

Again, recent research has established a relationship between the physical activity levels of parents and their children, yet the individual components of parental socialization influence have not been closely examined (Brustad, 1996). The effects of

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maternal employment are one of the crucial components of children's physical activity. One explanation for reduced physical activity is described by Anderson et al. (2003). Anderson et al. (2003) state that it is possible that unsupervised children may spend a great deal of time indoors, possibly due to safety concerns, watching television or playing computer games rather than participating in physically active activities. The impact of maternal employment on socialization influences and upon children's physical activity has not been researched to date.

The Relationship Between Maternal Employment and Children's Physical Activity

From 1970 to 1999 the percent of married women with children under six who participate in the labor force doubled, rising from 30% to 62%. Married women with children ages 6-17 dramatically increased their labor force participation as well, rising from 49% to 77% over this period (U.S. Bureau of the Census, 2000). The prevalence of overweight children has also increased dramatically. Over the 1963-1970 period 4% of children between the ages of 6-11 were defined to be overweight. That number had more than quadrupled by 2004, reaching 18.8% (Ogden et al., 2006). Although the prevalence of overweight and obesity in adults has increased, the incidence of overweight in children relative to adults has also increased. During the 1960s the ratio of overweight among children to adults was about 0.3, but had risen to almost 0.5 by 1999 (Centers for Disease Control, 2006c). Regarding childhood overweight, the Surgeon General has been quoted as saying, "This crisis is stealing youth, innocence, and health from our children, and yet as a nation we have been badly remiss in addressing it." (Anderson et al., 2003). A better understanding regarding the determinants of childhood overweight is critical. This study

will examine the relationship between maternal employment and children's physical activity.

To date, there has been no research examining the relationship between maternal employment and children's physical activity. In fact, there has been only limited research specifically examining the link between maternal employment and childhood overweight. The Toyama Study (Takahashi et al., 1999) did include physical activity as a variable, however, this study did not examine the relationship between physical activity and maternal employment. One of the focuses of this study examined the relationship of maternal employment to childhood overweight and obesity. A special questionnaire was developed that contained such items as environmental and lifestyle factors of children, and past histories of parents. These questionnaires were distributed beforehand, and then collected during a routine checkup of 3-year-old children in Toyama, Japan. Of particular interest to the current study were the questions about the Mother's Job, and the Physical Activity level of the children. Mother's Job was evaluated on the basis of full-time work, part-time work, and no work. Physical Activity was evaluated on the basis of active, or not active. Mother's full-time work status was found to significantly influence obesity in 3-year-old children. Of the 1,281 participants, only 35 reported not being physically active. Physical Inactivity was not found to be a significant factor because of the limited number of inactive subjects.

A study conducted by Johnson et al. (1992), studied the relationship between maternal employment and the quality of young children's diets. This study examined the

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nutrient intake of children age 2-5. This study found no significant affect of maternal employment on nutrient intake.

A later study conducted by Anderson et al. (2003), examined whether a causal relationship existed between maternal employment and overweight children. This study used data from the National Longitudinal Survey of Youth. Supplemental data was used from the 1988-1994 National Health and Nutrition Examination Survey and the 1994-1996 Continuing Survey of Food Intakes by Individuals. Anderson et al. (2003) found that a positive relationship exists between maternal employment and childhood overweight. Specifically, the intensity of mother's work over the child's lifetime is consistently shown to be positively related to the child's likelihood of being overweight. The study found that a ten hour increase in the average hours worked per week increased the likelihood that the child was overweight by one half to one full percentage point. Through numerous statistical models, the authors show that increased maternal employment could explain 6-11 percent of the increase in childhood overweight.

Summary

The purpose of this chapter was to review the literature that served as a foundation for this study. The relevant literature was presented within six topics: current trends in overweight and obesity, physical activity determinants, parent's and children's physical activity patterns, assessment methodology in physical activity, parental influences on children's physical activity, and the relationship between maternal employment and children's physical activity. This study will use pedometers to objectively measure the relationship between parental physical activity and children's

physical activity. This study will be the first study to examine the relationship between maternal employment and children's physical activity.

Chapter 3

Methods

The purpose of this study is to determine children's and parent's activity levels, examine the relationship between maternal employment and children's physical activity, and determine if there are differences in physical activity levels among children with mothers who work full time, work part time, or are not employed. This study will objectively measure physical activity through the use of pedometers over a two week period. This chapter describes the methods that will be used to complete the study including the participants, instruments, procedures and statistical analysis.

Participants

Eighty families from Utah County, Utah, will participate in this two-week study. All children between the ages of 5 and 18 who reside in the home, and the mother and father will be evaluated. Families will be recruited through a variety of techniques, such as personal recruitment, referral, and teacher recruitment. Teacher recruitment will involve participants from two Utah County, Utah schools, one elementary, and one junior high school. The parents and the child will fill out informed consent and assent forms prior to participation in the study. Confidentiality of participants will be achieved by using identification numbers instead of names. Approval to conduct the study will be obtained from the principal, school district, and the Institutional Review Board.

Instruments

Pedometer: A Walk4Life LS 2525 (Walk4Life, Plainfield, Illinois) pedometer will be used to measure step counts (an objective indicator of physical activity levels) and

activity time of every child between the ages of 5 and 18 and parents who reside in the same home.

Walk4Life pedometers have been tested for objectivity, reliability, and validity. The Walk4Life LS 2525 model was tested for accuracy, and proved to be accurate within $\pm 1\%$ of actual steps taken (Crouter et al., 2003). Another study of the Walk4Life 2505 model found intraclass correlations between average steps and actual steps (at or above $67\text{m}\cdot\text{min}^{-1}$) above 0.946 at the 95% confidence interval (Beets, Patton, & Edwards, 2005). Pedometers are not without limitations. Pedometers are only sensitive to locomotor forms of movement and they are not able to record the intensity of movement. Despite these limitations, many tests have shown that pedometers are valid assessments of total volume of physical activity (Trost, 2001).

Demographic Form: A demographic form will be completed by either the mother or father when the family receives the pedometers. The form will ask for information on all family members regarding age, educational levels of father and mother, ethnicity, family income, height, gender, weight, religious affiliation, and maternal employment status. Height statistics will be gathered by using a stadiometer, and weight statistics will be gathered using a digital scale. This data will then be used to calculate BMI.

Pedometer Step Count Log: Each participant will be given the pedometer step count log on which to record daily step counts. Pedometer step counts will be recorded at the end of each day. Parents will be asked to help their children in the recording process.

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Procedures

The pedometers, consent forms, assent forms, demographic form, and the pedometer step count log will be delivered to the participants' home by the researcher, or distributed at biweekly informational meetings held at both schools. All members of the family will be encouraged to attend. The researcher will visit the homes of those families unable to attend the meetings and will provide the same information that occurred at the meetings. These meetings will be held on Monday afternoons or evenings before each 12-day testing period begins.

A 12-day testing period is needed to ensure a sufficient number of days are recorded by each family member. Between 8 and 9 days of monitoring are required in adolescents to achieve a reliability of 0.80 (Troost, Pate, Freedson, Sallis, & Taylor, 2000). A 12-day testing period allows for lost or unusable data. Additionally, weekend activity levels and weekday activity levels vary according to age and gender (Troost et al., 2000). A 12-day testing period allows for 3 weekend days and 9 weekdays.

During each meeting, instructions for using the pedometer, filling out the demographic form, and recording pedometer step counts will be reviewed with each family. Additionally, each family will be encouraged to continue with normal living patterns, and to complete the step count log honestly and accurately. The demographic form, consent forms, and assent forms will be given to the parents and children to complete and will be collected immediately by the researcher.

Each family member will wear a Walk4Life LS 2525 on the waistband of shorts or pants near the left hip for 12 consecutive days. All participants will wear the

pedometer from the time they awake at the beginning of the first monitored day to the time they retire at the end of that day. Pedometer step count will be recorded at the end of the day. The pedometer will only be removed during bathing, swimming, or any other event in which a pedometer is not allowed. Data will be collected over nine weekdays and three weekend days to account for differences in physical activity habits that may occur during the testing period.

Participants will begin the study on a Tuesday morning, and continue over a 12 day period, ending on Saturday night. The dependent variable will be the mean steps per day over a 12-day period. The independent variable will be maternal employment (full time, part time, and not employed). Each participant will be given the pedometer step count log on which to record daily step counts. Parents will be asked to help their children in the recording process. Pedometers will be reset after each participant records their data. Each family will receive an e-mail (if available) and a phone call at the midpoint of the study to remind them of the importance of the study and the importance of accurate physical activity information.

Activity can be monitored on up to 100 participants per testing period. At the end of each 12-day testing period, the researcher will pick up the pedometers and the step count log from each family at the participants' home or will be collected at each of the school sites. The Human Subjects Review Board will approve all procedures prior to data collection.

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Statistical Analysis

The study will last a period of two weeks. Data collection will take place over a two month time period during the months of September and October. The step count recording log will be used to compute average daily step counts. The age specific demographic and descriptive statistics for average number of steps per day will be calculated.

Pearson correlations will be computed between: mother's mean step counts and their children's mean step counts, and between father's mean step counts and their children's mean step counts. Significance will be set at $p < .05$.

A one-way ANOVA will be conducted on children's mean step counts based on maternal employment categories.

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Appendix A-1

Consent Forms

Consent to be a Research Participant

Dear Parent/Guardian,

Introduction

This research study is being conducted by Michael Scott Parker to determine family physical activity patterns. You were requested to participate because your family meets the criteria for participation in this study. The criteria for participation in this study are that a mother, father, and at least one child between the ages of 5-18 reside together in the same household.

Procedures

In this study, each member of your family will wear a Walk4Life LS 2525 ® pedometer (a device worn on the waistband, used to measure activity levels through vertical movement) for 12 days to measure daily physical activity using two of the modes it offers: number of steps taken and total activity time. Physical activity will be recorded daily on a log and returned to the researcher at the conclusion of the study. Height and weight information will be taken and recorded on the demographic form. This information will be recorded using code numbers to ensure privacy. An e-mail will be sent and a phone call given at the midpoint of the study to remind the family of the importance of the study.

Risks/Discomforts

There are minimal risks for participation in this study. However, you may feel emotional discomfort during height and weight measurements. Wearing the pedometer presents no increased risks above those of normal day-to-day living.

Benefits

There are no direct benefits to subjects. However, it is hoped that researchers will learn more about family physical activity patterns.

Confidentiality

The results of this study may be published in a professional journal and/or presented at a professional conference. Information obtained from this study will only be used for research purposes. Your family's names will not be revealed, and will remain confidential through the use of identification numbers.

Participation

Participation in this study is voluntary. Your family may choose to not participate, or you may choose to withdraw your family from participation in the study at anytime.

Questions about the research

If you have any questions regarding this study, you may contact the principal investigator Michael Scott Parker at (801) 423-6438 or e-mail michael.parker@nebo.edu.

Questions about your Rights as Research Participants

If you have any questions you do not feel comfortable asking me, you may contact Dr. Carol Wilkinson, Associate Professor of Exercise Sciences at BYU, (801) 422-8779, 249 D SFH or e-mail carol_wilkinson@byu.edu. If you have any questions regarding your rights as a participant in this research project, you may contact Dr. Renea Beckstrand, IRB Chair, (801) 422-3873, 422 SWKT, renea_beckstrand@byu.edu.

Sincerely,

Michael Scott Parker

(Please initial) page 1 of 2 _____

See next page

70 Maternal Employment and Children's Physical Activity

Parent Consent

I have read, understood, and received a copy of the consent form, and I volunteer to participate and allow my children to participate in this research study. Should one of my children choose not to participate in the study, this will not exclude all remaining members of the family from participation in this study.

Number of children in family between the ages of 5-18. _____

Number of children not participating in the study. _____

Mother's Name

Mother's Signature

Date

Father's Name

Father's Signature

Date

Assent for participation in research study

Name (please print):

1) _____ Age: _____

My parents have given permission for me to take part in this research study. I know that I will be asked to wear a pedometer. A pedometer is a small box that is worn near my waist and counts how many steps I take. My parents will help me write down on a form how many steps I take each day. I will do this for 12 days. I am doing this study because I want to and I know it might help other people in the future. I know that I can stop this study at any time without being penalized.

1) _____
Signature

Date

Appendix A-2

Pedometer Step Count Log

Pedometer Step Count and Activity Time Log

Name: _____ Pedometer #: _____

Day & Date	Step Counts	Exercise Time	Did you wear the pedometer the entire day?	What types of activity did you do today?	If yes, what did you do and for how long?
Day: ___ Date: ___		__ hr. __ min. __ sec. Total min. _____	Yes No If No how long was it off? _____	Physical Activity <u>Yes No</u> Sedentary Activity (TV, computer, Nintendo, etc.) Yes No	What: How long: _____ What: How long: _____
Day: ___ Date: ___		__ hr. __ min. __ sec. Total min. _____	Yes No If No how long was it off? _____	Physical Activity <u>Yes No</u> Sedentary Activity (TV, computer, Nintendo, etc.) Yes No	What: How long: _____ What: How long: _____
Day: ___ Date: ___		__ hr. __ min. __ sec. Total min. _____	Yes No If No how long was it off? _____	Physical Activity <u>Yes No</u> Sedentary Activity (TV, computer, Nintendo, etc.) Yes No	What: How long: _____ What: How long: _____
Day: ___ Date: ___		__ hr. __ min. __ sec. Total min. _____	Yes No If No how long was it off? _____	Physical Activity <u>Yes No</u> Sedentary Activity (TV, computer, Nintendo, etc.) Yes No	What: How long: _____ What: How long: _____
Day: ___ Date: ___		__ hr. __ min. __ sec. Total min. _____	Yes No If No how long was it off? _____	Physical Activity <u>Yes No</u> Sedentary Activity (TV, computer, Nintendo, etc.) Yes No	What: How long: _____ What: How long: _____
Day: ___ Date: ___		__ hr. __ min. __ sec. Total min. _____	Yes No If No how long was it off? _____	Physical Activity <u>Yes No</u> Sedentary Activity (TV, computer, Nintendo, etc.) Yes No	What: How long: _____ What: How long: _____

Appendix A-3

Forms

4) Maternal employment status. (please circle one)

<u>Employed Full Time</u>	<u>Employed Part Time</u>	<u>Not Employed</u>
	(Please circle one from each column)	
Morning	Morning	1 – 10 hours
Afternoon	Afternoon	11 – 20 hours
Evening	Evening	21 – 30 hours
Night	Night	31 – 39 hours

5) Paternal employment status. (please circle one)

<u>Employed Full Time</u>	<u>Employed Part Time</u>	<u>Not Employed</u>
	(Please circle one from each column)	
Morning	Morning	1 – 10 hours
Afternoon	Afternoon	11 – 20 hours
Evening	Evening	21 – 30 hours
Night	Night	31 – 39 hours

6) Religious Affiliation _____

Dear Research Participant,

Thank you for participating in the physical activity study. With your help, it is hoped that researchers can better understand the nature of family physical activity patterns.

It is extremely important to the study that correct and complete data on all participants be submitted next Sunday. If you have any questions or concerns regarding any part of the study, please notify me immediately.

Michael Scott Parker

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michael.parker@nebo.edu

Again, your participation is greatly appreciated!

Sincerely,

Michael Scott Parker