5-2011

Examining activity levels and motor proficiency: A comparison of children who are overweight and at a healthy weight to their parents and peers

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OF CHILDREN WHO ARE OVERWEIGHT AND AT A HEALTHY

WEIGHT TO THEIR PARENTS AND PEERS

by

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A doctoral document submitted in partial fulfillment of
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THE GRADUATE COLLEGE

Date: May 10, 2011

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ABSTRACT

Examining Activity Levels and Motor Proficiency: A Comparison of Children who are Overweight and at a Healthy Weight to their Parents and Peers

by

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Objective: The purpose of this study was to examine relationships and differences between motor proficiency, activity level, and parental activity level in children who are at a healthy weight and children who are overweight or obese.

Methods: Forty-four children (26 children at a healthy weight and 18 children who were overweight or obese) between the ages of 8-16 (BMI: 14.3-43.6 kg/m^2) and 36 parents (BMI: 18.1-44.7) participated in this study. Children and parents wore StepWatch activity monitors (SAM) to measure activity levels over a 72 hour period. Tests reflecting several determinants of motor performance were also administered to all children including: 60 second half sit up test, Timed Up and Go (TUG) test, and 30 second sit to stand (STS) test.

Results: Data analyses demonstrate several significant correlations between the SAM data of fathers to daughters and mothers to sons. A statistically significant difference was found between children at a healthy weight and children who are overweight or obese for percent time spent in high activity. Statistically significant differences were found between all three motor performance tests between children at a healthy weight and children who are overweight or obese.

Conclusion: Relationships between activity levels of parents and children suggest that children pattern their activity levels after their parents. More specifically, children and parents of opposite genders demonstrate stronger relationships in their activity levels than children and parents of the same gender. Differences were also found for all motor performance tests between children at a healthy weight and children who were overweight or obese, indicating that children at a healthy weight may be more motor proficient.

Introduction

Childhood obesity is a growing epidemic in the United States. Research indicates that 33% of all children are currently overweight, and this problem has been rising over the past several decades.[1] Between 1980 and 2008, the percentage of 6 to 11 year old children who were obese rose from 6.5% to 19.6%.[2,3] Likewise, the percentage of 12 to 19 year olds who were obese rose from 5.0% to 18.1% in this same time frame. Childhood obesity is a rapidly growing, global health issue that involves many factors. From 1999-2005 hospitalizations related to childhood obesity rose from 125.9 million to 237.9 million dollars.[4] Current intervention strategies have not been able to reverse this trend. Upcoming and new interventions strategies are focusing on the education of expectant mothers and improving the availability of high quality nutritious food in schools and children's homes.[5]

Children who are obese are at a higher risk for serious health problems across their lifespan.[6] Health problems identified in this population include elevated blood pressure, high cholesterol, type 2 diabetes, liver disease, heart disease, sleep apnea, hepatic stenosis, and asthma.[1, 6-12] In a recent study by Dietz,[13] it was determined that 60% of overweight children have developed at least one cardiovascular risk factor. Researchers have identified genetic and behavioral risk factors that contribute to childhood obesity. Genetics have a statistically significant influence on body weight.[14, 15] Recent research suggests that abnormalities in the gene that codes for the hormone ghrelin, which stimulates the appetite, may play a role in obesity.[16] Behavioral factors such as physical activity and diet also play an important role in determining a child's weight.[17] In addition, children between 8 and 18 years of age spend on average three hours per day participating in sedentary activities such as watching television, movies, or playing video games.[18]

Children who are overweight or obese often have a lower level of motor proficiency and related characteristics when compared to their peers who are at a healthy weight. For the purposes of this paper, we have defined motor proficiency as being skilled, efficient and well-practiced in an activity. Ara et al.[19] reported an inverse relationship between physical fitness and the amount of subcutaneous fat mass the child had. In addition to lower physical fitness, D'Hondt et al., [20] demonstrated decreased motor skills in overweight children, noting that children who are obese have decreased manual dexterity, ball skills and static and dynamic balance when compared to healthy weight and overweight children. Riethmuller et al.[21] found that self-esteem, cardiorespiratory fitness, and physical activity are associated with motor proficiency. In addition Wrotniak et al.,[22] identified a positive association between physical activity and motor proficiency and an inverse relationship between motor proficiency and a sedentary lifestyle in children.

Children who are overweight or obese are not only at a higher risk for health problems, but are also at risk for becoming socially isolated from their peers. In addition, overweight or obese children are often stereotyped and given negative labels or bullied. Wardle et al.[23] found that children between 4 and 11 years' old labeled children who are obese as ugly, selfish, lazy, stupid, dishonest, socially isolated and frequently teased. In this same study children at a healthy weight were labeled as clever, healthy, attractive, kind, happy, socially popular, and enjoyable to play with. In a study done in the 1960's by Goodman et al.,[24] that was recently replicated by Latner and Stunkard,[25] children were asked to rank six pictures of children that had disabilities or different physical features as possible friends. In both studies the child who was obese came in last place behind children who were on crutches, sat in a wheel chair, or had a hand amputation or facial deformity.

Current research supports the existence of a relationship between a child's environment and the development of childhood obesity. The social cognitive theory serves as a foundation for this relationship and focuses on the following concepts: self-efficacy, social support, self-control, and expectations.[26,27] Sharma, Wagner, and Wilkerson[26] determined that elements such as activity, water consumption, fruit and vegetable consumption, and time spent watching TV can be predicted by self-efficacy, self-control, and expectations. Family also plays an important role in this theory by offering social support.[27] It has been found that children will most likely engage in similar activities as their parents.[28, 29] Fogelholm et al.[29] concluded that inactivity of a parent was a stronger predictor of their children's activity level than a high parent activity level. They also concluded that mothers had a stronger relationship with their sons in regards to high activity level than fathers did. Salvy and Roemmich et al.[30] found that the presence of a physically active peer inspired children who were overweight to be active as well. Past studies have looked at the activity levels of youth when compared to their family members and peers separately but never in the same study.[31] Epstein et al.[31] used accelerometers to record the amount of activity in overweight and healthy children.

In summary, childhood obesity is an important, rapidly growing and complex public health issue which is associated with or influenced by many variables.[32] However, it remains unclear how these variables behave in different combinations. Understanding how these variables interact will be important in the development of intervention strategies targeting multiple aspects of the problem of childhood obesity. This study focuses on familial and developmental behavioral components of childhood obesity. The purpose of this study is to examine relationships and differences between motor proficiency, activity level, and parental activity level in children who are at a healthy weight and children who are overweight or obese. We hypothesize that children who are overweight or obese will have decreased motor proficiency and activity levels when compared to their peers who are at a healthy weight. We also hypothesize that parental activity levels will be similar to their child's activity level regardless of whether their children are of a healthy weight, overweight or obese.

Materials and methods

Participants

Investigators recruited a sample of convenience of 44 children and 36 parents from the Las Vegas area to participate in this study. Child participants included 23 females and 21 males, all between the ages of 8 and 16, with the mean age of 11.8 years. Children in the study were assigned to groups according to Centers for Disease Control (CDC) standards (Table 1) using Body Mass Index (BMI) criteria for childhood obesity.[33] Group 1 children met a criterion (>85th percentile BMI) for being overweight or at risk for becoming overweight (n=18).[33] Group 2 children met a criterion (<85th percentile BMI) for being at a healthy weight (n=26).[33] Parents were also classified according to the CDC standards into two groups one group met criterion (>25 BMI) for being overweight (n=22), other group met a criterion (<25 BMI) for being at a healthy weight (n= 14).[33] Additionally, for statistical purposes the parents were classified according to the classification of their child (e.g. parent of healthy weight child, parent of overweight child). Some parents had more than one child included in this study. Children were excluded from the study if they had any current disease or other illness, known disability, or developmental problem that would prevent study participation or inability to communicate with the investigators in English. The Institutional Review Board of the University of Nevada Las Vegas (UNLV) approved this study. All child participants assented to participate; all parent participants provided informed consent and permission for their children to participate.

Testing procedure

To determine if there was a relationship between groups, we collected the following data on all children and parents: height, weight, BMI, and a 72-hour period of activity monitoring using a Step Watch Activity Monitor (SAM).[i] Data were collected at either the participants' home, at a neutral location in the community or at the UNLV physical therapy movement science laboratory on the UNLV campus.

All child participants supplied their age and underwent tests of motor performance including: 30 second sit to stand (STS)[34], the timed up and go (TUG)[35] test, and 60 second sit up test (Sit up). The STS required that the participant begin the test seated in a standard folding chair, then move between sitting and fully standing as many times as possible in 30 seconds. The TUG measures the time it takes participants to stand up from a chair, walk ten feet, turn around, walk back, and sit down. Williams et al.[36] found the TUG to be reliable in children (intraclass corellation coefficent [ICC] = 0.83. The sit up test required participants to raise the upper back in a smooth motion from supine with

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[i] Contact Information for SAM : info@orthocareinnovations.com
OrthoCare Innovations, 840 Research Parkway, Suite 200, Oklahoma City, OK 73104
Oklahoma City Corporate Office: 800.672.1710 main, 405.239.5372 fax

knees flexed, feet anchored to the ground by a researcher, hands reaching out on the surface four inches forward, then return to supine, and repeat this action as many times as possible in 60 seconds. Diener et al.[37] found a test-retest reliability for the 60 second half sit up test to be r = 0.98.

Data collection

Each parent and child were given a SAM and instructed to wear it continuously except when showering, for 72 hours without altering their normal everyday physical activities.

Data for a large number of variables were collected by the SAMs and this investigation focused on: total number of steps, percent time spent in high activity (>40 steps/minute), percent time spent in medium activity (15-40 steps/minute, percent time spent in low activity (≤15 steps/minute), and percent time spent in total activity.[38] Weight and height were obtained to classify parents and children into a healthy and non healthy weight groups. Children were then tested on the TUG, STS, and sit up test according to standard protocols.

Data analysis

Data were analyzed using PASW Statistics 18, Release Version 18.0.0 (Ó SPSS, Inc., 2009, Chicago, IL, www.spss.com). Descriptive statistics were calculated to find percents, means, and standard deviations of SAM data, scores on TUG, STS, and sit up tests. To assess whether there was a correlation between the activity levels of children in different weight classifications and their parents, four different sets of correlations were tested using the Pearson product moment correlation (r). The relationships consisted of mothers to daughters, mothers to sons, fathers to daughters and fathers to sons. The data used in these analyses consisted of SAM data from both the parents and children.

In addition to the correlational statistics, two separate one way ANOVAs were performed to test for between group differences in child and parent activity levels using SAM data. The first ANOVA looked at the difference in activity levels of Group 1 children (overweight or obese) their fathers, and their mothers. The second ANOVA was conducted to look at differences in activity levels between Group 2 children (healthy weight), their fathers, and their mothers.

Two separate independent samples t-tests were also performed to test for differences in activity levels between Group 1 and Group 2 children. The first t-test analyzed differences between the SAM data of the two groups of children and the second assessed differences in motor proficiency between the two groups of children using scores on the TUG, STS, and sit up tests.

Results

Activity levels between children and their parents

In analyzing the four correlations between parents and children, the following associations were found to be statistically significant ($p<0.05$): relationship between son’s total activity to mother’s total steps ($r=0.746$), son’s total activity to mother’s high activity ($r=0.911$), son’s total activity to mother’s medium activity ($r=0.557$), son’s total activity to mother’s total activity ($r=0.832$), son’s high activity to father’s medium activity ($r=-0.755$), son’s high activity to father’s low activity ($r=-0.724$), daughter’s high activity to father’s high activity ($r=0.808$), daughter’s low activity to father’s medium activity ($r=0.707$), daughter’s low activity to father’s low activity ($r=0.568$), daughter’s low activity to father’s total activity ($r=0.645$), and daughter’s total activity to father’s medium activity (r=0.627). See Table 2 for coefficients and p-values of all of the associations tested.

There were no statistically significant differences among children at a healthy weight, their mothers, and their fathers for total steps $F(2, 47)=0.048$, $p=0.954$, percent time spent in high activity $F(2, 47)=0.592$, $p=0.557$, percent time spent in medium activity $F(2, 47)=0.305$, $p=0.738$, percent time spent in low activity $F(2, 47)=0.565$, $p=0.572$, or percent time spent in total activity $F(2, 47)=0.368$, $p=0.694$. See table 3 for means and standard deviations. Similar results were found for children who are overweight or obese and their parents; no statistically significant differences were found between children who are overweight or obese, their mothers, and their fathers for total steps $F(2, 34)=0.255$, $p=0.776$, percent time spent in high activity $F(2, 35)=0.319$, $p=0.729$, percent time spent in medium activity $F(2, 35)=1.982$, $p=0.153$, percent time spent in low activity $F(2, 35)=1.250$, $p=0.299$, and percent time spent in total activity $F(2, 35)=1.587$, $p=0.219$. See table 4 for means, standard deviations, and standard errors.

<u>Activity levels between children at a healthy weight and children who are overweight or obese</u>

In looking at the difference in SAM data between children at a healthy weight and children who are overweight or obese, only the category of amount of time spent in high activity showed statistical significance. Children at a healthy weight spend more time in high activity than children who are overweight or obese, $t(32)=3.220$, $p=0.003$ (violation of homogeneity, $p<0.0005$). No statistical significance was found between children for total steps $t(41)=1.303$, $p=0.200$, percent time spent in medium activity $t(42)=0.714$, $p=0.479$, percent time spent in low activity $t(42)=-0.847$, $p=0.402$, or percent time spent in total activity t(42)=0.110, p=0.913. See table 5 for means, standard deviations, and standard errors.

There was a statistically significant difference between children at a healthy weight and children who are overweight or obese for the 30 second sit to stand, t(42)=3.259, p=0.002 (violation of homogeneity, p=0.04), the TUG, t(42)=-2.754, p=0.009, and the 60 second sit ups, t(41)=2.649, p=0.011. See table 6 for means, standard deviations, and standard errors.

Discussion

The results of this study indicate that there is a positive relationship in activity levels between children and their parents. There are also differences in activity levels and motor proficiency between children who are overweight or obese and children who are at a healthy weight. These results indicate that children from Group 1 (overweight/obese) demonstrate slower TUG times, perform fewer sit ups in 60 seconds, and fewer sit to stands in 30 seconds than children from Group 2 (healthy weight).

We found a moderate to high positive relationship between activity levels of children and their parents, which is consistent with current evidence.[39] Lau et al.[39] found that children often model their behavior after their parents in their speech and actions. The results of the present study suggest that parents may also serve as models for their children with regard to intensity of activity and number of steps they take throughout the day. In addition to modeling, it is also possible that active parents provide their children with more opportunities to be active during shared family time. Lau et al.[39] also found that parents are much more influential in younger children's beliefs and behaviors than their children's peers. Interestingly, results reported suggest that parents may exert stronger influence over activity levels of opposite gender. The present study demonstrated stronger correlations between activity levels of sons to mothers and daughters to fathers compared to same gender parents and children. Fogelholm et al.[29] also found that mother's vigorous activity levels had an association on son's activity. Part of the child's identity may include their desire to be active or inactive. Additionally, Canavera et al.[40] reported that a child's weight and physical activity may be affected by their environment, behavioral traits, and their genetics.

One hypothesis of this study was that parents' activity levels would have an influence on their child's. There were no differences found between the activity levels of healthy weight children and their parents or overweight/obese children and their parents. This suggests that regardless of weight status children model their activity levels after their parents. The current evidence supports this finding and the important role parents play in influencing their children to be physically active. Bois et al.[41] found that mothers modeling of physical activity had a direct effect on their child's time spent in physical activity in children aged 9 to 11 years old and that father's beliefs of their child's physical abilities had a direct effect on their physical activity. Additionally, Edwardson et al.[42] performed a systematic review and reported that parents play an important role in influencing their child's moderate to vigorous physical activity.

Parents influence overall physical activity, and leisure time physical activity through encouragement, transportation to organized activities, and being role models to children aged 6 to 18.[42] Ornelas et al.[43] reported that significant predictors of adolescents meeting guidelines for physical activity were: communication with child, parental involvement with children activities, and family cohesion. They also found that parental monitoring such as curfews and other rules were not predictors. Hence, an authoritative parenting style and valuable family time is suggested with adolescents to improve their physical activity. Therefore, it is important to educate parents about the influence they can have on their child's physical activity and suggest ways to implement it in their lives.

Another hypothesis of this study was that children at a healthy weight have higher activity levels than children who are overweight or obese. There was only one difference found between the above mentioned groups of children and their activity levels. Children at a healthy weight spent more time in high activity than children who were overweight or obese. This is consistent with the findings of Gutin et al.[44] who reported that adolescents involved in greater vigorous physical activity were associated with better cardiovascular fitness and lower percent body fat. Another study, also by Gutin et al.,[45] found that obese adolescents who participated in increased intensity of exercise during training sessions improved best in cardiovascular fitness and percent body fat than those at a lower intensity. Additionally, Fogelholm et al.[46] recommended that exercise should be at least moderate (>30-40% maximal oxygen consumption (VO2 max)) to receive health benefits. This information may be beneficial for parents and community programs to help guide choices in children's exercise activities at a greater intensity.

It was hypothesized that children at a healthy weight would have better motor proficiency than children who are overweight or obese. Children at a healthy weight were able to perform motor performance tests (TUG, STS, and sit ups) more efficiently and at a faster rate than overweight or obese. Lopes et al.[47] suggest that motor skill is a predictor of physical activity and better motor skill predicts greater activity. In the current study, it was found that children who are overweight had decreased motor proficiency than those who are at a healthy weight. This may be because children who are overweight may have decreased coordination, lower self-esteem and thus decreased motivation to be physically active.[48] Venetsanou et al.[48] suggested that this could also be due to the manner in which a child is raised. For example, the social cultural context may form specific demands for the child's motor behavior and favor some aspects of motor development while impairing others. Clinically, this finding implicates the importance of increasing their strength, coordination, and motivation to improve their amount of activity and their abilities in physical activity.

Further research needs to be conducted to determine whether decreased activity and motor proficiency in children contributes to a higher BMI. D'Hondt et al.[20] found similar results concerning activity and BMI and determined that the lack of activity could not be explained solely by biomechanics and the effects of gravity, but also poor self-perception of physical abilities may decrease their motivation to participate in physical activities. Therefore, it would seem that there is a lack of motivation and thus the children who are overweight or obese are less active, leading to an increase in their BMI. Clinicians should discover what motivates each individual child to be physically active and teach parents how to help motivate their children in a healthy way. Many children who are overweight or obese may never be seen by physical therapists but may be seen by pediatricians or family practitioners who are able to refer them to pediatric multidisciplinary weight management programs. Additionally, implementing physical activity screenings in public schools is a way clinicians may be able to help and educate families on how to influence and support their children to be physically active.

There were several limitations to this study. First, some of the participants wore SAMs on the weekend while others wore them during weekdays. Future studies need examine how weekend and weekday activity patterns vary for participants. Second, in our sample of convenience, many of children in both groups were involved in similar extracurricular activities such as dance and sports. Children who participate in these activities may not truly represent the activity levels and motor proficiency of their respective health status group. Third, participants were asked to remove the SAMs if they were going to be involved in any water recreation or activities. This may have limited our potential to accurately capture activity levels of individuals whose primary activities involved swimming or other water events. Using a supplemental log or other means of monitoring water activities should be considered in future studies. Additionally, future researchers should investigate the effect motor proficiency level has on activity level and the most efficient and successful way for parents to influence their child. If improved motor proficiency leads to increased activity, then interventions to improve motor proficiency might be most beneficial to individuals who are overweight or obese.

Conclusion

The results of this study indicate that children who are overweight or obese have decreased motor proficiency and activity levels compared to children at a healthy weight. Additionally, there is a relationship between children’s activity level and the activity level of their parents, particularly for parents and children of opposite genders. We recommend that parents assume a more active role in guiding activity levels of their children by demonstrating increased activity of their own. We also recommend that parents consider promoting activities that help increase motor proficiency in their children. Lastly, we recommend that parents and teachers encourage activities that don't exceed the motor capabilities of their children, so as not to discourage them from continued physical activity throughout their lives.

Conflict of interest

No conflicts of interest existed for any of the authors during this study.

Acknowledgments

The authors would like to acknowledge Dr. Merrill Landers for assistance with revisions, data input and data analysis and Vickie Byers for assistance with subject recruitment.

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EXHIBITS

Table 1

CDC BMI standards for children and teens[29]

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	Equal to or greater than the 95th percentile

Table 2

Correlations between activity levels of sons and mothers

Specific Relationships	r	p	r^2
son total steps to mother total steps	0.416	0.139	0.173
son total steps to mother high activity	0.417	0.138	0.174
son total steps to mother medium activity	0.415	0.140	0.172
son total steps to mother low activity	-0.225	0.440	0.051
son total steps to mother total activity	0.253	0.383	0.064
son high activity to mother total steps	0.331	0.227	0.110
son high activity to mother high activity	0.333	0.225	0.111
son high activity to mother medium activity	0.333	0.225	0.111
son high activity to mother low activity	-0.171	0.543	0.029
son high activity to mother total activity	0.260	0.350	0.068
son medium activity to mother total steps	0.446	0.095	0.199
son medium activity to mother high activity	0.324	0.239	0.105
son medium activity to mother medium activity	0.496	0.060	0.246
son medium activity to mother low activity	-0.056	0.843	0.003
son medium activity to mother total activity	0.249	0.370	0.062
son low activity to mother total steps	0.337	0.220	0.114
son low activity to mother high activity	0.316	0.251	0.100
son low activity to mother medium activity	0.302	0.274	0.091
son low activity to mother low activity	0.074	0.795	0.005

son low activity to mother total activity	0.238	0.393	0.057
son total activity to mother total steps	0.746	0.001	0.557
son total activity to mother high activity	0.911	0.000	0.830
son total activity to mother medium activity	0.557	0.031	0.310
son total activity to mother low activity	0.254	0.360	0.065
son total activity to mother total activity	0.832	0.000	0.692

Correlations between activity levels of sons and fathers

Specific Relationships	r	p	r^2
son total steps to father total steps	0.483	0.188	0.233
son total steps to father high activity	0.589	0.095	0.347
son total steps to father medium activity	-0.033	0.933	0.001
son total steps to father low activity	-0.157	0.686	0.025
son total steps to father total activity	0.082	0.834	0.007
son high activity to father total steps	0.026	0.947	0.001
son high activity to father high activity	0.609	0.082	0.371
son high activity to father medium activity	-0.755	0.019	0.570
son high activity to father low activity	-0.724	0.027	0.524
son high activity to father total activity	-0.613	0.079	0.376
son medium activity to father total steps	0.437	0.240	0.191
son medium activity to father high activity	0.197	0.612	0.039
son medium activity to father medium activity	0.426	0.252	0.181
son medium activity to father low activity	0.264	0.492	0.070

son medium activity to father total activity	0.436	0.241	0.190
son low activity to father total steps	0.581	0.101	0.338
son low activity to father high activity	0.507	0.164	0.257
son low activity to father medium activity	0.157	0.686	0.025
son low activity to father low activity	0.113	0.771	0.013
son low activity to father total activity	0.316	0.408	0.100
son total activity to father total steps	0.551	0.124	0.304
son total activity to father high activity	0.482	0.189	0.232
son total activity to father medium activity	0.186	0.631	0.035
son total activity to father low activity	0.077	0.843	0.006
son total activity to father total activity	0.298	0.435	0.084

Correlations between activity levels of daughters and mothers

Specific Relationships	r	p	r^2
daughter total steps to mother total steps	-0.129	0.621	0.017
daughter total steps to mother high activity	-0.338	0.185	0.114
daughter total steps to mother medium activity	0.189	0.468	0.036
daughter total steps to mother low activity	-0.054	0.836	0.003
daughter total steps to mother total activity	-0.042	0.873	0.002
daughter high activity to mother total steps	0.051	0.846	0.003
daughter high activity to mother high activity	-0.051	0.847	0.003
daughter high activity to mother medium activity	0.290	0.259	0.084
daughter high activity to mother low activity	-0.291	0.258	0.085

daughter high activity to mother total activity	-0.036	0.892	0.001
daughter medium activity to mother total steps	-0.173	0.508	0.030
daughter medium activity to mother high activity	-0.395	0.117	0.156
daughter medium activity to mother medium activity	0.119	0.649	0.014
daughter medium activity to mother low activity	0.091	0.728	0.008
daughter medium activity to mother total activity	-0.013	0.960	0.000
daughter low activity to mother total steps	-0.358	0.159	0.128
daughter low activity to mother high activity	-0.460	0.063	0.212
daughter low activity to mother medium activity	-0.138	0.597	0.019
daughter low activity to mother low activity	0.065	0.805	0.004
daughter low activity to mother total activity	-0.169	0.516	0.029
daughter total activity to mother total steps	-0.299	0.243	0.089
daughter total activity to mother high activity	-0.463	0.061	0.214
daughter total activity to mother medium activity	-0.011	0.968	0.000
daughter total activity to mother low activity	0.033	0.900	0.001
daughter total activity to mother total activity	-0.127	0.628	0.016

Correlations between activity levels of daughters and fathers

Specific Relationships	r	p	r^2
daughter total steps to father total steps	0.391	0.186	0.153
daughter total steps to father high activity	0.294	0.330	0.086
daughter total steps to father medium activity	0.306	0.309	0.094
daughter total steps to father low activity	0.024	0.939	0.001

daughter total steps to father total activity	0.218	0.473	0.048
daughter high activity to father total steps	0.348	0.243	0.121
daughter high activity to father high activity	0.808	0.001	0.653
daughter high activity to father medium activity	-0.141	0.647	0.020
daughter high activity to father low activity	-0.400	0.175	0.160
daughter high activity to father total activity	-0.151	0.622	0.023
daughter medium activity to father total steps	0.279	0.355	0.078
daughter medium activity to father high activity	-0.040	0.897	0.002
daughter medium activity to father medium activity	0.386	0.193	0.149
daughter medium activity to father low activity	0.240	0.429	0.058
daughter medium activity to father total activity	0.324	0.280	0.105
daughter low activity to father total steps	0.481	0.096	0.231
daughter low activity to father high activity	-0.192	0.530	0.037
daughter low activity to father medium activity	0.707	0.007	0.500
daughter low activity to father low activity	0.568	0.043	0.323
daughter low activity to father total activity	0.645	0.017	0.416
daughter total activity to father total steps	0.479	0.097	0.229
daughter total activity to father high activity	-0.058	0.851	0.003
daughter total activity to father medium activity	0.627	0.022	0.393
daughter total activity to father low activity	0.434	0.139	0.188
daughter total activity to father total activity	0.552	0.051	0.305

Table 3

Mean activity levels of children at a healthy weight and their parents

(One way ANOVA)

SAM data		Mean	SD*	SE*
Total steps	Father	19362.909	8033.209	2422.104
	Mother	19319.429	9238.498	2469.092
	Child	20006.800	6489.142	1297.828
	Total	19672.680	7520.151	1063.510
Percent High Activity	Father	2.582	2.643	0.797
	Mother	2.029	2.082	0.556
	Child	2.752	1.621	0.324
	Total	2.512	1.990	0.281
Percent Medium Activity	Father	7.927	3.251	0.980
	Mother	8.779	3.854	1.030
	Child	8.796	2.834	0.567
	Total	8.600	3.188	0.451
Percent Low Activity	Father	17.191	3.794	1.144
	Mother	17.779	3.978	1.063
	Child	18.716	4.486	0.897
	Total	18.118	4.172	0.590
Percent Total Activity	Father	27.700	6.586	1.986
	Mother	30.343	11.323	3.026
	Child	29.952	6.852	1.370

	Total	29.566	8.179	1.157

* SD = Standard Deviation; SE = Standard Error

Table 4

Mean activity levels of children who are overweight or obese and their parents (One way ANOVA)

SAM data		Mean	SD	SE
Total Steps	Father	17806.857	6726.810	2542.495
	Mother	15789.500	9262.724	2673.918
	Child	17507.278	5777.966	1361.880
	Total	17006.838	7089.885	1165.570
Percent High Activity	Father	1.114	0.641	0.242
	Mother	1.467	2.377	0.686
	Child	1.617	0.601	0.138
	Total	1.477	1.399	0.227
Percent Medium Activity	Father	9.614	4.116	1.556
	Mother	6.508	2.897	0.836
	Child	8.130	3.347	0.768
	Total	7.891	3.450	0.560
Percent Low Activity	Father	19.700	4.757	1.798
	Mother	17.158	4.568	1.319
	Child	19.962	5.259	1.207
	Total	19.028	4.999	0.811
Percent Total Activity	Father	30.443	8.694	3.286
	Mother	25.142	8.260	2.385
	Child	29.721	7.024	1.611

Total	28.408	7.853	1.274

Table 5

Comparison of activity levels of children at a healthy weight vs. children who are overweight or obese (Independent samples t-test)

SAM data	Weight status	Mean	SD	SE
Total Steps	Healthy weight	20006.80	6489.142	1297.828
	Children who are overweight or obese	17507.28	5777.966	1361.880
	Total	18757.04	6133.554	1329.854
Percent High Activity	Healthy weight	2.752	1.621	0.324
	Children who are overweight or obese	1.617	0.601	0.138
	Total	2.185	1.111	0.231
Percent Medium Activity	Healthy weight	8.796	2.834	0.567
	Children who are overweight or obese	8.130	3.347	0.768
	Total	8.463	3.091	0.668
Percent Low Activity	Healthy weight	18.716	4.486	0.897
	Children who are overweight or obese	19.962	5.259	1.207
	Total	19.339	4.873	1.052
Percent Total Activity	Healthy weight	29.952	6.852	1.370
	Children who are	29.721	7.024	1.612

overweight or obese			
Total	29.837	6.938	1.491

Table 6

Comparison of motor performance for children at a healthy weight vs. children who are overweight or obese (Independent samples t-test)

Motor test	Weight status	Mean	SD	SE
Timed Up & Go	Healthy weight	4.546	0.585	0.117
	Children who are overweight or obese	5.064	0.659	0.151
	Total	4.805	0.622	0.134
30 Second Sit to Stand	Healthy weight	24.420	6.094	1.219
	Children who are overweight or obese	19.263	4.398	1.009
	Total	21.842	5.246	1.114
60 Second Sit Up	Healthy weight	51.840	15.798	3.160
	Children who are overweight or obese	40.250	11.443	2.697
	Total	46.045	13.621	2.929

APPENDIX

UNLV
UNIVERSITY OF NEVADA LAS VEGAS

UNLV IRB Approved OCT 20 2009 Expires OCT 19 2010

Biomedical IRB – Full Board Review
Approval Notice

NOTICE TO ALL RESEARCHERS:

Please be aware that a protocol violation (e.g., failure to submit a modification for any change) of an IRB approved protocol may result in mandatory remedial education, additional audits, re-consenting subjects, researcher probation suspension of any research protocol at issue, suspension of additional existing research protocols, invalidation of all research conducted under the research protocol at issue, and further appropriate consequences as determined by the IRB and the Institutional Officer.

DATE: December 16, 2009

TO: **Dr. Robbin Hickman**, Physical Therapy

FROM: Office for the Protection of Research Subjects

RE: Notification of IRB Action
Protocol Title: **Parent and Child Monitoring of Physical Activities in Nevada**
Protocol #: 0909-3228

This memorandum is notification that the project referenced above has been reviewed by the UNLV Biomedical Institutional Review Board (IRB) as indicated in Federal regulatory statutes 45CFR46. The protocol has been reviewed and approved.

The protocol is approved for a period of one year from the date of IRB approval. The expiration date of this protocol is October 19, 2010. Work on the project may begin as soon as you receive written notification from the Office for the Protection of Research Subjects (OPRS).

PLEASE NOTE:
Attached to this approval notice is the **official Informed Consent/Assent (IC/IA) Form** for this study. The IC/IA contains an official approval stamp. Only copies of this official IC/IA form may be used when obtaining consent. Please keep the original for your records.

Should there be *any* change to the protocol, it will be necessary to submit a **Modification Form** through OPRS. No changes may be made to the existing protocol until modifications have been approved by the IRB.

Should the use of human subjects described in this protocol continue beyond October 19, 2010, it would be necessary to submit a **Continuing Review Request Form** *60 days* before the expiration date.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at OPRSHumanSubjects@unlv.edu or call 895-2794.

Office for the Protection of Research Subjects
4505 Maryland Parkway • Box 451047 • Las Vegas, Nevada 89154-1047

VITA

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Degree:
Bachelor of Science, Health and Human performance, 2008
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Doctoral Document Title: Examining Activity Levels and Motor Proficiency: A Comparison of Children who are Overweight and at a Healthy Weight to their Parents and Peers

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