THE EXPERIMENTAL EFFECT OF PARENTAL INFLUENCE
ON CHILDREN’S PHYSICAL ACTIVITY

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by

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Today’s children are not participating in adequate amounts or intensities of physical activity. While research has demonstrated several positive factors that contribute to increases in physical activity, no experimental studies have been conducted examining the impact of parental influence on children’s physical activity behavior. Because the existing evidence is from non-experimental studies, the causal impact of parental influence on children’s physical activity behavior cannot be inferred. The purpose of this study was to assess the amount, intensity, enjoyment (i.e., liking), and preference of children’s physical activity under three conditions; alone, with a parent watching, and with a parent participating.

Twenty children (n = 10 girls) between the ages of 3-6 years old participated in each condition for 30-minutes in which they could choose from a variety of physical and/or sedentary activities. More counts (p ≤ 0.02) were accumulated during the parent participating (109,523 counts) condition than the alone (67,938 counts) and parent watching (85,624 counts) conditions. More time (p = 0.01) was allocated to sedentary activities during the alone (15 minutes) condition than the parent participating (6 minutes) condition. A significantly greater (p ≤ 0.01) proportion of children chose to participate in the additional 10-minute bonus period during the parent participating (89%) condition than the parent watching (55%) and alone (22%) conditions.
*Parental participation* during bouts of physical activity (or at minimum direct supervision) may be an important component in the development of physical activity environments intended to maximize physical activity behavior in children.
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CHAPTER I
INTRODUCTION

Children who participate in physical activity compared to those that are more sedentary enjoy positive health benefits such as improved cardiovascular fitness (Sallis, Patterson, Buono, & Nader, 1988), increased peak bone mineral density (De Bourdeaudhuij, Philippaerts, Crombez, Matton, Wijndaele, & Balduck, 2005), and increased muscular strength and endurance (Faigenbaum, Westcott, Loud, & Long, 1999; Sallis et al., 1988), with these benefits likely continuing into adulthood (Telama, 2009; Telama, Yang, Laakso, & Viikari, 1997; Telama, Yang, Viikari, Wanne, & Raitakari, 2005). Due to these health benefits associated with physically active children, the Center for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) have established guidelines recommending that children engage in a minimum of 60 minutes or more of at least moderate intensity physical activity (3-6 METs) on most days if not all days of the week (CDC, 2011; Thompson, 2010).

Despite the evidence supporting the positive effects associated with increased physical activity in children (Biddle & Asare, 2011; Davidson, Simen-Kapeu, & Veugelers, 2010; De Bourdeaudhuij et al., 2005; Faigenbaum et al., 1999; Sallis et al., 1988; Telama, 2009; Telama et al., 1997; Telama et al., 2005), most are not participating in adequate amounts ($\geq 60$ min·day$^{-1}$ on at least 5-7 d·wk$^{-1}$), nor are they regularly achieving exercise intensities great enough to be considered moderate intensity (3-6 METs) (Ball, Marshall, & McCargar, 2005; Epstein & Goldfield, 1999; Sallis, Prochaska, Taylor, Hill, & Geraci, 1999; Weiss, McCullagh, Smith, & Berlant, 1998). Failure for
children to participate in adequate amounts and intensities of physical activity can lead to the development of childhood obesity and obesity-related disorders (Hills, Andersen, & Byrne, 2012; Pradinuk, Chanoine, & Goldman, 2011). Presently, approximately 17% of children are obese (body mass index (BMI) for age ≥ 95th percentile) with an additional 17% considered overweight (BMI for age ≥ 85th - < 95th percentile). The prevalence of childhood obesity and being overweight has tripled in the past three decades reaching epidemic levels (CDC, 2011). Numerous health risks are associated with being overweight and/or obese such as elevated blood pressure, blood glucose, and cholesterol, greater risk for the development of type II diabetes, and respiratory abnormalities (Faith, Pietrobelli, Allison, & Heymsfield, 1997). As this childhood obesity epidemic continues to grow, it is imperative for researchers to identify and examine environmental, social, and behavioral factors that affect physical activity participation in children. A greater understanding of these factors that may contribute to physical activity behavior in children may aid in the development of more effective recommendations and/or interventions designed to increase participation in physical activity.

Children participate in a variety of physical and sedentary activities and it remains unclear as to why some children are more physically active than others. Evidence suggests that a number of factors affect children’s participation in physical activity. These factors include, but are not limited to: the availability of sedentary activity choices, children’s weight status, reinforcing (i.e., motivating) value of physical activity and sedentary alternatives, self-efficacy for physical activity, and peer support (Beets, Pitetti, & Forlaw, 2007; Beets, Vogel, Forlaw, Pitetti, & Cardinal, 2006; Epstein, Roemmich,
Several non-experimental studies have also identified parental influence as an important factor that appears to be associated with physical activity behavior in children (Beets, Cardinal, & Alderman, 2010; Dunton, Liao, Almanza, Jerrett, Spruijt-Metz, Chih-Ping, & Pentz, 2012; Prochaska, Rodgers, & Sallis, 2002). Parental influence has been defined as any opinion, attitude, or action that affects the child’s behavior(s) (Bandura, 1977). However, no studies that we are aware of have examined the impact of parental influence on children’s physical activity behavior utilizing experimental techniques. Because the existing evidence is all from non-experimental studies, the causal impact of parental influence on children’s physical activity behavior cannot be inferred. Understanding the ability of parental interaction to cause a change in physical activity behavior in children will be useful information for future recommendations geared towards parents who are concerned that their children are adequately active.
CHAPTER II
LITERATURE REVIEW

Several non-experimental studies have identified parental influence as an important factor that is associated with physical activity behavior in children (Beets et al., 2010; Dunton, Liao, Almanza, Jerrett, Spruijt-Metz, Chih-Ping, & Pentz, 2012; Prochaska et al., 2002). Parents are believed to play an important role in shaping children’s physical activity levels through support and behavioral modeling (Beets et al., 2010; Sallis & Nader, 1988). Parental social support such as purchasing equipment, paying fees, providing transportation, doing activities with, offering encouragement, and discussing benefits have been found to have positive effects on children’s physical activity behavior (Beets et al., 2010). Parents reported that when they provided positive social support in regards to their children’s physical activity it encouraged their children to pursue additional physical activity options. Conversely, children were more likely to engage in more sedentary-related activities when receiving negative social support from their parents (Beets et al., 2010).

The Social Learning Theory states that people learn within a social context, which is facilitated through modeling and observational learning. According to this theory, parents play an important role in their children’s habits and attitudes towards physical activity (Bandura, 1977; Sallis & Nader, 1988; Zecevic, Tremblay, Lovsin, & Michel, 2011). People, especially children, learn from the environment and seek acceptance from society by learning through influential models such as their parents. Social behavior is learned primarily by observing and imitating the actions of others and can be influenced
by being rewarded and/or punished for these actions (Ormrod, 1999). Through modeling and reinforcing behavior parents convey information to their children (Trost, Sallis, Pate, Freedson, Taylor, & Dowda, 2003; Weiss et al., 1998). This phenomenon has been supported by correlation-based studies which have indicated that children’s physical activity levels are positively associated with their parent’s physical activity levels. In other words, physically active parents are more likely to have physically active children (Prochaska et al., 2002; Rodriguez, Brown, & Troped, 2005). This relationship appears to be compounded by the number of active parents in the house. According to Rodriguez et al., (2005) girls and boys who had two physically active parents were four to eight times, respectively, more likely to participate in physical activity when compared to children who had two inactive parents.

While actual parental physical activity behavior is a significant correlate to children’s physical activity behavior, parental beliefs in the importance of physical activity and the amount of encouragement they provide their children to participate in physical activity have also been shown to be positive correlates to children’s physical activity (Trost et al., 2003; Weiss et al., 1998). Research from Eccles (1999) and Weiss (2000) support the notion that parental support is a positive predictor of children’s activity by demonstrating that parents who educate their children on the health benefits and importance of physical activity are more likely to have physically active children. Additionally, parents who provide positive support and rewards (e.g., praise) for their children’s participation in physical activity had children who were more likely to engage
 Another way that parents may influence their children’s physical activity is through socialization. Through the process of socialization, more specifically gender socialization, boys and girls learn behaviors and attitudes that are deemed appropriate for acceptance within perceived societal norms such as classical examples of boys playing with trucks, wearing the color blue, and playing outdoors, while on the other hand girls playing with dolls, wearing the color pink, and doing household related-activities such as learning how to cook (Elkin & Handel, 1988). This "learning" happens by way of many different agents of socialization (i.e., friends, school, mass media) with parental interactions being the most important for young children (Elkin & Handel, 1988). As parents are present in a child's life from the beginning, their influence in a child's early socialization is very important, especially in regards to gender roles. Four methods in which parents socialize gender roles in their children have been identified, which includes shaping gender related attributes through toys and activities, differing their interaction with children based on the sex of the child, serving as primary gender models, and communicating gender ideals and expectations (Epstein, Marina, & Ward 2011). During physical activity boys tend to engage in more vigorous play with their fathers, while on the other hand, girls are more closely supervised by both parents which has been shown to potentially inhibit their choice of physical activities (Maccoby, 1986; Meaney, Stewart, & Beatty, 1985). This evidence suggests that the presence of parents may not have the same influence on boys and girls as it pertains to physical activity behavior, with
parents limiting girls’ physical activity choices and encouraging boys’ involvement in vigorous physical activities. However, these findings are somewhat equivocal as Salvy et al., (2008) demonstrated that girls were more intensely active when they reported being in the presence of family members, while boys engaged in less vigorous play. A possible explanation offered by the authors for this finding may be that the vigorous physical activity of boys may be seen as disruptive within the family environment and family members may attempt to hinder or suggest other less vigorous physical activities (Salvy et al., 2008). It is because of these equivocal findings in regards to parental influence on children’s physical activity that additional research, especially experimental approaches to this area is suggested.

The family system approach which includes a combination of several interrelated parental behaviors that foster children’s motivation and enjoyment (i.e., authoritative parenting styles, positive reinforcement, emotional and tangible social support) has been used as a means to promote physical activity (Kitzman-Ulrich, Wilson, St. George, Lawman, Segal, & Fairchild, 2010). The pioneer of the family systems theory (FST), Dr. Murray Bowen, explored how the family system may influence health behaviors in youth. The FST framework involves family systems variables (competence, satisfaction, cohesion), and positive (authoritative) parenting styles (shared decision making, setting appropriate boundaries, effective conflict resolution, appropriate monitoring for developmental stage, warm and sensitive parental behaviors) (Bowen, 1985). These variables have demonstrated a positive influence on health behaviors in youth. An authoritative parenting style is characterized by a child-center approach in which parents
provide rules and guidance without being overbearing, while an authoritarian parenting style is characterized by a strict parenting approach in which parents tell their children what to do without little open discourse between parent and child. According to Bowen (1985) an authoritative parenting style is essential in positively influencing children’s behavior, while an authoritarian parenting style has been associated with negative effects on children’s behavior such as increased participation in sedentary activities and secluding and/or withdrawing oneself from parents and/or peers. Several studies have demonstrated that an authoritative parenting style has been associated with more physical activity involvement in youth when compared to an authoritarian parenting style (Mellin, Neumark-Sztainer, Story, Ireland, and Resnick, 2002; Patrick, Nicklas, Hughes, and Morales, 2005). Incorporating a positive family system approach can influence the adoption and maintenance of health behaviors through role-modeling, providing support for engaging in healthy behaviors, and creating a supportive climate for health behavior change (Kitzman-Ulrich et al., 2010).

Children and parents spend a considerable amount of time together during the week, so by measuring the amount of time per day children and parents spend together while participating in physical and sedentary activities may yield important information in regards to parental influence on children’s physical activity. The studies that have addressed this have relied on self-reported measures and interviews (Thompson, Jago, Brockman, Cartwright, Page, & Fox, 2010; Veitch, Salmon, & Ball, 2010). Through qualitative interviews it was found that during weekdays families performed very little or no physical activity together and the activities that parents and children performed
together were reported to be primarily sedentary (i.e., watching TV) (Thompson et al., 2010). On the weekends, it was reported that parents performed more physical activities with their children. It was also reported that when families visited a park or playground during weekdays they engaged in more physical activities (Veitch et al., 2010). In order to replace the time that parents and children spend together in sedentary activities with physical activities it is suggested that parents and children visit parks or playgrounds more often during weekdays, limit screen time, set aside time for participation in physical activity, and continue to engage in physical activities during the weekends. Following these recommendations could have health benefits for both children and parents alike.

While these previous non-experimental studies provide evidence in support of the notion that parental activity is associated with that of their child, it is heretofore unknown what the causal impact of parental presence and active involvement in play may be on the amount and intensity of their child’s physical activity. These non-experimental studies provide insight into the relationship between parental influence and children’s physical activity however, we feel studies that actually manipulate parental influence and assess its effects on children’s physical activity behavior may yield new information and would allow for causal inference. This information may aid in the development of more effective physical activity interventions and recommendations for children as the obesity epidemic continues to grow.

**Rationale**

Several non-experimental studies have identified parental influence as an important factor that appears to be associated with physical activity behavior in children.
However, there are no studies that we are aware of that have examined the impact of parental influence on children’s physical activity behavior utilizing experimental techniques. Therefore, the casual impact of parental influence on children’s physical activity is unknown. For that reason, it is necessary to examine the potential casual impact that a parent may have on children’s physical activity participation and intensity of that activity while utilizing objective measures.

**Purpose**

The primary purpose of this study was to assess the amount, intensity, enjoyment (i.e., liking), and preference of children’s physical activity in a controlled setting under three experimental, social conditions; *alone*, with a *parent watching*, and with a *parent participating* in the activity with their child. Another purpose of this study was to assess the differences in children’s physical activity based on their parent’s reported physical activity. To the best of our knowledge this was the first study to experimentally examine the effects of parental influence on their child’s physical activity behavior utilizing objective measures of physical activity and activities that are similar to what children are likely to participate in (e.g., running, jumping, games, and sedentary activities).

**Hypothesis**

It was hypothesized that the *parent participating* condition will increase children’s physical activity behavior relative to the *alone* condition. We also hypothesized that the *parent watching* condition will not increase children’s physical activity relative to the *alone* condition as parents will not be modeling or encouraging physical activity behavior during the *watching* condition. Finally, we also hypothesized
that children with highly active parents will participate in more physical activity in all three conditions (alone, with a parent watching, and with a parent participating).
CHAPTER III

METHODS

Participants

Twenty children \((n = 10\) girls) between the ages of 3-6 years old, with no contraindications to physical activity (i.e., orthopedic injury, cardiovascular disorder, etc.), along with one parent or legal guardian per child, were recruited from flyers posted in the local community and a database of potential participants who contacted the laboratory for separate, unrelated studies. Each child and parent came to the Applied Physiology Laboratory at Kent State University for three separate laboratory visits; playing \textit{alone}, with their \textit{parent watching}, and with their \textit{parent participating}. Upon completion of the study, children and parents each received one $10.00 gift card to a local store for each visit they complete ($30.00 per child if all visits are completed and $10.00 per parent if \textit{parent participating} visit completed; $40.00 total). This study was approved by the Kent state University Institutional Review Board.

Procedures

Upon arrival for the first visit, parental consent and child assent was obtained. Each parent and child then underwent anthropometric assessments (age, height, weight, and BMI). Parents completed the validated International Physical Activity Questionnaire (Booth, 2000) which assessed how much time was spent engaging in vigorous, moderate, walking, and sitting related activities during the past seven days. Parents also completed another International Physical Activity Questionnaire in regards to their child’s activity during the past seven days.
During each of the three separate social condition laboratory visits, participants were taken to a 4,360 square foot gymnasium where they were shown a variety of age-appropriate physical activity options and sedentary alternatives (described in Gymnasium Configuration). After being shown the physical activity options and sedentary alternatives each child was fitted with an accelerometer (Actigraph GT1M, Pensacola, FL) that was comfortably wrapped around their waist and it monitored their physical activity intensity. The Actigraph accelerometer has been shown to be a valid and reliable instrument for quantifying physical activity behavior in children and adolescents (Trost, Ward, Moorehead, Watson, Riner, & Burke, 1998). After being fitted with the accelerometer, children were given permission to participate in any of the sedentary and/or physical activities they wish, in any pattern for 30-minutes.

The *alone* social condition consisted of only the children participating in the sedentary and/or physical activities with no parent being present in the gymnasium. The *parent watching* social condition was the same as the *alone* condition except the parent was seated in a chair in the gymnasium watching their child participate in the activities. During this condition, the parent was allowed to speak with their child but they were not allowed to leave their chair. Finally, the *parent participating* social condition consisted of having the parent actively participating with their child in the sedentary and/or physical activities that the child chose to participate in. Parents were instructed to follow their child and play with the activities their child chose. The parent was not to select the activities nor instruct their child what activities to utilize. Instead the parent was to let the child dictate the activities they wished to participate in.
In addition to accelerometry data, the time children allocated to sedentary and physical activities during each 30-minute activity session was recorded via a stopwatch. At the end of each 30-minute session, each child was asked to indicate their liking of the activity by using a visual analog scale (Roemmich, Barkley, Lobarinas, Foster, White, & Epstein, 2008). Children were then asked if they would like to play for an additional 10-minutes or if they wished to be finished for the session. If a child elected to participate in an additional 10-minutes of activity they followed identical procedures to their initial 30-minutes for that day. After all three conditions were completed, each child was asked to indicate which condition (alone, with a parent watching, or with a parent participating) was their favorite. During each session only the child, parent (depending on the social condition), and members of the research staff were present in the gymnasium.

**Gymnasium Configuration**

Physical activities and equipment consisted of four jump ropes, four Wilson® indoor/outdoor basketballs, five 6 inch (0.153 m) tall hurdles (SKLZ® Speed Hurdles), four Nerf™ Pro Grip™ footballs with targets and goals (Hasbro®, Pawtucket, RI), two Franklin® soccer balls to kick around a series of seven cones separated three feet apart, and navigating two obstacle courses made up of gymnastic/soft-play equipment (UCS Inc. Lincolnton, NC). The first obstacle course consisted of the following foam gymnastic/soft-play equipment arranged in order, one 60” (1.52 m) long by 48” (1.22 m) wide ramp ascending to a peak height of 15” (0.38 m) next to a 34” (0.86 m) long by 24” (0.61 m) diameter octagonal cylinder laid horizontally. Immediately after the cylinder there was a 60” (1.52 m) long by 36” (0.91 m) wide ramp ascending to a peak height of
15” (0.38 m) next to an upright, 48” (1.22 m) tall octagonal ring with a 28” (0.71 m) diameter opening and another 60” (1.52 m) long by 36” (0.91 m) wide ramp placed in a descending fashion, after the octagonal ring. The second obstacle course consisted of one 24” (0.61 m) long by 24” (0.61 m) wide ramp ascending to a peak height of 5” (0.13 m) next to a 34” (0.86 m) long by 24” (0.61 m) diameter octagonal cylinder laid horizontally. After the cylinder there were two octagonal rings. The first ring had a 48” (1.22 m) total diameter with a 28” (0.71 m) diameter opening and has a height of 12” (0.31 m). The second ring had a 48” (1.22 m) total diameter with a 28” (0.71 m) diameter opening and has a height of 24” (0.61 m). Finally, next to the second ring there was another 24” (0.61 m) long by 24” (0.61 m) wide ramp placed in a descending fashion.

The sedentary activity area was equipped with two tables and two chairs to accommodate both the child and parent. The age-appropriate sedentary alternatives included four different Transformer™ action figures (Hasbro®, Pawtucket, RI), four different MOXIE Gurlz™ toy dolls (MGA Entertainment Inc., Van Nuys, CA), four reading books, Crayola® crayons, markers, and colored pencils with blank paper for drawing, coloring sheets, the block stocking game called Jenga® (Hasbro®, Pawtucket, RI), the board game called Sorry® (Hasbro®, Pawtucket, RI), and the matching game called Perfection™ (Milton Bradley Company, East Longmeadow, MA).
Measurements

Anthropometrics

Children and parents were measured for height via a stadiometer and weight by using a balance beam scale (Health O Meter, Chicago, IL). In addition to height and weight, gender and age were recorded.

Accelerometry

Children were fitted with an accelerometer (Actigraph GT1M, Pensacola, FL) that was comfortably wrapped around the hip. The accelerometer recorded the number of physical activity counts per session for each child. The Actigraph accelerometer has been shown to be a valid and reliable instrument for quantifying physical activity levels in children and adolescents (Trost et al., 1998).

Amount of Time Allocated to Sedentary and Physical Activity

The amount of time each child allocates towards sedentary and/or physical activities was recorded from direct observation of research personnel by using a stopwatch. Research personnel started the stopwatch and left it running for a duration of 30-minutes and recorded each child’s start and stop times at each activity on the workload documentation form.

International Physical Activity Questionnaire

Upon arrival for the first session parents completed the validated International Physical Activity Questionnaire (Booth, 2000), which assessed activity (vigorous, moderate, walking, sitting) during the last seven days. Parents completed the questionnaire indicating how much time they themselves engaged in vigorous, moderate,
walking, and sitting related activities. Parents also completed one separate survey for their child answering the same questions, which has been shown to be a valid assessment of their child’s physical activity (Booth, 2000). Children were placed into one of two groups based upon their parents physical activity: 1.) moderate: three or more days of vigorous activity of at least 20-minutes per day or five or more days of moderate activity and/or walking of at least 30-minutes per day or five or more days of any combination of walking, moderate, or vigorous activity achieving a minimum of at least 600 MET minutes/week; or 2.) high: vigorous activity on at least three days and accumulating at least 1500 MET minutes/week or seven or more days of any combination of walking, moderate, or vigorous activity accumulating at least 3000 MET minutes/week. There was no low activity group as all parent’s responses qualified them as either moderately or highly physically active.

Preference of Condition

Upon completion of all three social conditions children were asked by research personnel to indicate which condition (alone, with a parent watching, or with a parent participating) was their favorite. For example, “Did you have more fun when you were by yourself, while your parent was sitting in the gym watching you, or while your parent was playing in the gym with you?”

Liking

At the end of each 30-minute session, children were asked to indicate their liking of the activity using a visual analog scale (VAS) (Roemmich et al., 2008) by marking on a 10-cm line anchored by “like it very much” on the left and “do not like it at all” on the
right. Research personnel described the VAS to each child while they viewed a pictorial description of the scale that illustrated a “happy” face on the left above “like it very much” and as the VAS proceeded to the right the faces progressively became “sadder” with the last face on the right above “do not like it at all” being unhappy (i.e., crying).

**Analytic Plan**

Independent samples t-tests were used to examine any differences between sex (boys, girls) in physical characteristics (age, height, weight).

A two sex (male, female) by three social condition (*alone*, with a *parent watching*, and with a *parent participating*) analysis of co-variance (ANCOVA) with repeated measures on social condition and co-varying for sex of the parent was utilized to assess differences in accelerometer counts, sedentary minutes, and liking.

Children were split into two groups based upon their parent’s activity (high or moderate physical activity) from their responses from the International Physical Activity Questionnaire. Then a three social condition (*alone*, with a *parent watching*, and with a *parent participating*) by parental activity group (high, moderate, low) ANCOVA with repeated measures on social condition and liking, and co-varying for sex of the parent was used to assess differences in children’s physical activity based on their parents reported physical activity. Post-hoc analyses for all significant main and interaction effects were completed by using t-tests with the Benjamini and Hochberg False Discovery Rate correction (Benjamini and Hochberg, 1995).

Wilcoxon signed rank tests were used to examine any differences in the children’s decision to choose to participate in the additional 10-minutes across the three social
conditions. Additionally, a chi-square analysis was performed to assess any differences in the children’s preference of the three social conditions.
CHAPTER IV
RESULTS

Physical Characteristics

Independent samples t-tests revealed no significant differences ($p = 0.27$, Table 1) between boys and girls physical characteristics for age, height, and weight. Physical characteristics for parents ($n = 3$ males and $17$ females) are reported in Table 1.

Table 1

*Children’s and Parent’s Physical Characteristics* (Data are Means ± SD)

<table>
<thead>
<tr>
<th></th>
<th>Boys ($n=10$)</th>
<th>Girls ($n=10$)</th>
<th>Males ($n=3$)</th>
<th>Females ($n=17$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>4.30 ± 0.95</td>
<td>3.80 ± 0.92</td>
<td>36.67 ± 0.58</td>
<td>32.29 ± 5.43</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>110.08 ± 9.81</td>
<td>100.27 ± 12.49</td>
<td>181.25 ± 8.12</td>
<td>164.11 ± 5.78</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>18.77 ± 2.85</td>
<td>17.03 ± 3.96</td>
<td>105.75 ± 28.69</td>
<td>73.62 ± 22.97</td>
</tr>
</tbody>
</table>

Social Conditions

Accelerometer Counts

There was a significant main effect of condition for accelerometer counts ($F = 12.14$, $p < 0.001$, Figure 1). More counts ($t \geq 2.53$, $p \leq 0.02$) were accumulated during the *parent participating* ($109,523 \pm 32,155$ counts) condition than the *alone* ($67,938 \pm 37,857$ counts) and *parent watching* ($85,624 \pm 44,985$ counts) conditions. The *parent watching* condition was also greater ($t = 2.80$, $p = 0.01$) than the *alone* condition. There were no significant main or interaction effects for sex ($F = .001$, $p = 0.99$).
Figure 1. Accelerometer counts for each condition (Data are Mean ± SEM). *condition was significantly greater than alone, †significantly greater than watching ($p < 0.05$ for all).

**Time Allocated to Sedentary Activities**

There was a significant main effect of condition for time allocated to sedentary activities ($F = 5.04, p = 0.01$, Figure 2). More time ($t = 2.97, p = 0.01$) was allocated to sedentary activities during the *alone* (15 ± 10 minutes) condition than the *parent participating* (6 ± 8 minutes) condition. Time allocated to sedentary activities in the *parent watching* (10 ± 10 minutes) condition was not significantly different ($t \geq 1.35, p \leq 0.19$) when compared to the *alone* and *parent participating* conditions. There were no significant main or interaction effects for sex ($F = 0.84, p = 0.44$).
Figure 2. Time allocated to sedentary activity for each condition (Data are Mean ± SEM).

*condition was significantly greater than playing ($p < 0.05$ for all).

**Liking for Each Condition**

There was a significant main effect of condition for liking ($F = 4.97$, $p = 0.01$), Figure 3). Children liked ($t \geq 2.39$, $p \leq 0.03$) the *parent participating* (9.9 cm) condition more than the *alone* (8.0 cm) and *parent watching* (8.7 cm) conditions. Liking was not significantly different ($t = 1.04$, $p = 0.31$) between the *alone* and *parent watching* conditions. There were no significant main or interaction effects for sex ($F = 0.65$, $p = 0.53$).
Figure 3. Liking for each condition (Data are Mean ± SEM). *condition was significantly greater than alone, †significantly greater than watching ($p < 0.05$ for all).

**Bonus Period of Activity**

A significantly greater ($Z \geq -2.45$, $p \leq 0.01$) proportion of children chose to participate in the additional 10-minute bonus period during the *parent participating* (89%) condition than the *parent watching* (55%) and *alone* (22%) conditions. There was not a significant difference ($Z = -1.00$, $p = 0.32$) between the proportion of children who chose to participate in the additional 10-minute bonus period between the *parent watching* and *alone* conditions.
**Figure 4.** Bonus period of activity for each condition (Data are Mean ± SEM). *condition was significantly greater than alone, †significantly greater than watching ($p < 0.05$ for all).

**Preference of Condition**

Chi-square analysis revealed a significantly greater ($\chi^2 = 19.60, p \leq 0.001$) number of children indicated they preferred the parent participating ($n = 16$) condition versus the parent watching and alone ($n = 2$ for each) conditions.
Figure 5. Preference of condition (Data are Mean ± SEM). *condition was significantly
greater than alone, †significantly greater than watching (p < 0.05 for all).

Parental Activity Group Effect onAccelerometer Counts

For the parental physical activity group (moderate, high) by condition ANCOVA
there was a significant parental activity groups by condition interaction (F = 44.23, p =
0.001, Figure 6). More counts (t = 3.11, p = 0.01) during the parent participating
condition were accumulated in the group of children with moderately active parents
(124,499 ± 23,542 counts) than the group of children with highly active parents (101,459
± 34,040 counts). Conversely, more counts (t ≥ 3.06, p ≤ 0.02) were accumulated during
the parent watching and alone conditions in the group of children with highly active
parents (91,827 ± 41,986 and 70,395 ± 31,755 counts, respectively) than the group of
children with moderately active parents (74,104 ± 51,423 and 63,375 ± 49,841 counts,
respectively). As was the case with the initial analysis of accelerometer counts, there was a significant main effect of condition ($F = 7.28, p = 0.003$, Figure 6). There were no significant main or interaction effects for sex ($F \leq 1.3, p \geq 0.31$).

Figure 6. Accelerometer counts for each condition for parental activity groups (moderate, high) (Data are Mean ± SEM). *Children with moderately active parents accumulated more counts than children with highly active parents. †Children with highly active parents accumulated more counts than children with moderately active parents ($p < 0.05$ for all).

Parental Activity Group Effect on Liking

For the parental physical activity group (moderate, high) by liking ANCOVA there was a significant parental activity groups by condition interaction ($F = 16.65, p = 0.02$, Figure 7). There was a greater percent increase in liking ($t \geq 3.52, p \leq 0.02$) from
the alone to parent participating and parent watching to parent participating conditions for the group of children with moderately active parents (61% and 36%, respectively) than the group of children with highly active parents (30% and 1%, respectively). There was also a greater percent increase in liking (t = 2.09, p = 0.04) from the alone to parent watching conditions for the group of children with highly active parents (29%) than the group of children with moderately active parents (18%). As was the case with the initial analysis of liking, there was a significant main effect of condition (F = 5.01, p = 0.01, Figure 7). There were no significant main or interaction effects for sex (F ≤ 1.9, p ≥ 0.35).
Figure 7. Percent increase in liking for each condition for parental activity groups (moderate, high) (Data are Mean ± SEM). *Children with moderately active parents had a greater percent increase in liking than children with highly active parents. †Children with highly active parents had a greater percent increase in liking than children with moderately active parents ($p < 0.05$ for all).
CHAPTER V

DISCUSSION

This study provides the first casual evidence of the acute impact that a parent has on children’s physical activity participation using objective measures. Our results indicate that relative to *alone* and *watching* conditions, children’s physical activity levels were greatest when their parent was *participating* with them during a 30-minute activity session. From the *alone* to *watching* condition there was a 26% increase in physical activity, a 28% increase from *watching* to *participating*, and 61% increase from *alone* to *participating*. There was a 58% reduction in time allocated to sedentary activities when the parent was *participating* compared to the *alone* condition. Children liked (i.e., enjoyed) the *parent participating* condition more than the *alone* and *watching* conditions, which may explain why majority (80%) of the children (*n* = 16) indicated that the *parent participating* condition was their favorite condition. Additionally, 89% of children elected to participate in the 10-minute bonus activity when their parent was *participating* versus only 55% and 22% in the *parent watching* and *alone* conditions, respectively. The increased liking (assessed via VAS) and motivation (assessed via the decision whether or not to participate in the bonus 10-minute bout of activity) associated with the *parent participating* condition may have a positive effect on physical activity behavior, not just acutely (i.e., a single bout of physical activity as assessed presently), but chronically (i.e., average daily physical activity behavior). Taken together, these results may have important implications as it pertains to children’s physical activity participation and energy expenditure. If children are participating in more physical activity while their
parent is *participating* with them this would lead to additional energy expenditure for the child and perhaps the parent.

**Physical and Sedentary Activity**

Our hypothesis stated that only the *parent participating* condition would increase children’s physical activity behavior relative to the *alone* condition. As we hypothesized children accumulated significantly more accelerometer counts and less sedentary minutes when their parent was *participating* with them versus the *alone* condition. There was also a significant increase in accelerometer counts in the *parent participating* condition relative to the *watching* condition. However, contrary to our hypothesis the *parent watching* condition also caused an increase in accelerometer counts relative to the *alone* condition. We believed that children’s physical activity would not increase during the *parent watching* condition because parents would not be modeling or encouraging physical activity behavior. Previous research has shown that parental modeling and encouragement towards physical activity are significant, positive correlates to children’s physical activity (Eccles, 1999; Weiss, 2000). Parents who educate their children on the importance of physical activity and also those parents who provide support (e.g., praise) for their children’s participation in physical activity had children who were more likely to engage in physical activities (Eccles, 1999; Weiss, 2000). Our results are in support of these previous non-experimental findings by providing casual evidence that parental interaction and to a lesser extent, parental presence, has a positive impact on children’s physical activity behavior.
The effects reported in the present study are logical as parents of three-six year old children are considered their primary role models (Zecevic et al., 2011). If a parent is willing to be physically active with their child, that child likely views this willingness as an endorsement for that activity. However, the present results are perhaps more robust than one would have expected. The simple act of a parent being present, instead of absent, while their child is participating in physical activity increased that child’s activity in a 30-minute time period by 26%. Relative to the parent watching condition there was a further 28% increase in physical activity in the parent participating condition. This represents a 61% increase in child physical activity relative to the alone condition. This greater activity associated with parental participation and to a lesser extent watching could have important benefits in the prevention of obesity and other disorders related to sedentary behavior (Hills et al., 2012; Pradinuk et al., 2011). Our results provide the first experimental evidence that parental supervision and participation both cause a robust increase in an acute bout of children’s physical activity behavior.

When converting accelerometer counts to caloric expenditure, children “burned” an average of 75.78 kcals in the 30-minute parent participating condition, 53.33 kcals in the parent watching condition, and 44.91 kcals when alone. Assuming children participated in similar 30-minute activity sessions three times per week for one year with their parent participating, using these caloric expenditure rates, they would expend 24,500 kcals and 35,000 kcals more than the parent watching and alone conditions respectively. Assuming 3,500 kcals equals one pound of body weight (American College of Sports Medicine, 2010), these greater caloric expenditures when a parent is
participating would equate to seven to 10 pounds of body weight per year more than the parent watching and alone conditions, respectively. Furthermore, these findings may aid in the development of more effective physical activity interventions allowing for children to participate in adequate amounts and intensities of physical activity and assist in the combat against the development of childhood obesity and obesity-related disorders. Also, these findings are important for parents and practitioners interested in maximizing caloric expenditure during physical activity in children.

**Liking and Motivation**

Parents play a critical role in shaping children’s interest and involvement in physical activity by creating environments that promote enjoyment of physical activity. Previous research has found that children engaged in more physical activities when parents provided enjoyable environments, such as visiting parks or playgrounds (Veitch et al., 2010; Thompson et al., 2010). Results from our study demonstrated that children liked (i.e., enjoyed) the parent participating condition more than the alone and parent watching conditions with 16 children reporting that the parent participating condition was most preferred. Our results and findings from other previous studies (Beets et al., 2007; Epstein et al., 2011; Jago et al., 2010, Sallis et al., 1999; Salvy et al., 2009) suggest that if children find an activity to be more enjoyable it has the potential to lead to more engagement of the activity. Applying a method previously utilized by Barkley et al. (2011), children’s motivation was assessed in the present study by providing children with the option to play for an additional 10-minute bonus period after completing their initial 30-minute activity session. Currently, 89% of children chose to participate in the
additional 10-minute bonus period during the parent participating condition while only 55% and 22% chose the bonus period in the parent watching and alone conditions respectively. It is reasonable to suggest that since more accelerometer counts were accumulated during the parent participating condition and children were also more motivated to participate in the additional 10-minute bonus period during this condition, it would be expected that physical activity participation during these bonus periods would remain greatest in the parent participating condition. This greater liking and willingness to elect the 10-minute bonus when parents were participating suggests that children may have exhibited even greater increases in total physical activity if the session were not capped at 30-minutes. Future studies should consider examining the impact of parental participation on child physical activity over a longer time frame (e.g., 60-minutes).

**Parental Activity**

Findings from our study indicate that those parents who reported being highly active according to self-reports from the International Physical Activity Questionnaire had children that engaged in more physical activity during the alone (70,395 ± 31,755 counts) and parent watching (91,827 ± 41,986 counts) conditions when compared to those children who had parents that reported being only moderately active (alone 63,375 ± 49,841 and watching 74,104 ± 51,423 counts). This evidence may suggest that children with highly active parents, versus those with less active parents, are less in need of the presence or participation of a parent to motivate them to participate in physical activity. Conversely children with less active parents may have a greater reliance upon direct parental participation to motivate them to participate in additional physical activity.
notion is supported by the present results as children with less active parents engaged in more physical activity during the parent participating (124,499 ± 23,542 counts) condition versus children with highly active parents (101,459 ± 34,040 counts). Furthermore, potential rationale for the differences observed between children with highly and less active parents in physical activity may be due to liking (i.e., enjoyment). For children with highly active parents from the alone to watching condition there was a 29% increase in liking, only a 1% increase from watching to participating, and 30% increase from alone to participating. Conversely, for children with less active parents there was an 18% increase in liking from alone to watching, 36% increase from watching to participating, and 61% increase from alone to participating. These findings suggest that the greater liking observed in the group of children with less active parents during the parent participating condition may be a potential influencing factor for greater physical activity participation. Conversely, the same can be inferred for the children with highly active parents during both the parent watching and alone conditions. Non-experimental studies have shown similar findings by suggesting that through modeling and reinforcing behavior, such as participating in physical activity in front of their children and educating their children on the health benefits of physical activity, parents convey information to their children resulting in increased physical activity for the child (Trost et al., 2003; Weiss et al., 1998). This phenomenon has been supported by correlation-based studies which have indicated that children’s physical activity levels are positively associated with their parent’s physical activity levels. In other words,
physically active parents are more likely to have physically active children by positively influencing their behavior (Prochaska et al., 2002; Rodriguez, Brown, & Troped, 2005).

**Limitations and Future Directions**

While this was the first experimental study to examine parental influence on children’s physical activity behavior, it is not without limitations. Currently, children played with only one parent, with 17 of the 20 parents being mothers. Although this is a realistic social environment at times, children do encounter interactions that involve the other parent and/or both parents simultaneously. The presence of the other parent and/or both parents may differentially alter physical activity behavior. In the current study parent sex was co-varied for; however, since only three parents were fathers this is still considered a limitation. Another limitation is the 30-minute free choice activity session. According to the results, majority of the children (89%) did choose to participate in the additional 10-minutes when their parent was *participating* with them. In addition to children choosing more time when their parent was *participating* with them, their physical activity increased the most during this time period as well, relative to the *alone* and *watching* conditions. This suggests that when children are being physically active along with their parents this may increase physical activity levels to a greater extent if children are allowed a greater amount of time (i.e., > 30 minutes) for physical activities. Lastly, parental involvement during an experimental setting can also affect children’s physical activity behavior. It is reasonable to speculate that children with parents that are more actively involved may exhibit different physical activity behavior than children with parents that are less actively involved. Additional research is warranted to examine
how interactions with the other parent and/or both parents, parental interactions, and how the amount of time given to children may alter physical activity behavior.

**Conclusion**

This was the first experimental study designed to assess the impact of parental influence on children’s physical activity behavior. Prior non-experimental studies have indicated that when children are young, parents likely have a significant impact on their physical activity behaviors by being active with their children and also by providing opportunities for their children to be active (Beets et al., 2010; Dunton et al., 2012; Prochaska et al., 2002). Since parental influence was manipulated in the present study and its effects on children’s physical activity behavior were assessed objectively we can conclude that *parental participation* and, to a lesser extent, simply *watching* caused an increase in children’s physical activity behavior, their liking of the activity, their motivation to be active, and decreased sedentary behavior. These findings may aid in the development of more effective physical activity interventions and recommendations for children as the obesity epidemic continues to grow. It is important for parents to create social and physical environments that support physical activity, so that children can make healthy choices and establish healthy behaviors. Based upon the present results, it is reasonable to conclude that *parental participation* during bouts of physical activity (or at minimum direct supervision) may be an important component in the development of physical activity environments intended to maximize physical activity behavior in children.
APPENDIX A

RECRUITMENT FLYER
Appendix A

Recruitment Flyer

PHYSICAL ACTIVITY
RESEARCH OPPORTUNITY
FOR 3-6 YEAR OLD CHILDREN

Children will come to Kent State University three times and complete a 30-minute activity session each time. Children will receive $30.00 in gift cards and parents will receive a $10.00 gift card to a local store upon completion of the study.

For more information please contact either:
Dr. Jacob Barkley
Associate Professor, Exercise Science, Kent State University
Email: j barkle1@kent.edu
Phone: 330-672-0209

OR
Michael Rebold, MS, CSCS
Doctoral Student, Exercise Science, Kent State University
Email: m rebold@kent.edu
Phone: 440-227-1413
APPENDIX B

RECRUITMENT PHONE SCRIPT
Appendix B

Recruitment Phone Script

Hello, this is _____________________ from the Applied Physiology Lab at Kent State University. I am calling because you have previously expressed interest in a study in our laboratory and you indicated your willingness to be contacted for future studies. Would you like to hear about a new study that your child may qualify to participate in?

The purpose of this study is to determine physical activity patterns of children ages 3-6 years old when they are alone or with a parent watching and with a parent participating. If you decide to participate in this study your child will be asked to complete three 30 minute activity sessions. In one session your child will have access to activities in a gym and play alone, in another session your child will play with a parent watching, and in the third session your child will play with a parent actively participating. In all 3 sessions your child will have access to a variety of physical activity options (running, jumping, and throwing, shooting or kicking a ball) and sedentary activities such as coloring in coloring books, playing with age appropriate toys and matching games. Your child can participate in any of the activities he/she chooses for as much time as he/she chooses. Your child will be allowed to rest whenever he/she wishes during each 30 minute session. To record his/her activity your child will be wearing an activity monitoring belt during each 30 minute session. We will also ask him/her how he/she liked each of the sessions. Participation in this study is completely voluntary.

Any information obtained from your child, including the medical screen, will be treated in strict confidence. You may stop at any time. Do you have any questions? Does this sound like something you are interested in?

If no: Thank you for your time.

If yes: Great, I have a few questions to ask you to determine if your child is eligible to participate in this study. This will only take a couple of minutes and you can ask me questions at any time.

1. Answer questions on medical history for both child and parent.
2. Are you and your child able to be here 3 x Mon-Sat between 9am-4pm? If not: what time fits your schedule?
3. Let’s go ahead and set up your appointment times.

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APPENDIX C

MEDICAL HISTORY (CHILD AND PARENT)
Appendix C

Medical History (Child and Parent)

Medical History Screen (Child)

Name ______________________________  Date __________  Subject # __________
Address _________________________________________
Phone Number ______________________________
Age __________
DOB __________
Sex M  or  F
Height ________ in
Wt ________ lbs
Height ________ cm (inches *2.54)
Wt ________ kg (lbs/2.2)
BMI ___ kg/m^2
Weight percentile __________

Which ethnic group do you most identify with (circle response):
American Indian/Alaskan Native  Asian/Pacific Islander  Black, not of Hispanic Origin
Hispanic  White, not of Hispanic Origin  Other___________________

Y/N
___ Has a doctor ever said that your blood pressure was too high or too low?
___ Have you ever had pain in their heart or chest?
___ Have you ever notice extra heart beats, skipped beats or a racing heart?
___ Has a doctor ever said that you have heart trouble, an abnormal electrocardiogram
  (ECG or EKG), heart attack, or coronary?
___ Do you often have trouble breathing?
___ Have you ever been diagnosed with asthma?
___ Have you ever been diagnosed with diabetes?
___ Do you have any orthopedic limitations to physical activity?

Do you have any other medical conditions that affect your ability to safely participate in physical activity? If yes, please explain. ______________________________

Y/N
Are you currently taking any medication(s)? Y or N
If yes, please describe the medication(s). ______________________________

Y/N
Have you ever played any activities with either of your parents before? Y or N
On average how many hours per week would you say you spend playing activities with either of
your parents? __________

Y/N
Does the child seem eligible? Y or N
Medical History Screen (Parent)

Name ______________________________  Date __________  Subject # __________

Address ________________________________________________________________

Phone Number ______________________________

Age __________  DOB __________  Sex  M or F

Height _______ in  Wt _______ lbs

Height _______ cm (inches *2.54)  Wt _______ kg (lbs/2.2)  BMI ___ kg/m^2

Weight percentile __________

Which ethnic group do you most identify with (circle response):
- American Indian/Alaskan Native
- Asian/Pacific Islander
- Black, not of Hispanic Origin
- Hispanic
- White, not of Hispanic Origin
- Other___________________

Y/N

___ Has a doctor ever said that your blood pressure was too high or too low?

___ Have you ever had pain in their heart or chest?

___ Have you ever notice extra heart beats, skipped beats or a racing heart?

___ Has a doctor ever said that you have heart trouble, an abnormal electrocardiogram (ECG or EKG), heart attack, or coronary?

___ Do you often have trouble breathing?

___ Have you ever been diagnosed with asthma?

___ Have you ever been diagnosed with diabetes?

___ Do you have any orthopedic limitations to physical activity?

Do you have any other medical conditions that affect your ability to safely participate in physical activity?  If yes, please explain. _________________________

Are you currently taking any medication(s)?  Y or  N

If yes, please describe the medication(s). __________________________________________

Have you ever played any activities with your child before?  Y or  N

On average how many hours per week would you say you spend playing activities with your child? __________

Does the parent seem eligible?  Y or  N
APPENDIX D

PARENT INFORMED CONSENT
Appendix D

Parent Informed Consent

Informed Consent to Participate in a Research Study

Study Title: The Experimental Effect of Parental Influence on Children’s Physical Activity

Principal Investigator: Dr. Jacob E. Barkley and Michael J. Rebold

Your child is being invited to participate in a research study. This consent form will provide you with information on the research project, what your child will need to do, and the associated risks and benefits of the research. Your child’s participation is voluntary. Please read this form carefully. It is important that you ask questions and fully understand the research in order to make an informed decision. You will receive a copy of this document to take with you.

Purpose: We are conducting a research project on how the presence of a parent influences children’s responses towards physical activity. As the childhood obesity epidemic continues to grow, it is imperative for researchers to identify and examine environmental, social, and behavioral factors that affect physical activity participation in children.

Procedures

If you decide to allow your child to participate, you will be asked to bring your child to the Exercise Physiology Laboratory on three separate occasions for approximately 45 minutes each. During the initial visit we will measure you and your child’s age, height, weight, and BMI, complete two questionnaires so we can gain a better understanding of you and your child’s physical activity habits, and we will also give an explanation of the protocol in its entirety.

During each of the three separate laboratory visits, you and your child will be taken to a 4,360 square foot gymnasium where the both of you will be shown a variety of age-appropriate physical activity options (jump ropes, basketball, mini hurdles, footballs with targets and goals, soccer balls with cones, and two obstacle courses made up of gymnastic/soft-play equipment) and a table of sedentary activities (one table with two chairs, action figures, toy dolls, books, crayons, markers, and colored pencils with blank paper for drawing, coloring sheets, and board games). After being shown the physical activity options and sedentary table both of you will be fitted with a device to measure your physical activity (parents will only wear the device during the parent participating condition) that will be comfortably wrapped around your waist. After being fitted with the device, your child will be given permission to participate in any of the sedentary and/or physical activities they wish, in any pattern for 30 minutes. The alone social condition will consist of only your child participating in the sedentary and/or physical activities with you not being present in the gymnasium. The parent watching social condition will be the same as the alone condition except you will now be seated in a chair in the gymnasium watching your child
participate in the activities. During this condition, you can speak with your child but you cannot leave the chair. Finally, the *parent participating* social condition will consist of having you actively participating with your child in the sedentary and/or physical activities that your child chooses to participate in. You are instructed to follow your child and play with the activities that your child chooses. You are not to select the activities nor instruct your child what activities to utilize.

In addition to physical activity data, the time your child allocates to sedentary and physical activities during each 30 minute activity session will be recorded via a stopwatch. At the end of each 30 minute session, your child will be asked to indicate their liking and difficulty of the activity. Your child will then be asked if they would like to play for an additional ten minutes or if they wish to be finished for the session. If your child elects to participate in an additional ten minutes of activity they will follow identical procedures to their initial 30 minutes for that day. After all three conditions are completed, your child will be asked to indicate which condition (*alone*, with a *parent watching*, or with a *parent participating*) was their favorite.

**Benefits**
This research will not benefit you or your child directly. However, your child’s participation in this study will help us to better understand environmental, social, and behavioral factors that affect physical activity participation in children.

**Risks and Discomforts**
If your child is very physically active during the sessions, he or she may experience muscle soreness a day or two after the activity. An exercise physiologist that is CPR/First Aid certified will be present to assure that your child is exercising safely during all activity sessions. Medical treatment by the University Health Center is provided only to currently registered students. Please be advised that for all other injuries, emergency services will be called for those occurring on the Kent State University campus. You or your medical insurance will be billed for this service. No other medical treatment or financial compensation for injury from participation in this research project is available.

**Privacy and Confidentiality**
Your child’s study related information will be kept confidential within the limits of the law. Any identifying information will be kept in a secure location and only the researchers will have access to the data. Research participants will not be identified in any publication or presentation of research results; only aggregate data will be used. You and your child’s name will not be used during the study; both will be assigned a number that will serve as your identity.

Your research information may, in certain circumstances, be disclosed to the Institutional Review Board (IRB), which oversees research at Kent State University, or to certain federal agencies. Your child’s confidentiality may not be maintained if there is an indication that if he/she may harm themselves or others.
**Compensation**
After all three sessions are completed your child will be awarded $30 in gift cards to a local store for his or her participation. For your participation in the *parent participating* session you will be awarded a $10 gift card.

**Voluntary Participation**
Taking part in this research study is entirely up to you and your child. You and/or your child may choose not to participate or may discontinue their participation at any time without penalty or loss of benefits to which he/she is otherwise entitled. You will be informed of any new, relevant information that may affect your child’s health, welfare, or willingness to continue participation in this study.

**Contact Information**
If you have any questions or concerns about this research, you may contact Dr. Jacob Barkley at 330-672-0209 or Michael Rebold at 440-227-1413. This project has been approved by the Kent State University Institutional Review Board. If you have any questions about your rights as a research participant or complaints about the research, you may call the IRB at 330.672.2704.

**Consent Statement and Signature**
I have read this consent form and have had the opportunity to have my questions answered to my satisfaction. I voluntarily agree to grant permission for my child to participate in this study. I understand that a copy of this consent will be provided to me for future reference.

______________________________  __________________
Parental Signature                  Date

I have witnessed the consent process and believe that the participants listed above have been fully informed, understand the project and what they will have to do, and have voluntarily agreed to participate.

______________________________  __________________
Witness Signature                  Date
Appendix E

Child Assent Form

The Experimental Effect of Parental Influence on Children’s Physical Activity

Hi, (child’s name)

My name is Michael Rebold, and I am trying to learn more about how much you like to play in different activities by yourself, with your parent watching, and with your parent playing. I would like you and one of your parents to come to the gym here at Kent State University for three days. If you decide to be in this project we will first see how tall you are and then we will weigh you. After that you will get to play in different activities either alone, with your parent watching, or with your parent playing. While playing in these activities you will be asked to wear a special belt around your waist that helps us see how many times you move. It does not hurt and will be easy for you to still play. You will play in these activities for 30 minutes each time we meet. After the 30 minutes of playing are over you will be asked how much you liked and how hard it was to play alone, with your parent watching, and with your parent playing. You will then be asked if you would like to play for 10 more minutes.

Do you want to do this?
Do you have any questions before we start?
If you want to stop at any time just tell me.

If you want to be in the study, write your name on the line below:

______________________________________________ ____________________________
Child Signature Date

______________________________________________ ____________________________
Parent Signature Date

______________________________________________ ____________________________
Witness Signature Date
APPENDIX F

VISUAL ANALOG SCALE FOR LIKING (VAS)
Appendix F

Visual Analog Scale for Liking (VAS)

Visual Analogue Scale for Liking

Like it very much.  
Do not like it at all.
Appendix G

Workload Documentation Form

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<th>TIME SPENT</th>
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</table>
APPENDIX H

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (IPAQ)
Appendix H
International Physical Activity Questionnaire (IPAQ)

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

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

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

   _____ days per week

   □ No vigorous physical activities ➔ Skip to question 3

2. How much time did you usually spend doing vigorous physical activities on one of those days?

   _____ hours per day
   _____ minutes per day

   □ Don’t know/Not sure

Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.
3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

   _____ days per week

   [ ] No moderate physical activities  ➔  **Skip to question 5**

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

   _____ hours per day
   _____ minutes per day

   [ ] Don’t know/Not sure

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

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

   _____ days per week

   [ ] No walking  ➔  **Skip to question 7**

6. How much time did you usually spend **walking** on one of those days?

   _____ hours per day
   _____ minutes per day

   [ ] Don’t know/Not sure
The last question is about the time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the last 7 days, how much time did you spend sitting on a week day?

   ____ hours per day
   ____ minutes per day

☐ Don’t know/Not sure

This is the end of the questionnaire, thank you for participating.
APPENDIX I

GYM SET-UP
Appendix I

Gym Set-Up

Obstacle course #1
- Basketball hoop & ball
- Jump rope

Obstacle course #2
- Nerf Football
- Throw towards wall
- Jump through either direction
- Mini Hurdles x5
- Jump rope

Obstacle course #3
- Soccer Ball
- Dribble through cones either direction
- Soccer Cones x5
- Mini Hurdles x5
- Sedentary table
- Chair x2
REFERENCES
REFERENCES


