Comparisons of Recess, Physical Activity, and Positive Emotional States in K-2 Children

by

Laura Clark

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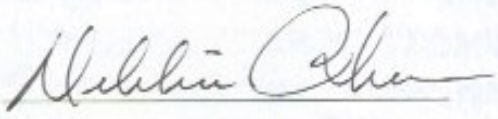

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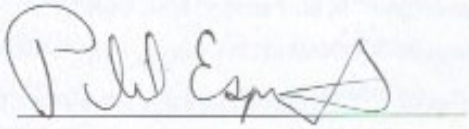

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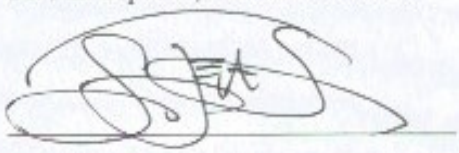

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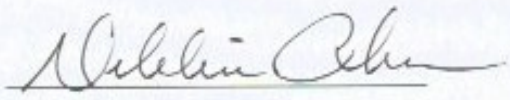

Dr. Debbie Rhea, Associate Dean

Harris College of Nursing and Health Sciences

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Abstract

The primary purpose of this study was to explore the physical activity and emotional differences between students who received three 15-minute recess breaks daily and those who received only one 30-minute recess daily. Grades K-2 children (N=262) from two North Texas private schools, one participating in the LiiNK Project and one comparison school, wore pedometers during school hours for one school week and were observed at recess for positive and not-positive emotional states. An independent t-test revealed that intervention school students took significantly more steps than comparison school students, $F(260)=0.784$, $p<0.0001$. A univariate ANOVA revealed significant interactions between school and grade, $F(2, 250)=4.298$, $p<0.05$, school and gender, $F(1, 250)=4.660$, $p<0.05$, and grade and gender, $F(2, 250)=6.919$, $p<0.001$, on average daily steps. For comparison of positive emotional expressions, a univariate ANOVA revealed that during recess, intervention school students displayed significantly higher percentages of positive emotions than comparison school children, $F(1, 52)=15.332$, $p<0.0001$. For not-positive emotions, a univariate ANOVA revealed that intervention school students displayed significantly lower percentages of not-positive emotions than comparison school students, $F(1, 52)=13.900$, $p<0.0001$.

Acknowledgements

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To the schools involved in this study, especially the principals and the teachers who were so willing to help, thank you! This study would not have been possible without their cooperation. To the members of The LiiNK Team: Dr. Rhea, Alex Rivchun, Dr. Kathy Cammarata, Carol Bollinger, David Farbo, April Long, and Angela Baleztena, I could never have completed this study without the countless hours and hard work you dedicated. I appreciate the support and motivation you provided as well as the innovative ideas you helped develop for this study. Finally, thank you to my parents, sisters, and friends for their unconditional love and guidance. To my mom - without your support, this accomplishment would not have been possible.

Table of Contents

List of Tables

Chapter 1

Introduction

It is essential that children develop a foundation of physical health and psychological well-being at a young age so they may mature into healthy adolescents and adults. Parents, guardians, schools, and community programs share the responsibility of developing healthy children. However, recent trends among American youth indicate that many children who are healthy at birth are not developing into the healthiest adolescents and adults possible. Alongside a decrease in physical activity and play opportunities, there has been a dramatic rise in overweight trends and sedentary behavior among American youth (Ahn & Fedewa, 2011; Gray, 2011). These interrelated trends are associated with physical, cognitive, emotional, and psychological risks. These risks merit attention and action for reversing the pandemic of inactivity and obesity of young children today.

Over the past few decades, the number of overweight or obese children and adolescents in the United States has increased dramatically. According to the Centers for Disease Control and Prevention (CDC), 12.7 million American children and adolescents are plagued by obesity (CDC, 2014b). Furthermore, researchers report that up to one third of elementary aged children are overweight or obese (Davis et al., 2012). Overweight children face physical health risks such as high blood pressure and cholesterol, joint problems and loss in bone strength, Type 2 diabetes, breathing problems, and developing risk factors for chronic diseases (CDC, 2015). Obese children are more likely than normal-weight children to become obese as adults, and obese adults face the same risks listed previously as well as the risks of developing cardiovascular disease and several types of cancer (CDC, 2014a; CDC, 2015; Office of Disease Prevention and Health Promotion [ODPHP], 2014a). Mental

health risks associated with being overweight/obese as a child include negative emotional states such as unhappiness, depression, and social problems (CDC, 2014a; Danielson et al., 2012). Low self-esteem is also "one of the main psychosocial factors" associated with children who are overweight or obese (Danielson et al., 2012, p. 723). This is concerning because as American children are becoming more sedentary, they may be suffering from these depressive symptoms and/or lowered self-esteem. Because of the damaging physical and psychological risks associated with being overweight, it is necessary to explore the antecedents of becoming overweight and consider strategies to reverse this pandemic.

Some of the factors contributing to the dramatic rise in obesity among children include unhealthy dietary habits, minimal physical activity, and an increase in sedentary lifestyles. Of these factors, physical activity is essential to combating childhood obesity and improving overall health (CDC, 2010; DeBate, Gabriel, Zwald, Huberty, & Zhang, 2009). Physical activity promotes physical health and psychological well-being and reduces symptoms of depression among children and adolescents (DeBate et al., 2009; Eime, Young, Harvey, Charity, & Payne, 2013). Ahn and Fedewa (2011) conducted a meta-analysis of the current research to explore how physical activity has been shown to effect mental health in children. Their work determined that "increased levels of physical activity had significant effects in reducing depression, anxiety, psychological distress, and emotional disturbance in children" (p. 393).

Despite the known health benefits of physical activity, inactive lifestyles among children are increasing. The decline in physical activity can be attributed to several factors. First, children are required to sit for long hours during school days with minimal breaks. In order to meet testing standards, schools have lengthened school days and school years and

decreased recess and physical education opportunities for children (Gray, 2013). It is a misconception that academic achievement suffers with recess and physical education breaks, and more time should be allotted to content areas. In fact, the opposite is true; schools in countries that incorporate time for play breaks and focus less on standardized testing have improved academic success (Hani, 2014; Rhea, 2015; Rhea, Rivchun, & Pennings, in press; Sahlberg, 2015). Only 59% of American school districts require elementary schools to provide "regularly scheduled" recess for children (Lee, Nihiser, Fulton, Borgogna, & Zavacky, 2013, p. 35). Of the school districts that either require or recommend recess breaks, only 30% operate on the guideline of 30 or more minutes of recess per day (Lee et al., 2013). Also, "less than one in eight districts require schools at each grade level to provide physical activity breaks," (Lee et al., 2013, p. 46). These reductions in activity opportunities are impeding the ability of children to meet the recommended 60 minutes of exercise daily because they do not make up for sedentary behavior at school when they get home (Dale, Corbin, & Dale, 2000). When children are not attending school, many are watching television, using the computer, and playing video games instead of engaging in play and physical activity (Dwyer, Baur, Higgs, & Hardy, 2009).

Physical activity in childhood sets the stage for maintaining an active lifestyle throughout adulthood (Eime et al., 2013). Like Gray (2013), Dwyer and colleagues (2009) explain that physical activity for young children occurs "predominantly during play" and that active "play needs to be restored in children's lives" (p. 29-30). Play is a basic biological drive that provides valuable learning opportunities that cannot always be taught in the classroom, such as social skills, responsibility, and problem solving (Gray, 2013). It is through free play that children can explore and develop. During school hours, recess

provides the opportunity for children to engage in unstructured play. Unstructured play describes situations in which children determine the rules of play, and adults do not interfere unless safety concerns arise. Once adults enter children's free play, the environment of the play shifts to include the adult. Free play is necessary to promote the healthy physical, psychological, social, and emotional well-being of children. However, because recess time has been reduced in most elementary schools in America, children are playing less and less in and outside of the school setting. This loss of free play stunts mental growth in children and diminishes opportunities for physical activity and cognitive development (Gray, 2013).

Schools play a crucial role in developing healthy children and should provide students with physical activity and play opportunities. While schools focus on cultivating knowledge among students in different academic disciplines, many schools are neglecting the overall health of children by diminishing play opportunities. The CDC supports and encourages physical activity through four community strategies (2010). Of these strategies, two are integral for schools to adopt because schools "are well positioned to promote and reinforce healthy behaviors" among children (CDC, 2010, p. 3):

1. To create or enhance access to places for physical activity
2. To enhance physical education and activity in schools and physical activity in childcare settings

Because of the health benefits of physical activity, it is imperative that children establish active patterns and remain active over time. It is evident that inactivity at a young age can lead to unfavorable and severe psychological and physical consequences in adolescence and adulthood, and there is a need for more research on the relationship between activity and emotional states among children. Since children today are more overweight and

sedentary and less physically active than ever before, it is imperative that communities and schools implement strategies in line with the CDC guidelines to improve children's health and well-being. Let's Inspire Innovation N' Kids (the LiiNK Project) is an ongoing intervention in Texas elementary schools that aims "to bridge the gap between academics and the social, emotional and healthy well-being of children" (LiiNK, 2015, p. 1). This goal is being achieved by increasing daily recesses in schools and providing children with character development content.

Statement of Purpose

This study had a dual purpose. The primary purpose was to determine the physical and emotional differences between the intervention and comparison school grades K-2 aged children. A secondary purpose was to explore how physical activity levels determine positive emotional states among grades K-2 aged children.

Chapter 2

Review of Literature

It is evident from previous research that physical activity and play have a wide array of physical and mental health benefits among children (Ahn & Fedewa, 2011; CDC, 2014a; DeBate et al., 2009; Gray, 2011). This literature review will examine the importance of play and physical activity to develop positive social, emotional, cognitive, and physical well-being in children. Play also provides opportunities for creativity and socialization at a young age. The benefits of physical activity extend into both physical and psychological domains, and remaining active is essential for children to grow into healthy adults. This literature review will also explore the current state of literature on positive emotional states in children, and how play and physical activity may influence those emotional states.

Peter Gray's Play Theory

By definition, play is "an activity that is freely chosen and directed by the participants and undertaken for its own sake, not consciously pursued to achieve ends that are distinct from the activity itself" (Gray, 2011, p. 444). By this description, play is intrinsically rewarding because children partake in it for the enjoyment of the play itself. Another vital aspect of play is its unstructured nature, meaning that children guide their own activities without the involvement of adults. The introduction of adults into children's play changes the dynamics of the play. Unstructured play provides opportunities for creativity, but as soon as adults enter the play setting, the atmosphere of the play changes. It is important that children set their own rules and guidelines for play, and adults only become involved if safety concerns arise (Gray, 2011). Psychologist Dr. Peter Gray describes the progression of play from an evolutionary standpoint: In hunter-gatherer societies, children were free to play

without adult direction. Since then, free play among children has declined, yielding unfavorable consequences, such as stunted mental growth, a decline in creativity, and socialization problems (Gray, 2011; Gray, 2013). Reasons for the decline of free play include increased school time, more time spent on homework, safety concerns of children playing outside, and increases in technology and screen time (Ahn & Fedewa, 2011; Burdette & Whitaker, 2005). Screen time refers to time that children spend using technology, such as watching television or playing video games. Alongside this decline in play has been an increase in anxiety, depression, and feelings of helplessness, and a decrease in creativity and empathy among young people today (Gray, 2011).

Play in schools. Children sit for seven plus hours during the school day. Unfortunately, children do not make up for in-school sedentary behavior at home (Ahn & Fedewa, 2011). Ahn and Fedewa (2011) attribute this reduction in physical activity to the increased pressure of testing standards on schools, which has resulted in less time for recess and more time for academic lessons. This decrease in play opportunities is detrimental for children since physical activity is demonstrated predominately during play in children (Dwyer et al., 2009). Gray (2011) states that, "children are designed by natural selection and [have] evolved to play." By reducing recess (unstructured) and/or physical education (structured) time, children are deprived of the social, emotional, cognitive, and physical benefits of play. Dwyer and colleagues (2009) call for a restoration of play into children's lives to increase physical activity levels and to promote "a sense of psychological wellbeing" (p. 30). Increased opportunities for play would allow for more physical activity, socialization, and creative behaviors, while restoring appropriate and safe amounts of freedom back into the lives of children. Gray (2011) points out that although everyone craves freedom, schools

deprive children of freedom, by allowing them little control over what they do during the school day. Physical activity has been measured during physical education classes and through structured interventions, but little is known about how much active time children engage in as a result of unstructured recess (O'Dwyer et al., 2013; Weber, Rissel, Hector, & Wen, 2014).

Physical activity levels among children are declining, depressive symptoms are on the rise, and unstructured free play is restricted in schools today. These intertwined factors merit attention; O'Rourke & Cooper (2010) explain that educators share the responsibility to learn about what makes children happy. Activity levels have been strongly correlated with adult and adolescent happiness and it is necessary to explore how activity levels during play determine children's happiness levels.

Physical Activity

The CDC recommends that children participate in at least 60 minutes of moderate to vigorous physical activity daily (CDC, 2014a). Unfortunately, only 42% of children and 8% of adolescents are meeting this recommendation. Sedentary behaviors and obesity levels remain a serious health concern among American children today (U.S. Department of Health and Human Services [HHS], 2015).

Benefits of activity. Physical activity improves well-being and is associated with fewer depressive symptoms (Goldfield et al., 2011; Kwak et al., 2008). Ahn & Fedewa (2011) also concluded that "increased levels of physical activity [have] significant effects in reducing depression, anxiety, psychological distress, and emotional disturbance in children," while enhancing self-concept (p. 393). Positive correlations have been found between physical activity and academic achievement/cognitive skills (Drollette et al., 2013; Wittberg,

Northrup, & Cottrell, 2012), increased global self-worth (Petty, Davis, Tkacz, Young-Hyman, & Waller, 2009), and social/psychological well-being (Debate et al., 2009; Telles, Singh, Bhardwaj, Kumar, & Balkrishna, 2013) in children ages 7-13. Debate and colleagues (2009) implemented a physical activity program among third- through eighth- grade girls and found increased psychological well-being for the girls who took part in the program. These results indicate that young girls who exercise on a regular basis can experience the psychological benefits of exercise and could have improved commitment to physical activity over time. Researchers also found that young males who self-reported being healthier or exercising more also reported less depressive symptoms than males who self-reported being less healthy or exercising less (Kwak et al., 2008). Physical activity also yields physiological benefits by improving cardiovascular health, bone health, flexibility and balance, and decreasing obesity and related diseases (CDC, 2014a; Davis et al., 2012).

Risks of inactivity. Despite the known health benefits of physical activity, sedentary behavior among youth is increasing and introducing detrimental health effects. Physical inactivity is associated with higher body mass index (BMI) scores and an increased risk for obesity. Physical inactivity is strongly correlated with becoming overweight or obese, which has been correlated with low self-esteem and depressive symptoms, such as loss of energy and reduced interest in usual activities (Danielson et al., 2012; Debate et al., 2009; Petty et al., 2009). Overweight children are likely to experience cardiovascular health problems, bone and joint issues, pre-diabetes, and other health related issues, and are more likely than their normal-weight peers to be overweight/obese as adults (CDC, 2014a). Overweight children also face weight stigmatization and bullying (Reulbach et al., 2013). Despite these health concerns, inactivity is on the rise, and over the past three decades, child and adolescent

obesity has tripled (Chung, Perrin, & Skinner, 2013). Children who are less active are likely to experience the negative physical and psychological consequences associated with inactivity.

Physical activity tracking studies indicate that children who are more physically active will retain that activity over time, as opposed to children who are less active (DeBate et al., 2009; Edwards et al., 2013). The consequences of being inactive shape the future of children's lives and must not be overlooked. As described above, researchers have determined a strong relationship between physical activity and positive psychological states (e.g., high self-esteem, self-worth, social well-being). Since physical activity levels can determine the health of children, it is crucial to explore this relationship further. One of the most critical factors that physical activity may influence is happiness. Children can have fun while being physically active; through play, children can fulfill their recommended activity levels and benefit from activity for better physical, social, and emotional health. It is vital to establish active habits during childhood, so that children may grow to be active adults and reap the psychological and physical benefits of physical activity.

Positive Emotional States

In the past, researchers have heavily investigated negative psychological states, such as depression, stress, and anxiety. Although positive psychology and positive emotional states are gaining attention, this field remains understudied (Holder, 2012; Kim-Prieto, Diener, Tamir, Scollon, & Diener, 2005). Positive emotional states include feelings that promote subjective well-being, which Diener (1984) describes "as comprising an affective component (i.e., the experience of relatively frequent positive and relatively infrequent negative emotions) and a cognitive component (i.e., life satisfaction or the overall evaluation

of [one's] life" (as cited in Tugade, Shiota, & Kirby, 2014, p. 276). Well-being includes positive emotions, a state of flow, meaning in life, getting along well with others, and feeling good (Holder, 2012; ODPHP, 2014b; Seligman, Ernst, Gillham, Reivich, & Linkins, 2009). Positive subjective well-being, which includes happiness, has been explored primarily in adult populations because of adults' cognitive and emotional abilities to accurately report on their own feelings (Holder, Coleman, & Sehn, 2009; Holder, 2012).

While there are physical health risks of negative emotional states, such as "deleterious changes in the cardiovascular system," happiness and optimism yield beneficial effects (Diener & Chan, 2011, p. 11). Adult happiness has been associated with social relationships, marriage, job satisfaction, activity level, macro-social conditions, and life events (Csikszentmihalyi & Hunter, 2003; Holder & Coleman, 2008; Kim-Prieto et al., 2005). Individuals with high subjective well-being tend to be healthier, maintain more active lifestyles, have improved creativity and productivity, and live longer (Diener & Chan, 2011; Holder, 2012; O'Rourke & Cooper, 2010; Tugade et al., 2014). People are likely to list happiness as a key characteristic when describing a "good life," and adults across 48 different countries reported happiness as the number one trait they desired for their children (Diener & Chan, 2011; Diener & Lucas, 2004).

The desire for happiness has inspired research on determinants and correlations of positive emotions among adults, adolescents, and children (Tugade et al., 2014). Although subjective well-being in children has been related to academic, emotional and social outcomes, there are still differences between the predictors of adulthood and childhood happiness that need to be explored (Holder & Coleman, 2008; Tugade et al., 2014). Seligman and colleagues (2010) state, "the roots of" adulthood happiness "are developed in

[a person's] childhood" (as cited in O'Rourke & Cooper, 2010, p. 94). Happiness among children is valued, but little is known about what makes children happy (Holder, 2012; O'Rourke & Cooper, 2010).

Children's happiness. Darwin (1872) describes laughing and smiling as the primary expressions of joy or happiness; laughter occurs when "the mouth is opened more or less widely, with the corners drawn" upwards, through the action of the zygomatic major (Dennis, Cole, Wiggins, Cohen, & Zalewski, 2009; Ekman, Friesen, & Ancoli, 1980). Darwin also illustrates children at play incessantly laughing and details joy as comprising facial (e.g., smiling), vocal (e.g., laughing) and bodily (e.g., clapping and dancing) expressions.

Csikszentmihalyi & Hunter (2003) studied American elementary- and secondary-aged children and their happiness levels at specific times each day over the course of one week. Social, active and passive leisure, and being with friends corresponded with above average happiness levels. School activities and being alone corresponded with lower happiness levels. Reported happiness levels peaked on Saturdays during the weekend, and during lunch time and during late afternoon during the school week. The researchers attributed these relationships, in part, to freedom: Children seem happiest when they are free to socialize and/or have opportunities to play. Holder and Coleman (2009) similarly found that active leisure time was positively correlated with well-being among children. However, passive leisure (e.g., screen time) had the opposite relationship on children's well-being. Therefore, children who spent free time watching television or playing video games had lower well-being scores than children who spent free time being active. The researchers point out the importance of developing social relationships, which is possible when children are being

physically active together (Holder et al., 2009). These findings align with the play theory, in that children benefit from engaging in self-directed activities and play (Gray, 2011).

The LiiNK™ Project

Students in the United States have been receiving lower test scores in core content areas (e.g., reading, math) for the past few decades. As lesson time has increased and less importance has been placed on play and physical movement time, test scores have still not improved. Finland is ranked among the top nations in the world for academics and has a much different approach to education than the United States. Core classes (e.g., reading, math, and science), physical education, and play are all viewed as important. Children do not begin elementary school until 7 years of age, they attend school for shorter periods of time daily, they do not have much assigned homework, and there is no standardized testing among elementary-aged students. Maybe most importantly, 15-minute recess breaks are required every hour of the school day. Alongside multiple recesses, Finnish children also receive a 30-minute lunch and a physical education class. Until 3rd grade, children in Finland are only in school for about 4.5 hours. Their school schedule allows for about 3 hours of content (this includes a physical education class), a 30-minute lunch, and about 1 full hour of recess. Dr. Debbie Rhea has developed the LiiNK Project (Let's Inspire Innovation 'N Kids), which has launched over the past three years in Texas public and private schools (Rhea, 2015; Rhea, 2016; Rhea et al., in press). Modeling the Finnish education system, the LiiNK Project hopes to eventually restructure the American school day to improve on-task classroom behaviors and the physical, social, and emotional well-being of children. The project operates at this time under the first two of the four objectives below:

1. Increase the amount of physical activity/recess in schools

2. Create equality across content areas and add ethics/character development

3. Assess students differently and use less standardized testing

4. Create more time for play and creativity with less hours in the classroom setting

The first and second objectives listed above have been implemented in six Texas elementary schools, each with a matching comparison school. The intervention consists of adding four 15-minute recesses throughout each day: usually two before lunch and two after lunch. The children also receive three to four 15-minute character development lessons weekly. The project launched as a pilot in grades K and 1 at two private schools (each with a matching comparison school) in 2013. Each year since 2013, one grade has been added to the pilot schools so now grades K-3 are receiving the additional recesses and the added character development lessons. In Fall 2015, four public intervention schools (with matching comparison schools) joined the project.

Results from the first two years indicate that children who receive the intervention engage in significantly higher percentages of on-task behaviors in the classroom and significantly less off-task behaviors than the matching comparison school students. Academic performance has significantly increased in reading and math. Since children know they have opportunities for more play throughout the day, they are "more disciplined and focused in the classroom" (Rhea, 2015; Rhea, 2016; Rhea et al., in press). The children are demonstrating social growth and displaying more independence both in the classroom and at recess. Schools have an immense influence on children, and these results are showing substantial academic, social, and emotional improvements for the children who are receiving more recesses and the added character development lessons. This study will further explore

this intervention to determine if there are differences in physical activity levels and emotional states for children in an intervention school versus children in a comparison school.

Measures of Physical Activity

Researchers have measured physical activity among children using a variety of methods, including self-report methods (Goldfield et al., 2011; Holder & Coleman, 2009; Jensen & Steele, 2011). However, Dwyer and colleagues (2009) state that children younger than 9 or 10 can't adequately report their physical activity levels and call for an objective measurement of activity among children. Many activity trackers exist to calculate physical activity, heart rate, sleeping patterns, steps taken, calories burned, etc. These trackers include pedometers, accelerometers, and heart rate monitors. Pedometers have proven reliable and valid for measuring ambulatory activity among children as young as 5 years old (Clemes & Biddle, 2013). They offer an objective means for measuring physical activity and are practical and unobtrusive (Czajka, Slawinska, Kolodziej, & Kochan, 2015).

Although pedometers have been used in a variety of studies to gauge physical activity levels, there is no agreed upon standard for how long pedometers should be worn each day, for how many days they should be worn, or the type of days they should be worn on (weekdays, weekend days, or a combination) (Clemes & Biddle, 2013). Gauthier, Laurence, Thirkill, and Dorman (2012) measured daily step counts in a traditional school setting and in a Balanced School Day (BSD) setting. The BSD schedule divided classroom time into three blocks of 100 minutes, separated by two 45-minute breaks. The children wore pedometers on four separate school days over two weeks; pedometers were worn simultaneously at the traditional and BSD schools. Pedometers were worn on regular school days. Average daily step counts were calculated and compared between school types. In another study by

Edwards and researchers, accelerometers were used to measure activity among children during two weekdays and one weekend day every four months. Researchers recorded different levels of physical and also inactivity, and did not use results that appeared to be wrongly recorded. Czakjka and colleagues (2015) measured step counts of young Polish children using pedometers. Children wore the pedometers on their waists for 7 consecutive full days; both weekdays and weekend days were captured, as well as time at home and time at school.

Measures of Emotional States

Measurement techniques have been used to gather information from adult, adolescent, and child populations. Measures of emotional states include self-report questionnaires, observations, and experience sampling, and researchers have investigated both specific affective experiences and global emotions (Csikszentmihalyi & Hunter, 2003; Kim-Prieto et al., 2005). Through self-report questionnaires, researchers determined relationships between adult happiness and other factors, but less is understood about children's happiness. One reason for the imbalance of research between adults' and children's emotional states is that young children's cognitive abilities to self-report in non-laboratory settings is unknown (Durbin, 2010). Another measurement technique to capture emotional expressions is through observations. Several different observation methods have been practiced in the current literature. Ekman and Friesen (1978) developed the Facial Action Coding System (FACS), an objective means for measuring facial movements as displays of specific emotions (Bartlett et al., 1996). The FACS is a specialized technique that only "highly trained experts" use (Donato, Bartlett, Hager, Ekman, & Sejnowski, 1999, p. 974). Affective states have also been validly and reliably observed through coding techniques, in which researchers record

how many times certain feelings, such as happiness or sadness, are physically or verbally expressed (Denham, 1986; Denham, McKinley, Couchoud, & Holt, 1990). Experience sampling is another measurement technique that yields results of global emotional experiences, or overall affect. In experience sampling, participants report on their feelings at different times during the day, over a number of days (Csikszentmihalyi & Hunter, 2003).

Self-reporting of children's emotional states. Concerns of how accurately children can recall and report on their emotions should navigate the research conducted on children's emotional states. Despite these concerns, researchers use self-report scales for a number of reasons: questionnaires can be administered to a large number of participants, parents can provide accurate reports on their children, and some questionnaires have been statistically shown to be valid and reliable among child populations.

Holder and Coleman (2008) used three different questionnaires to assess temperament, popularity, and physical appearance in relation to children's aged 9-12 happiness levels. They also administered questionnaires to children's parents. The three measures completed by the children included the Piers-Harris Children's Self-Concept Scale 2 (PHCSCS2) (Piers & Herzberg, 2002), the Faces Scale (Andrews & Withey, 1976), and the Children's Questionnaire (Holder & Coleman, 2008). The PHCSCS2 has high test-retest reliability, internal consistency, and is the most often used scale among this age group (Holder & Coleman, 2008). Also, children understand Likert-type scales better than "visual analogue scales," and "prefer filling in circles and having more response options" (p. 283). Holder and colleagues (2009) assessed happiness among 8-12 year old children using the same self-report techniques. O'Rourke and Cooper (2010) examined happiness among 9-11

year old school children using the PHCSCS2, the Faces Scale, the Children's Questionnaire, and the Subjective Happiness Scale (SHS) (Lyubomirsky & Lepper, 1999).

The PHCSCS2 (Piers & Herzberg, 2002) assesses self-concept and has six subscales, including Happiness and Satisfaction. The full questionnaire contains sixty true-false questions, including negative statements such as "I worry a lot," or "I am unhappy" (Holder & Coleman, 2008, p. 283). Andrews and Withey (1976) developed The Faces Scale, which is a self-report Likert-type questionnaire that displays seven different facial expressions, ranging from a severe frown to a very upturned smile. Children are asked to rate their happiness levels by choosing which face corresponds most with how they feel (Holder & Coleman, 2008). Finally, the Children's Questionnaire "[contains] nine items [that are] related to happiness," such as "How many times a week do you visit with your friends outside of school?" (Holder & Coleman, 2008). Children respond to these questions by blackening a circle on a Likert-type scale. Additional scales, such the Oxford Happiness Questionnaire (Hills & Argyle, 2002), exist to measure children's temperament and happiness. Although many researchers employ self-report questionnaires for the measurement of children's emotional states, it is necessary to consider children's developmental readiness to accurately assess their own feelings.

Durbin (2010) studied young children ages 3-6 completing laboratory tasks designed to elicit both positive and negative emotions. Alongside the children's reports of their emotional states, observers coded emotional expressions of the children. The comparison of self-reported emotions and the objective coding of emotions indicated high convergence for some emotions (Durbin, 2010). This suggests that young children may be able to accurately self-assess and report their emotions under specific conditions. However, Durbin points out

that positive states were self-reported more frequently than negative states, which may be the result of social desirability bias. The children also reported emotions at a less frequent rate than the coders recorded emotions.

While young children may be able to validly report emotions under controlled laboratory conditions, little is known on how accurately children can self-report specific or global emotions in natural environments (Durbin, 2010). Also, statements such as "I worry a lot," or "I am unhappy," have the potential of introducing negative thoughts to a child. Finally, children may have developmental limitations in understanding and responding to narrow self-report questionnaires on their emotional states.

Observation of children's emotional states. Infants are born with the ability to express positive and negative emotions (Friedman & Miller-Herringer, 1991); nonverbal states of emotion have been observed for many years. Darwin (1872) describes how joy, surprise, and many other emotions manifest themselves through behavior. Studies have explored the expression of emotions through observational techniques. Denham (1986) investigated prosocial behaviors and emotions among a preschool population. Children's emotional displays in free-play environments were videotaped and then coded according to operational definitions. In another study, Denham and colleagues (1990) explored enduring emotional states of preschoolers by observing emotions in the classroom "using focal event sampling" over 8 days (p. 1147). In each of these studies, the emotions recorded were defined as having specific "facial, bodily, vocal, and behavioral indices," and each was represented as a percentage of total expressions recorded (Denham, 1986, p. 197; Denham, 1990, p. 1092). Denham and colleagues conducted another study observing emotions among preschoolers through event-based recordings (2003). In this investigation, researchers

employed several measures, including observation of emotions of young children during free play. Observers watched each child for 12 sessions, each consisting of two 5-minute trials. During the trials, observers recorded "happy, sad, angry, afraid, tender, hurt, other, and neutral emotional displays" according to operation definitions (Denham et al., 2003, p. 243). Dennis and colleagues (2009) also used observation techniques for preschoolers' angry and happy expressions. Facial, vocal, and postural operational definitions were developed to categorize each emotion. Happy expressions were considered those that elicited smiling with corners of the mouth turning upwards, laughing, giggling, jumping in glee, and clapping hands (p. 524). Angry expressions included a furrowed brow, lips pressed, a clenched jaw, harsh vocal quality, fists, and finger jabbing (p. 524). Friedman and Miller-Herringer (1991) coded facial expressions of infants for smile range, duration of smile, and smile intensity (p. 769).

Summary

It is clear from previous literature that the health of children depends heavily on physical activity and play. More research is needed on the impact of children's emotional well-being factors. Children can meet physical activity requirements through play at school and at home. Since physical activity and play are declining with associated physical and psychological risks, it is critical to explore this relationship further. This study will further examine the relationship between play, physical activity, and positive emotional states in children through the LiiNK Project population (grades K-2 in the private school setting). This study will implement the use of pedometers to measure physical activity because of their validity, reliability, and feasibility among a young population. Researchers will

perform observations during recess to investigate percentages of positive and not-positive emotional expressions.

Research Questions

Question 1: Are there physical activity and emotional differences between the intervention school and comparison school?

Question 2: Are there physical activity and emotional (positive) differences among grade level or gender?

Question 3: What is the relationship between positive emotional states and multiple recesses daily?

Hypotheses

Based on previous research and theories, this study will test the following hypotheses:

1. Intervention school students will demonstrate significantly higher activity levels than comparison school students.
2. Physical activity patterns and emotional states will not differ by grade level or gender.
3. Intervention school students will demonstrate significantly higher percentages of positive emotional states than comparison school students.

Significance of the Study

Play provides children opportunities for learning, social growth, creativity, and improving their psychological and emotional well-being. Many studies have defined relationships between physical activity and health among adolescent and adult populations. Physical activity lowers physical health risks and improves mental health factors such as self-esteem and happiness (Eime et al., 2013). However, less is known about how physical activity levels, as a result of increased free play, influence positive emotional states in young

children. If a relationship can be further determined between these variables, play interventions might aid in helping children live happier and healthier lives.

Assumptions

It will be assumed that pedometers will provide accurate results regarding physical movement. It will be assumed that teachers will help to make sure pedometers are worn correctly. It will also be assumed that positive emotional states can be reliably and validly measured through observations among a child population.

Chapter 3

Method

This study explored physical activity levels and positive emotional states (PES) among children during free play. Data collected from the first two years of the LiiNK Project showed that children involved in the project had significant improvements in classroom behavior, increased academic scores, and demonstrations of social growth and independence (Rhea, 2015; Rhea et al., in press). Because of these results and the known benefits of physical activity on overall health, it was important to also measure how active children were as a result of the four added recesses. Furthermore, this study explored how physical activity, as a result of increased free play, influenced children's happiness. This chapter will detail the participants, measures, procedures, and design used in this study.

Participants

Originally, the total number of available participants was 333. With an attrition rate of 21.3%, a total of 262 participants took part in this study. Participants were selected from a convenience sample from two North Texas private elementary schools participating in the LiiNK Project. The two schools included K-2 students at one intervention school (N=137; K=46; 1=43; 2=48) and one comparison school (N=125; K=36; 1=47; 2=42). The intervention school students received three 15-minute recesses and a physical education (PE) class daily, as well as a 15-minute character development lesson three times weekly. The comparison school followed its original schedule of one 30-minute recess each day, one PE class, and no added character development program. The comparison school offered time before school for children who arrived early to have outside recess; this time was not included in the study because a) not all students participated in it, and b) this was not part of

regular school hours. Students from all three K-2 classrooms at the intervention school were included in the study, and three of four K-2 classrooms at the comparison school were included in the study. All students from these six classrooms were included in the study, except those students who were not included in the school's standardized tests and/or those students who were not on file with the school for parent permission.

Measures

Three instruments were used in this study. First, demographics were collected on grade and gender. Second, the students wore pedometers that measured physical activity (steps per day). Third, the students were observed for PES during recess.

Demographic questionnaire. A demographic questionnaire was administered to students' teachers through the LiiNK Project to collect grade and gender data.

Pedometers. Pedometers have been shown to be reliable and valid measures of physical activity among young populations (Clemes & Biddle, 2013). The Robic M339 3D Motion Sensor Memory Pedometer was used to objectively measure physical activity among the participants (Robic, 2015). This pedometer is a tri-axis motion sensory that can be worn anywhere on the body to accurately track movement. Approximately 125 pedometers were purchased for this study. Data recorded included total steps taken. The participants wore the pedometers on a loose necklace, underneath the shirt, and at approximately the center of the chest. This method of wear reduced issues: Belt or pocket pedometers could not be worn if a child was wearing a dress or a skirt, and shoe pedometers could not be worn on all shoe types (e.g., flats, some sandals). Wearing the pedometers around the neck minimized distraction in the classroom, was a simple and unobtrusive method, and was ideal for the young children

who continuously wore the trackers throughout the school days. The children were able to assemble the device appropriately without assistance.

Recess observations. Children were observed during recesses for emotional states (positive, not-positive, or other). Coders verbally recorded situational information (e.g., date, time, student number, temperature, humidity) first. Then, observers verbally recorded the emotional expressions of one child for a full recess. Finally, coders recorded what time recess ended. After the verbal recording was complete, the researchers transcribed the data so coding of emotional states could take place. Details on how observations were dissected are discussed in a later section.

Procedures

Texas Christian University's (TCU) Institutional Review Board (IRB) granted approval for the LiiNK Project intervention and student research projects. The IRB application included information about the proposed cover letter, the instruments, and the procedures used in the LiiNK Project (See Appendix A). The IRB also approved additional addendums to the project as changes became necessary. Next, schools and parents were notified (fall 2015) of the additions to the LiiNK Project that would take place early the following spring 2016 semester. Parents/legal guardians were sent letters that described the addendum to the project and asked for informed consent for their children to participate. If consent by administrators, teachers, and parents was not obtained, those participants were not included in the study. Participants were in no way pressured to participate in the study.

It was necessary to decide which physical activity tracker would yield reliable step counts and be realistic for young children to wear throughout a school day. After deciding to purchase pedometers because of their accurate measurements among children as young as 5

years old (Clemes & Biddle, 2013), the LiiNK graduate student team of four students piloted the pedometers for accuracy of steps by gender. Each of the graduate students wore the pedometers around the neck by a lanyard just as the K-2 students would wear them over the course of one week. Step counts were compared to accelerometers that the four graduate students already owned. Once it was determined that the pedometers were accurate for adult movement, second grade students at each school piloted the pedometers. The pedometers proved reliable and valid for the young children, and the students were able to wear the pedometer as intended around their necks without problems. Therefore, the pedometers were used to track activity for this study.

Four TCU graduate students were the primary investigators for this study. Prior to data collection, a training was held for the primary graduate student researcher to teach the other three graduate students how to operate the pedometers and how to verbally record recess observations. The training took place on in early October 2015 in the Bass building on the TCU campus. During the training, each individual learned how to verbally record situational data (i.e., date, time, student number, temperature, humidity, recess number) and observational data (i.e., emotional state) into a recording device. The observers watched videos of recess (the LiiNK Project was granted permission to use these) during this training to practice how to reliably record data. Then, observers were trained how to transcribe the voice-recordings and how to code the behaviors according to the operational definitions created by Durbin and colleagues (2010). The observers were also taught how to turn on, program, and clear the pedometers.

After the trainings were complete, the team of observers piloted the observational model to ensure that the observations were reliable across observers. The four observers

piloted the recess observation tool five times (on different days over the course of 3 months) until the tool was reliable and consistent across observers. During each pilot observation, the researchers attended one recess together and randomly selected one child to collectively observe. The team then separated so observers were out of earshot from one another, and each observer completed the verbally recorded recess observation. After the recess was complete, the observers transcribed the data and coded the behaviors as positive, not-positive, or other, according to Durbin et al.'s (2010) operation definitions. The observers then compared observations and discussed discrepancies between observations. After discussion and reasoning from the first pilot data, solutions were formed to ensure that observations remained consistent across observers. More pilot observations were conducted until there were no discrepancies among the observers. The primary advisor, who did not attend the pilot recess observations, reviewed the observation data and confirmed that results were consistent and reliable across the observers. Data collection began in the beginning of the spring 2016 semester, which allowed the intervention school an entire semester to implement the extra recesses.

Pedometers. Approximately 125 pedometers were purchased for this study. A rotation was designed so 2nd graders wore the pedometers during the first two weeks, 1st graders wore the pedometers during the following week, and kindergarteners wore the pedometers during the final week of data collection. This schedule was designed so the oldest children wore the pedometers first in case helpful feedback, which younger students may not have recognized, could be provided to researchers. Conclusions vary on how many days of pedometer wear for children is necessary to accurately measure activity levels. Some researchers suggest at least one full week of wear, including week and weekend days, while

Stryker and colleagues and Vincent & Pangrazi suggest at least five days of pedometer wear is needed (as cited in Clemes & Biddle, 2013). Because the purpose of this study was focused around measuring activity during school hours, data was collected over the course of five school days. If a child removed the pedometer for an extended period (more than one hour) during the day, that data was dismissed (Clemes & Biddle, 2013). If a student did not wear the pedometer for at least four days, that student's step counts were not included in analyses. If a student was missing only one day of data, the four other days were averaged for that child to calculate a fifth day of step counts that was representative of that child. Finally, Rowe and colleagues reported that competition among children did not influence activity (reactivity), in their study of children's physical activity levels (as cited in Clemes & Biddle, 2013). For this reason, all days of collection were included in analyses and no familiarization day was included.

Each pedometer was assigned to a student number, and this information was documented and kept anonymous and confidential. The trained researchers programmed the pedometers to reflect the correct weight and stride measurements for each grade. These measurements were calculated averages from the Centers for Disease Control (see Table 2 in Chapter 4) according to average age per grade level (CDC, 2001a; CDC, 2001b).

On the first day of collection in each grade at both schools, graduate students were present to provide instructions and demonstrations to teachers regarding pedometer wear (See Appendix C). The participants wore the pedometers from the time they arrived at school (8:30am) each morning until they departed school each afternoon (3:30pm). Teachers checked the pedometers throughout each day to ensure they were still being worn and working properly. Step counts were collected from each pedometer at the end of each school

day. After each collection week, the pedometers were assigned to new student numbers and set to the new averaged weight and stride length measurements, for the next grade level. If a pedometer malfunctioned, the student was given a new pedometer for the next day, and the inaccurate data was not included in analysis. Each afternoon at both schools, researchers recorded if any student left early, arrived late, took off his or her pedometer, was sick, went to the nurse, or was absent. This data was not analyzed with the normal data. Weather data was recorded each day of collection. There were no bad weather days that hindered outside recess. Class schedules were collected, and any non-normal activities (e.g., an assembly) that occurred during the school day were noted.

A rotation was set up to allow one grade level at each school to wear the pedometers at the same time for one full school week. Due to scheduling conflicts, Grade 2 data was collected over the course of two weeks. During the first week of the study, Grade 2 students at the comparison school (N=42, males=20, females=22) wore the pedometers. During the second week, Grade 2 students at the intervention school (N=48, males=26, females=22) wore the pedometers. Each school had a planned field trip during the assigned collection week, so the fifth day of data collection was collected between one and three weeks after the initial wear week. Weather was similar between the intervention school and the comparison school during these collection times.

During the third week of the study, Grade 1 students at the intervention school (N=43, males=20, females=23) and Grade 1 students (N=47, males=27, females=20) at the comparison school wore the pedometers. During the final week of collection, kindergarteners at the intervention school (N=46, males=19, females=27) and kindergarteners at the comparison school (N=36, males=22, females=14) wore the

pedometers. Because of a school holiday at the beginning of kindergarten collection, the fifth day of collection was collected during the following week at both schools.

Recess observations. Since it is unknown how reliably young children can report on their own emotions, observational techniques were employed for this study, which may yield more accurate reports on positive emotional states among children than traditional self-reporting. The observational-type investigations discussed in Chapter 2 laid the foundation for the current study. Observations of emotions during free play were recorded and coded to provide data on the emotional states of children during recess.

Observations were voice-recorded at recess to measure positive emotional states among K-2 children. The observers documented each child's emotional expressions (e.g. "smiling with two other friends," "frowning") for the duration of recess. Then, observers individually transcribed their observations: The situational information (e.g., date, time, duration, weather, grade, gender) and recorded descriptions of emotional states were transferred exactly to a typed document. After this, the primary graduate student met with each observer separately to review his or her transcript. At this time, the goal was to identify all emotional characteristics to validate that a particular response was indeed what the observer labeled it as. If clarification was needed in order to correctly code an emotion, the person who completed the observation expanded with detail any supplemental information pertinent to that observation. After the individual meetings, the entire team of observers met to review all transcripts. The team collectively determined what each emotional expression should be coded as. Originally, it was determined that the emotional descriptors would be coded according to Durbin et al.'s observational definitions. However, after completing, reviewing, and coding the observations, a similar but different set of emotional expressions

was constructed (e.g., happy, sad, angry), and the emotions were assigned to "positive," "not-positive," or "other.". These categories can be found in Appendix D or Table 10 in Chapter 4. The frequency of positive and not-positive expressions was counted and compared to total expressions observed, yielding a percentage of positive emotions and not-positive emotions.

Observations were conducted at the intervention school (N=30) and the comparison school (N=27) to measure PES among the children. It took approximately five weeks to complete all observations at both schools. Intervention school observations averaged 11.39 minutes, and comparison school observations averaged 11.63 minutes. The four coders were randomized to observe both male and female students in all three grades and during morning and afternoon recesses. Each observer observed one student per recess. Regardless of which school the observation was conducted at, each observer only observed one child per recess for a maximum of 15 minutes. More details will be given in Chapter 4 regarding total time and average durations of recess observations per school.

Design

Descriptive statistics were used to determine means and standard deviations of demographic data (gender and age by school). An independent t-test was used to determine if there were significant differences between average steps taken by school (intervention or comparison). An ANOVA was used to determine the differences and interactions of the independent variables of school type (intervention or comparison), grade (K, 1, 2), and gender (male or female), and the dependent variable of average steps per child. A repeated measures MANOVA was run to determine the differences and interactions of the independent variables of school, grade, and gender, and the dependent variable of average steps per day per child. A univariate ANOVA was used to determine if there were

significant differences for percentage of positive emotions by school or gender. A univariate ANOVA was also used to determine differences for percentage of not-positive emotions by school or gender. A Scheffé post hoc was run on all significant differences and interactions at a confidence level of .05.

Chapter 4

Results

The following results represent the physical activity levels and observed positive emotional states (PES) of grades K-2 children in two private schools (one intervention school and one comparison school) in North Texas. The intervention school students, involved in the LiiNK Project, received three 15-minute recesses daily, spread out over the day (approximately 9:30 am, 11:00 am, and 2:00pm). The comparison school students received one 30-minute recess daily: Kindergarteners and 2nd graders had recess at 11:00 am daily, and 1st graders had recess at 1:40 pm daily. The following research questions were asked: (1) Are there physical activity and emotional differences between the intervention school and the comparison school? (2) Are there physical activity and emotional (positive) differences among grade level or gender? (3) What is the relationship between positive emotional states and multiple recesses daily? The following sections delineate the findings of these research questions: (1) Descriptive statistics, (2) Physical activity patterns, and (3) Emotional states observed during recess.

Descriptive Statistics

School, grade, and gender information are presented in this section. Originally, 333 participants could participate in this study. Nineteen of these students opted not to participate and 52 students did not wear the pedometers for enough days to yield reliable results. If a student did not wear the pedometer for at least four days, that data was not included in analysis. Therefore, 71 students from the original sample were not included, yielding a total sample size of 262 participants (intervention=137, comparison=125). The attrition rate for this study was 21.3%.

Table 1 delineates the participants by school, grade, and gender. All of the groups were similar at the beginning of the study except Grade K females.

Table 1

Participants by School, Grade, and Gender

School	Grade	Gender	N
Intervention			
	K	Male	19
	K	Female	27
	1	Male	20
	1	Female	23
	2	Male	26
	2	Female	22
	Total		137
Comparison			
	K	Male	22
	K	Female	14
	1	Male	27
	1	Female	20
	2	Male	20
	2	Female	22
	Total		125
Total			262

The pedometers required average weight and stride length measurements. These were estimated from the Centers for Disease Control and Prevention growth charts according to average age per grade (CDC, 2001a; CDC, 2001b). Males and females were not calculated differently because at such young ages height and weight are similar for both genders. Table 2 depicts average age, as well as calculated weight, height, and stride measurements. Stride length is approximately one half of a child's height.

Table 2

Average Weight, Height, and Stride Length Measurements for K, 1, and 2 Grade Children

Grade	Age (months)	Weight (kg)	Height (cm)	Stride Length (cm)
K	66.5	20.41	113.63	56.82
1	78.5	22.99	120.46	60.23
2	90.5	25.88	126.94	63.47

Research Questions 1 & 2: Physical Activity Patterns

The first research question examined the physical activity differences between students at the intervention school (three 15-minute recesses) and students at the comparison school (one 30-minute recess). Hypothesis 1, stating that intervention school students would demonstrate significantly higher activity levels than comparison school students, was supported. An independent samples t-test revealed a significant difference for average daily steps taken over the course of one week between the intervention school and the comparison school, $F(260)=0.784$, $p<0.0001$. Table 3 indicates that students at the intervention school took significantly more steps than students at the comparison school (all three grade levels

averaged together). This was expected since the intervention school children received 15 more minutes of recess daily than the comparison school children.

Table 3

Means and Standard Deviations of Average Daily Steps Taken by School

School	N	M	SD
Intervention	137	6833.52*	1314.74
Comparison	125	6266.77*	1393.48

*Note. $p < 0.0001$.

The second research question explored differences of physical activity patterns across age and gender. Researchers hypothesized that physical activity patterns would not differ between grade level or gender. This hypothesis was not supported: A univariate ANOVA revealed significant interactions between school and grade, $F(2, 250)=4.298$, $p<0.05$, school and gender, $F(1, 250)=4.660$, $p<0.05$, and grade and gender, $F(2, 250)=6.919$, $p<0.001$, for average daily steps. There was no significant interaction between school, grade, and gender, $F(2, 250)=0.450$, $p=0.638$. The analysis also showed main effects for school, $F(1, 250)=34.265$, $p<0.0001$, grade, $F(2, 250)=41.106$, $p<0.0001$, and gender $F(1, 250)=137.101$, $p<0.0001$, on average daily steps taken. Univariate ANOVA results of main effects and interactions are presented in Table 4.

Table 4

ANOVA Table for Average Daily Steps Taken by School, Grade, and Gender

Source	*df*	*F*	*p*
	Average Daily Steps Over the Course of One Week		
School***	1, 250	34.265	0.0001
Grade***	2, 250	41.106	0.0001
Gender***	1, 250	137.101	0.0001
School by Grade*	2, 250	4.298	0.015
School by Gender*	1, 250	4.660	0.020
Grade by Gender**	2, 250	6.919	0.001
School by Grade by Gender	2, 250	0.450	0.638

Note. *p<0.05, **p<0.001, ***p<0.0001

School by grade interaction post hocs revealed significant differences between grade K intervention and comparison, p<0.012, and between grade 1 intervention and comparison, p<0.0001, but not between grade 2 intervention and comparison, p=0.065, on average daily steps. This indicates that children in grades K and 1 at the intervention school are taking significantly more steps than children in grades K and 1, respectively, at the comparison school. When examining grade differences across both schools, post hocs revealed significant differences between grades K and 1 and between grades K and 2, but no significant difference was found between grades 1 and 2 for average daily steps. Means and standard errors of average daily steps taken by school and grade are displayed in Table 5.

Table 5

Interaction of Average Daily Steps Taken for School by Grade

School[a]	Grade[a]	Mean	SE
Intervention			
	K	5979.98	146.316
	1	7360.65	149.392
	2	7199.24	141.545
Comparison			
	K	5416.46	167.050
	1	6155.45	144.153
	2	6815.31	150.963

Note. [a] Significant interaction, $p<0.05$

Post hocs for the school by gender interaction revealed that males and females at the intervention school took significantly more steps than males and females at the comparison school, $p<0.05$, by each grade level. Also, post hocs revealed that males took significantly more steps than females within each school, $p<0.0001$. Means and standards errors of average steps taken daily by school and gender are displayed in Table 6.

Post hocs for the grade by gender interaction revealed that when investigating both schools combined, males in each grade level took more steps than females in their same grade level, $p<0.0001$. Second grade intervention school males took the highest amount of daily steps. Table 7 displays the significant grade by gender interaction.

Table 6

Interaction of Average Daily Steps Taken for School by Gender

School [a]	Gender [a]	Mean	SE
Intervention			
	Male	7431.96	122.358
	Female	6261.28	115.615
Comparison			
	Male	6979.04	118.570
	Female	5279.1	133.072

Note. [a] Significant interaction, $p<0.001$.

Table 7

Interaction of Average Daily Steps Taken for Grade by Gender

Grade[a]	Gender[a]	Mean	SE
K	Male	6130.08	153.029
	Female	5266.35	160.923
1	Male	7482.80	144.153
	Female	6033.29	149.392
2	Male	8003.62	145.328
	Female	6010.92	147.324

Note. [a] Significant interaction, $p<0.001$.

Statistical analyses were also performed to examine the step differences by day for school and grade. A repeated measures MANOVA revealed significant differences for steps taken per day between schools, Wilks' Lambda=0.796, $F(4, 253)=16.175$, $p<0.0001$. The

repeated measures MANOVA also revealed significant interactions for steps per day by school, Wilks' Lambda=0.799, $F(4, 253)=15.894$, $p<0.0001$, steps per day by grade, Wilks' Lambda=0.570, $F(8, 506)=20.511$, $p<0.0001$, and steps per day by school and by grade, Wilks' Lambda=0.744, $F(8, 506)=10.082$, $p<0.0001$. These results indicate that children across grades at the intervention school were significantly more active over the course of the week, and also significantly more active when broken down by each day, than children at the comparison school. Means and standard deviations for average steps per day by school and grade are presented in Table 8.

Table 8

Means and Standard Deviations of Steps per Day by School and Grade

Day[a,b,c]	School[a,c]	Grade[b, c]	M	SD
1	Intervention	K	6088.93	834.13
		1	7324.30	1453.31
		2	7583.58	1815.06
	Comparison	K	5129.25	1005.03
		1	6670.06	1414.41
		2	7198.12	1950.13
2	Intervention	K	5331.50	878.08
		1	6655.26	1261.66
		2	7568.96	1496.26
	Comparison	K	5219.58	1081.55
		1	5888.49	1732.67
		2	6673.33	1751.38
3	Intervention	K	6251.41	1050.61

		1	7363.19	1592.83
		2	6960.46	1662.88
	Comparison	K	5208.69	1384.81
		1	6626.00	1235.55
		2	6051.36	1278.99
4	Intervention	K	5979.72	1205.29
		1	7399.72	1044.43
		2	6491.15	1513.18
	Comparison	K	6986.94	1367.00
		1	6218.66	1576.59
		2	6654.12	1743.44
5	Intervention	K	6010.61	1156.36
		1	7826.47	1512.92
		2	7729.94	1658.43
	Comparison	K	5193.75	1482.78
		1	5953.28	1707.57
		2	7218.26	1940.43

Note. [a, b, c] Significant interaction, $p<0.0001$

When examining Table 8, it is noticeable that on Day 4, students in grades K and 2 at the intervention school took less steps than students in grades K and 2, respectively, at the comparison school. This is a unique finding when reviewing the results altogether, but there is an explanation for this difference in the pattern. On Day 4, the intervention school had a school-wide assembly, and students were only allotted two out of their usual three recesses due to the shortened content time. It is important to note that recess adherence for the LiiNK Project has been at 88% for the school year 2015-2016, so missing a recess is not a common

occurrence at the intervention school. In addition, kindergarten teachers at the comparison school notified researchers that on Day 4, the students walked more than usual around the large school campus.

Pairwise comparisons also revealed significant day by day differences, Wilks' Lambda=0.796, $F(4, 253)=16.175$, $p<0.0001$, indicating that both the intervention school students and the comparison school students engage in significantly different physical activity patterns from one day to the next. Pairwise comparison results are displayed in Table 9.

Table 9

Pairwise Comparisons of Steps Taken Per Day at Both Schools During One School Week

Day	Day	Mean Difference	SE	Sig.
1	2	442.86****	65.731	0.0001
	3	255.52***	74.319	0.001
	4	43.99	79.562	0.581
	5	10.33	86.150	0.905
2	3	-187.33*	74.756	0.013
	4	-398.87****	75.414	0.0001
	5	-432.53****	83.930	0.0001
3	4	-211.53**	69.082	0.002
	5	-245.19**	78.732	0.002
4	5	-33.66	75.984	0.658

Note. *p<0.05, **p<0.01, ***p<0.001, ****p<0.0001.

Research Questions 1 & 2: Emotional States

In order to conduct observations accurately, previous literature was reviewed and the observation technique was developed. Pilot observations were conducted until the graduate student observation team and the primary advisor were confident the observations were consistent and reliable across observers and schools. More detail is provided in Chapter 3 that delineates the procedures used to ensure accurate observations. After the observation team was confident they were all collecting reliable and valid data, the observation team conducted 57 recess observations over the course of approximately five weeks. Each observer watched one randomly selected child at a time. Thirty observations were completed at the intervention school, and 27 observations were completed at the comparison school. One observation from the comparison school was not included in data analyses, because this observation was unique to the other observations; the child observed displayed both malicious and happy behaviors simultaneously. For example, the child was observed multiple times while both smiling and hitting another child with a toy. Observation time at the intervention school totaled 341.75 minutes, and observation time at the comparison school totaled 302.25 minutes. The average length per recording at the intervention school was 11.39 minutes, and the average length per recording at the comparison school was 11.63 minutes.

Researchers coded emotional expressions of children on the playground as positive, not-positive, other, or none, according to operational definitions. Table 10 delineates the positive, not-positive, and other emotions observed, along with the behaviors observed that fell under these categories.

Table 10

Positive, Not-Positive, and Other Emotional Expressions, and Behaviors Observed During Recess

Category	Emotions	Behaviors
Positive	Happiness/joy, content, excitement, surprise, celebration	Smiling, laughing, giggling, positive statement, jumping, clapping, hopping, skipping, cheering
Not-positive	Sad/upset, angry, aggressive, annoyed/irritated, frustrated	Frowning, scowling, pouting, negative statements, kicking, hitting, angry or frustrated expressions
Other	Concentrated, perplexed, element of surprise	Determined expression, hit in the face with object and surprised reaction

Percent positive emotions. The first research question explored how emotional states differed between the intervention school and the comparison school, and it was hypothesized that the intervention school students would demonstrate a significantly higher percentage of positive emotional states than the comparison school students. In other words, it was hypothesized that children at the intervention school would exhibit more happy behaviors than unhappy behaviors during recess when compared to children at the comparison school (see Appendix D for operational definitions). A Univariate ANOVA supported this hypothesis, revealing significant differences between schools for percentage of positive emotions expressed during recess, $F(1, 52)=15.332$, $p<0.0001$. Means and standard deviations are displayed in Table 11 for the percentage of positive emotional states observed at recess by school and gender.

Table 11

Means and Standard Deviations of Percentages of Positive Emotional States during Recess

School	Gender	M	SD	N
Intervention				
	Male	91.06	11.766	15
	Female	90.14	9.197	15
Comparison				
	Male	55.49	28.347	14
	Female	78.58	33.830	12

The second research question explored differences between grade and gender for emotional expressions at recess. It was hypothesized that there would be no significant differences among grade level or gender for the percentage of positive emotional states. Because of the smaller sample size for observations, the data could not be split by school, grade, and gender, and still yield reliable results. For this reason, the data was analyzed by school and by gender. An interaction effect approached significance for school type and gender, $F(1, 52)=3.972$, $p=0.052$, and perhaps with a larger sample size significance would be reached. Although a significant main effect was found for school ($p<.00001$), no significant main effect was found for gender by percentage of positive emotions during recess. These results did support the hypothesis that emotional states would not differ by gender. Results are presented in Table 12.

Table 12

Univariate ANOVA for Percentage of Positive Emotions Expressed During Recess

Source	*df*	*F*	*p*
	Percentage of Positive Emotions		
School*	1, 52	15.332	0.0001
Gender	1, 52	3.389	0.071
School by Gender	1, 52	3.972	0.052

Note. *p<0.0001.

Percent not-positive emotions. It was hypothesized that intervention school students would demonstrate significantly higher percentages of positive emotional states than comparison school students. This hypothesis was supported, and a Univariate ANOVA also revealed a significant main effect difference between the intervention and comparison school on percentage of not-positive emotions expressed at recess, $F(1, 52)=13.900$, $p<0.0001$. Intervention school students displayed significantly less not-positive emotions during recess than the comparison school students. Means and standard deviations of percentages of not-positive emotions expressed are displayed in Table 13 by school and gender.

It was hypothesized that emotional states would not differ by grade level or gender. The hypothesis was supported regarding positive emotions, and it was also supported regarding not-positive emotions. No gender main effect was found for not-positive emotions at recess, $F(1, 52)=2.486$, $p=0.121$, and there was no significant interaction for gender by school with percentages of not-positive emotions at recess, $F(1, 52)=3.556$, $p=0.065$. Univariate ANOVA results are presented in Table 14.

Table 13

Means and Standard Deviations for Percentages of Not-Positive Emotional States at Recess

School	Gender	M	SD	N
Intervention				
	Male	1.19	4.611	15
	Female	2.66	5.878	15
Comparison				
	Male	27.91	27.602	14
	Female	11.43	22.703	12

Table 14

Univariate ANOVA for Percentage of Not-Positive Emotions Expressed During Recess

Source	*df*	*F*	*p*
	Percentage of Not-Positive Emotions		
School****	1, 52	13.900	0.0001
Gender	1, 52	2.486	0.121
School by Gender	1, 52	3.556	0.065

Note. ****p<0.0001

Chapter 5

Discussion

This study was implemented to investigate the physical activity and emotional differences between young school children who received the LiiNK Project intervention versus students following a normal school schedule (comparison school). The LiiNK Project required implementation of four 15-minute recesses and three 15-minute character development lessons weekly during the school day. The goal was four 15-minute recesses, but the intervention school only scheduled three 15-minute recesses daily due to the amount of content required for their curriculum. The comparison school students in this study received one 30-minute recess per day and no added character development program. Results from the first two years of the LiiNK Project showed that students who receive additional recess breaks engage in significantly higher percentages of on-task behavior in the classroom, significantly lower percentages of off-task behavior in the classroom, and demonstrate social growth and independence in the classroom and at recess (Rhea et al., in press; Rhea, 2015). With sedentary behavior dominating the lives of youth today, strategically implementing three to four recess breaks throughout the school day could lead to increased activity; furthermore, children who are more active could experience the physical and psychological benefits that accompany physical movement. This thesis explored how added recesses, as a result of the LiiNK Project, affected physical activity patterns and emotional states in elementary children.

First, the descriptive statistics of this study will be examined regarding the participants involved in both the physical activity and the emotional states components of this study. Next, physical activity patterns across the intervention school and comparison

school will be explored. Then, percentages of positive and not-positive emotional states displayed by students at both schools during recess will be discussed. Next, the relationship between physical activity and emotional states will be discussed. Finally, the limitations of this study will be delineated, followed by a summary of the findings and suggestions for future research.

Descriptive Statistics

For the physical activity piece, participants were fairly evenly distributed across school (intervention=137, comparison=125), grade (K=31%, 1=34%, 2=34%) and gender (male=51%, female=49%), which allowed for reliable analysis of data between the intervention and comparison schools. The schools were also similarly matched for males and females per grade level, with the exception of females in grade K (See Table 1 in Chapter 4). Reasons for this discrepancy among kindergarten participants include that there were less females in K enrolled at the comparison school (N=22) than at the intervention school (N=32), and eight females at the comparison school were dismissed from the study for choosing not to wear the pedometer or being absent on data gathering days. Because the comparison school had less total students enrolled and less females than the intervention school, researchers felt that this attrition rate in K females at the comparison school was acceptable, and data analyses were still carried through.

Observations of emotions during recess were also evenly dispersed across schools (intervention=30, M=11.39 minutes; comparison=27, M=11.63 minutes), gender (male=29, female=27), and grade levels. At the intervention school, equal numbers of observations were conducted during both morning and afternoon recesses per grade level, and they were randomized across classroom. Observations at the comparison school took place during the

same time for each grade each day, because the comparison school only offered one recess to students. All of the observations were conducted over the course of five weeks, beginning in late January for both schools. There were no weather-related recess cancellations and no indoor recesses were held. The weather was similar across schools and days.

Research Questions 1 & 2: Physical Activity Patterns

The first research question examined the physical activity and emotional differences between students who received three 15-minute breaks throughout the school day and students who received only one 30-minute recess break daily. This section will focus on the physical activity pattern results followed by the emotional states in the next section. The physical activity pattern results supported the first hypothesis, providing evidence that children who received the multiple outdoor, unstructured, recess breaks throughout the school day (totaling 45 minutes) were more physically active (M=6833.52 steps) than comparison school students who received only one recess daily (M=6277.77 steps). This aligns with current literature showing children engage in physical activity through free play experiences (Burdette & Whitaker, 2005; Dwyer et al., 2009). Along with the cognitive, emotional, and social benefits of free play (Gray, 2011), it is evident from these results that children who received more unstructured, outdoor breaks throughout the school day were more physically active; intervention school children who were more active during this study may experience the benefits of physical activity (e.g., healthy bones and muscles, heart health, psychological well-being), and minimize the risks associated with living a more sedentary lifestyle (e.g., high cholesterol, high blood pressure, type 2 diabetes) (CDC, 2014a).

Comparisons across gender. The second research question investigated how physical activity patterns may differ among grade level and gender. The data by gender clearly showed that intervention school males and females took more steps than comparison school males and females. Interestingly though, males at both schools were more active than females in their same school and grade level, indicating that young males engaged in more movement during the school day than young females. Females also did not become much more active from one year to the next (See Table 6 & Table 7 in Chapter 4). This aligns with other research indicating males are more active than females (Bauman, Reis, Sallis, Wells, Loos, & Martin, 2012; Klinker, Schipperijn, Christian, Kerr, Ersboll, & Troelsen, 2014); if this pattern of lowered physical activity among females continues after school and as they get older, they may be more at risk for developing sedentary habits and may suffer from physical and psychological health consequences related to inactivity.

Second grade males were the most active subgroup of this study's population, and older males were more active than younger males. These findings may suggest a need for young males to acquire more physical activity as they develop. Anecdotally, observers witnessed females socializing on the playground more than males, especially at the comparison school. Since the pedometers did not track activity by time, it is impossible to detect when the majority of activity took place throughout the school day. However, it could be inferred that if comparison school females were utilizing their one 30-minute recess break to socialize, they may not have completed their 60 minutes of recommended activity daily (CDC, 2014a).

Also, this was the third year that second grade intervention school children received three recess daily. It is possible that since this older group of males was exposed to more

play breaks for two years prior to the present study, they were able to play and move more than children who received less play breaks or children who had been included in the LiiNK Project for less time. If this trend continues, children who are more active from an early age may maintain the activity levels germane to their health and well-being. Research is inconclusive on how stable children's physical activity is over time (Nyberg, Ekelund, & Marcus, 2009), and some researchers report lower stability in early childhood than in adolescent or adult years (Telema, 2009), meaning that physical activity levels vary from year to year in early childhood. However, children are more active than adolescents, suggesting that although activity levels may fluctuate during childhood, there is a steady decline in movement as individuals move into adolescent years (Klinker et al., 2014). It is important to implement strategies that promote physical activity patterns in childhood that will continue through adolescence and adulthood.

Comparisons across grade levels. When examining the activity levels by grade, intervention school students in grades K and 1 took more steps than comparison school students in grades K and 1, respectively. However, grade 2 intervention school students did not take significantly more steps than grade 2 comparison school children when examining males and females combined, and overall, grade 2 children at both schools were the most active group in this population. According to data from the LiiNK Project years 1 & 2, intervention school students are less off task and have less movement in the classroom as a result of added recess (Rhea et al., in press). Since intervention school students are less restless in the classroom, and therefore more on-task during instruction time, it is likely that intervention school students involved in this study were getting most of their step counts during recess. Although the pedometers used in this study did not track activity by time, it is

presumable that comparison school 2nd graders were either moving around more in the classroom than intervention school students, causing more disruption, or using their one 30-minute recess to burn off excess energy.

Students in K took the least amount of steps. One reason for this could be that kindergarteners at both schools had a slightly shorter school day than children in grades 1 and 2. On average, 1st and 2nd graders wore the pedometers for seven hours, while kindergarteners wore the pedometers for approximately six hours. However, kindergarteners at the intervention school received all three recess breaks, and kindergarteners at the comparison school received their one recess. With the last portion of the day seemingly consisting of content time for the older grades, it might be assumed that children in K were less active during their recess breaks than older students. However, this is a guided assumption because the pedometers did not track activity by time points, so it is impossible to know when the steps were being taken throughout the school day. Since students with more recess breaks were more active, and also more on-task in the classroom, the implementation of the LiiNK Project or similar school schedules could increase both female and male students' activity levels.

Research Questions 1 & 2: Emotional States

The first research question of this study explored the differences in physical activity patterns in the previous section and will now focus on the emotional states among intervention school students and comparison school students. The results of this study supported the hypothesis that children who received multiple unstructured, outdoor, play breaks throughout the school day would demonstrate higher percentages of positive emotions during recess (M=90.61%) than comparison school children (M=66.15%), who received one

traditional recess. Positive emotions included smiling, laughing, saying positive things, jumping, skipping, hopping, dancing, and similar behaviors (See Table 10 in Chapter 4 or Appendix D).

An astounding finding was that children at the intervention school displayed significantly lower ($p<0.0001$) percentages of not-positive emotions on the playground ($M=1.93\%$) when compared to comparison school children ($M=19.67\%$). Not-positive behaviors included frowning, pouting, crying, making a frustrated face, violent behaviors, and saying negative things (See Table 10 in Chapter 4 or Appendix D). It is important to note that children at both schools exhibited both positive and not-positive emotions, but the students who received more play breaks demonstrated significantly more positive emotions and significantly less not-positive emotions on the playground than children who only had one recess opportunity daily, even though it was only 15 minutes less total in a school day. These results indicate that children who received more recess breaks throughout the day, as well as a character development program, exhibited an overwhelming majority of happy behaviors on the playground. This corresponds to research that indicates that individuals who are more active experience more positive psychological states, such as happiness, than individuals who are more sedentary (Ahn & Fedewa, 2011).

Comparisons across gender. The second research question explored differences in emotional states among grade level and gender. It was hypothesized that there would be no significant differences among grade level or gender at the intervention school for the percentage of positive emotional states. Because of a smaller sample size for the recess observations, the data could not be stratified by school, grade, and gender, and still yield reliable results. For this reason, the data was analyzed only by school and gender. Overall,

the hypothesis was partially supported because analyses revealed no significant effect of gender or interaction between school and gender for positive or not-positive emotional states. However, the interaction approached significance between school and gender for positive emotional states (p=0.052).

Positive emotional states. At the intervention school, males (M=91.06%, SD=11.77) and females (M=90.14%, SD=9.21) displayed very high percentages of positive emotions. Comparison school males (M=55.49%, SD=28.35) and females (M=78.58%, SD=33.83) exhibited much lower percentages of positive emotions. The interaction between school and gender for positive emotional states cannot be overlooked (p=0.052); with a larger sample size significance may have been reached. Alongside the added recesses, the LiiNK Project implements a character development program. As a result of both pieces of the LiiNK Project, male and female children are demonstrated more happy behaviors and less unhappy behaviors at recess. These results align with play theory in that males and females benefit emotionally from the multiple opportunities daily to socialize, learn, and explore in an unstructured environment (Gray, 2013).

Not-positive emotional states. At the intervention school, both males (M=1.19%, SD=4.61%) and females (M=2.66%, SD=5.88%) exhibited very low percentages of not-positive emotional states. At the comparison school, however, males (M=27.91%, SD=27.60%) demonstrated nearly 30% of not-positive emotions on the playground, more than doubling the not-positive emotions that females exhibited on the playground (M=11.43%, SD=22.70%). This may be attributed to the games played at the comparison school, which were sport-type games, such as basketball and dodge ball. Many of the males observed at the comparison school were involved in these types of games, which had a more

competitive nature than activities most of the females were engaged in. Also, the intervention school playground did not have a blacktop, sport-type equipment (e.g., balls), or other areas conducive to competitive sport-type games, which may have reduced not-positive emotions arising from competitive situations at the intervention school.

Percent other emotions. Many emotions exhibited at recess could be coded as positive or not-positive according to the operational definitions set by this study and previous literature. However, certain expressions, such as contemplation or concentration, could not be coded into these binary categories. For this reason, observers created a third category devoted to "other emotions," which researchers felt were important to capture. (See Appendix D for a full list of these types of emotional expressions observed.) Statistical analyses were not carried out on these emotions, because they did not relate to the purpose or research questions of this study.

Research Question 3: Relationship Between Physical Activity and Emotional States

The third research question explored the relationship between physical activity and positive emotional states. This study was designed so names of students would not be attached to recess observations to maintain the anonymity of participants. Since names were not attached to pedometers or recess observations, correlations could not be conducted to analyze the relationship between physical activity and emotional states. However, strong patterns that arose from this data cannot be overlooked. It is evident that intervention school students in grades K-2 were, on average, more active, and also exhibited a higher percentage of positive emotional states (e.g., happiness) at recess than comparison school students. This relationship is noteworthy, because other researchers have shown individuals who are more

active report higher quality of life, more happiness, and higher self-esteem than individuals who remain inactive (Parfitt & Eston, 2005).

The benefits of physical activity are overwhelming, and it is evident that physical activity has some positive effect on emotional well-being from both this study and previous investigations (Ahn & Fedewa, 2011; CDC 2014a; Telles et al., 2013). Multiple recess breaks daily are providing opportunities for children to move, but they are also providing other opportunities that cannot be overlooked. For example, grade 2 children between the two schools did not take a significantly different amount of steps, but intervention school children exhibited a much higher percentage of positive emotions than comparison school children. Regardless of statistically similar step counts, comparison school grade 2 children still exhibited less happy behaviors on the playground than intervention school children. This indicates that while physical activity may be a determinant of happiness, other determinants such as socialization and multiple breaks from content time during the school day should be considered as possible determinants of positive emotional states.

Limitations

One limitation of this study was the inability of the pedometers to track activity by time. Although total step counts were measured by the pedometers, information on when students took the most steps was not available. Another limitation of this study was the lack of blinding of the recess observers. Ideally, observers would be blinded to which school was receiving the intervention. This was impossible to achieve because the length of the recess itself (15-minutes or 30-minutes) was a clear indication to the observer as to which school he or she was at. This limitation was considered prior to beginning the observations, and lengthy trainings and pilot observations were conducted to ensure with the most confidence

that observers were conducting observations similarly across both schools. Another consideration of the recess observations is that play areas at both schools were very different. As mentioned previously, the intervention school play area may have encouraged more creativity than competition during recess, because there were no balls, blacktops, or basketball hoops. On the other hand, the playground at the comparison school had both a blacktop with basketball hoops and a traditional playground structure. This difference may have contributed to the higher percentages of not-positive emotions that were observed during recess at the comparison school. Finally, the observations were designed to study children's emotional states in a natural setting for an extended period of time. Recess was the most natural and best way to capture emotional states and behaviors during the school day for this study. However, it was assumed that emotional expressions are a reliable indicator of emotions. This should be considered a limitation, because observable behavior may not always be congruent with emotional experiences (Izard, 1990). Finally, although the results yield telling information, it is not recommended to generalize the emotional states of children at recess to their overall happiness in life.

Summary

From the data collected during this investigation, it is evident that the intervention school students engaged in more physical activity during the school day and exhibited higher percentages of positive emotional states at recess than the comparison school students. The intervention school was matched very closely with the comparison school on almost all factors (e.g., school type (private), demographics, socioeconomic status), except for the implementation of the LiiNK Project. It is plausible then, to suggest that the added recesses

and character development program had strong beneficial effects on students' physical activity levels and positive emotional states at recess.

This study is among the first to examine how unstructured play breaks throughout the school day influence physical activity levels and emotional states among children. It is evident that physical activity has beneficial psychological effects on older populations, as discussed in Chapters 1 and 2, but these results provide evidence that play breaks may contribute to children's happiness and physical activity levels. Because of the importance of play and physical activity in children's lives, and also the extensive desire for happiness, these results must not be overlooked.

The LiiNK Project results have shown that play breaks throughout the day along with a character development program are helping to improve students' classroom behavior, academic scores, and socialization skills (Rhea et al., in press). This study, as an addition to the ongoing LiiNK investigation, provides evidence that play breaks also lead to more physical activity and displays of happiness on the playground. Schools today focus heavily on content time and standardized testing, and some schools don't require recess at all (Lee et al., 2013). This study provides data that points to increasing play opportunities for children for the improvement of not only academic scores but also physical, emotional, and social well-being.

Future Directions

Future research should explore how interventions such as the LiiNK Project impact children in older grade levels, as well as children in the public school setting. Future studies may explore how physical activity patterns during the school day extend to activity after school. Also, much research is needed on the determinants of happiness among children.

Too often it is assumed that research on adult happiness can be translated to child happiness. The results of this study indicate that children who receive more breaks throughout the school day are more active and exhibit more happy behaviors at recess than children who receive only one break during the school day. However, it is necessary to further explore these relationships among children.

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Appendix A

IRB

INSTITUTIONAL REVIEW BOARD

STUDENT PROTOCOL REVIEW REQUEST

The TCU Institutional Review Board (IRB) is responsible for protecting the welfare and rights of the individuals who are participants of any research conducted by faculty, staff, or students at TCU. Approval by the IRB must be obtained prior to initiation of a project, whether conducted on-campus or off-campus. While student research is encouraged at both the undergraduate and graduate level, only TCU faculty or staff may serve as Principal Investigator and submit a protocol for review.

Please submit this protocol to the appropriate Departmental Review Board for recommendation and submission to the IRB. DRBs will submit to the IRB electronically at IRB.StudentSubmit (pdf preferred). Include the Protocol Approval Form as a word document with highlighted sections filled in. Also submit a consent document, HIPAA form if applicable, Protecting Human Research Participants Training certificates, recruitment materials, and any questionnaires or other documents to be utilized in data collection. A template for the consent document and HIPAA form, instructions on how to complete the consent, and a web link for the Protecting Human Research Participants Training are available on the TCU IRB webpage at www.research.tcu.edu. Submission deadline for protocols is the 15th of the month prior to the IRB Committee meeting.

1. **Date:** 10/2/15

2. **Study Title:** The relationships between added recesses, physical activity levels, and positive emotional states among grades K-2 children

3. **Principal Investigator (must be a TCU faculty or staff):** Laura Clark

4. **Department:** Kinesiology

5. **Other Investigators: List all faculty, staff, and students conducting the study including those not affiliated with TCU.**
   Dr. Debbie Rhea, Dave Farbo, April Long

6. **Project Period:** October 5, 2015 – October 4, 2016

7. **If you *have* external funding for this project –**
   Funding Agency: N/A **Project #:** N/A **Date for Funding:** N/A

8. **If you *intend to seek/are seeking* external funding for this project –**
   Funding Agency: N/A **Amount Requested From Funding Agency:** N/A
   Due Date for Funding Proposal: N/A

9. <u>Purpose:</u> Describe the objectives and hypotheses of the study and what you expect to learn or demonstrate:

Thesis Purpose:
The primary purpose of this study is to determine the physical and emotional differences between the intervention and comparison school grades K-2 aged children. A secondary purpose is to explore how physical activity level determines positive emotional states among grades K-2 aged children.

Hypotheses:

H1: Intervention school students will demonstrate significantly higher activity levels than comparison school students.
H2: Physical activity patterns and emotional states will not differ by grade level or gender.
H3: The intervention school students will demonstrate significantly percentages of positive emotional states than comparison school students.

Research Questions:
Question 1: Are there physical activity and emotional (positive) differences among school, grade level, and gender as a result of 4 recesses daily?
Question 2: What is the relationship between positive emotional states and multiple recesses daily?

If a positive relationship can be determined between physical activity and positive emotional states, then play interventions could help children live happier and healthier lives.

10. <u>Background:</u> Describe the theory or data supporting the objectives of the study and include a bibliography of key references as applicable.

Play theory, constructed by Dr. Peter Gray, explains play as essential to the healthy development of children. Free play can be described as being intrinsically rewarding, meaning that children partake in the play for the enjoyment of the play itself. Also, play is unstructured. By this definition, children guide their own activities (e.g., create their own game at recess), and adults do not become involved unless safety concerns arise. According to play theory, play is the means through which children learn. Children develop social skills, solve problems, take appropriately challenging risks, explore their surroundings, and become more creative (Gray, 2013). Dwyer and colleagues (2009) point to the importance of play because it is also the vehicle through which children get their physical activity needs (Dwyer, Baur, Higgs, & Hardy, 2009).

Unfortunately, there has been a steady decline in free play (Gray, 2011). Reasons for this decline include increased school time and homework, safety concerns of parents, and increased screen time, or time spent watching television or using other technology. Because schools face pressure to meet testing standards, many play and physical activity opportunities have been replaced by academic lessons (Ahn & Fedewa, 2011). With

fewer opportunities to be physically active, children are becoming more sedentary. The CDC recommends that children engage in at least 60 minutes of moderate to vigorous physical activity daily. Unfortunately, only 42% of children are meeting this requirement (CDC, 2014a). Risks associated with sedentary behavior include lower self-esteem, depressive symptoms, and the possibility of becoming overweight or obese (CDC 2014a; Danielson, Stormark, Nordhus, Maehle, Sand, Ekornas, & Pallesen, 2012; Debate, Gabriel, Zwald, Huberty, & Zhang, 2009).

Being physically active has physical and mental health benefits: It promotes bone strength and cardiovascular function, reduces the risks of becoming overweight, and improves psychological states (e.g., happiness, self-esteem, well-being) (Ahn & Fedewaa, 2011; CDC, 2010; Debate et al., 2009). Happiness is one of the most desired traits that adults want for their children (Diener & Lucas, 2004). Physical activity has been positively correlated to positive emotional states in adult and adolescent populations, and among children. However, current research focuses on how structured physical activity interventions influence emotions among children (Ahn & Fedewa, 2011). Less is known about how physical activity in unstructured settings, or play settings, influences emotional states among young children.

A project launched by Dr. Debbie Rhea, "Let's Inspire Innovation 'N Kids" (Liink), has been launched in North Texas public and private schools to increase play and creativity among children. It operates under two objectives, one of which is to increase play and physical activity time during the school day. This is executed by adding four 15-minute recesses to the school day, instead of the usual one recess. Results from the first two years of this project indicate that intervention school children are engaging in significantly higher percentages of on-task behaviors in the classroom and significantly fewer off-task behaviors in the classroom compared to matching comparison school students. Also, children are demonstrating social growth and independence both in the classroom and on the playground (Liink, 2015). This study will further explore the relationship between added recesses and physical activity levels, and how physical activity levels determine children's positive emotional states.

References:

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11. <u>Subject Population:</u> Describe the characteristics of the participant population including the inclusion and exclusion criteria and the number of participants you plan to recruit:

The participants will be selected from a convenience sample of two private North Texas elementary schools participating in the Liink Project. Grades K-2 will be the focus of this study: One private intervention school (N=200) and one private comparison school (N=300). The intervention school students will receive three 15-minute recesses throughout the day. The comparison school will follow its original schedule of only one 20-minute recess preceding lunch each day. The comparison school offers time before school begins for children who show up early to have outside recess. Approximately 28 males and 28 females per grade level (K-2) at each school (N=2) will be randomly selected from the students who have a consent form signed on file to wear pedometers for the step tracking daily. This equates to approximately 168 K-2 children per school, or 336 children total. In order to measure children's positive emotional states, observations will be conducted at recess (N=54). This technique will be used because it is unknown how reliable children can self-report on their emotions. Also, questionnaires often times contain negative language (e.g., "I am usually unhappy"), which this study wants to avoid so possible risks are minimized. One researcher will observe one child per recess (3 recesses per day), equating to three children daily. For three days over the course of one week, three observers will be monitoring either K, 1, or 2 grade children at the intervention school. Approximately 27 intervention school students will be observed. This allows for nine students to be observed from each of grades K, 1, and 2. The same number of students (N=27) will be observed at the comparison school.

All students who have a consent form signed by the parent from grades K-2 can be included. Some attrition will be expected as a result of students being absent from school on data gathering days. Teachers and parents will be informed of these additions to the project and sign a consent form prior to any data gathering. Children can withdraw from the study at any time. No incentives will be offered for participating in this study.

12. <u>Recruitment Procedure:</u> Describe your recruitment strategies including how the potential participants will be approached and precautions that will be taken to

minimize the possibility of undue influence or coercion. Include copies of the recruitment letters, leaflets, etc. in your submission.

Because this study will consist of a convenience sample from the Liink Project study population, parents, teachers, and children will be notified of the additions to the project. No further recruitment procedures will take place. If a child's parent does not want his or her child to participate in the study, then that parent will sign that he or she does not want the child participating. That child will not be included in the pedometer tracking.

13. **<u>Consenting Procedure:</u> Describe the consenting procedure, whether participation is completely voluntary, whether the participants can withdraw at any time without penalty, the procedures for withdrawing, and whether an incentive (describe it) will be offered for participation. If students are used as participants, indicate an alternative in lieu of participation if course credit is provided for participation. If a vulnerable population is recruited, describe the measures that will be taken to obtain surrogate consent (e.g., cognitively impaired participants) or assent from minors and permission from parents of minors.**

Parents will sign an informed consent for their children (see Appendix B), agreeing to the procedures of the study. The informed consent will detail the procedures of the study and will state that children can withdraw from the study at any time, and parents can withdraw their child from the study at any time, by notifying schoolteachers or the primary researcher. The informed consent will explain that participation is voluntary. There is no incentive to participate.

14. **<u>Study Procedures:</u> Provide a chronological description of the procedures, tests, and interventions that will be implemented during the course of the study. Indicate the number of visits, length of each visit, and the time it would take to undergo the various tests, procedures, and interventions. If blood or tissue is to be collected, indicate exactly how much in simple terms. Flow diagrams may be used to clarify complex projects.**

Approval for the Liink Project has been obtained from Texas Christian University's (TCU) Institutional Review Board (IRB). The IRB application includes information about the proposed cover letter, the instruments, and the procedures used in the Liink Project. Additions to the Liink Project will be approved by the Department of Kinesiology Review Committee. Next, schools and parents will be notified of the additions to the Liink Project (see Appendix C for script). The additions are: 1) most of the students will wear pedometers to track number of steps each day from the beginning of the school day to the ending of the school day (approx. 7 hours) – no names will be associated with the child's steps, only a number; 2) observations will be conducted at recess – no contact with the students, no individual results from these observations will be collected. The researcher will be audiotaping word associations from their observations of bodily, verbal, and facial responses to each child's play environment (see Appendix D for operational definitions); 3) Two students at each recess will wear a voice recorder to pick up on the verbal language spoken throughout the recess time (15 minutes). This script will be connected to the observation

number identified for that same child per recess, but not by name. Parents/legal guardians will be invited to hear a description of the addition and provide informed consent for their children to participate. If consent by parents is not obtained, those students will not be included in the study. Participants will in no way be pressured to participate in the study. A pilot study will be conducted to ensure that the pedometers can be appropriately worn and used, and that the observations can be correctly recorded (verbally and then written) and then scored for accurate and reliable results. Data collection will begin in October, to allow the intervention school two months to implement the extra recesses and to lower chances of weather-related recess cancellations that winter may bring.

A team of three TCU graduate students will be the observers for this study. Prior to data collection, two trainings will be held for the primary graduate student researcher to teach the other two graduate students how to operate the pedometers and how to verbally record recess observations. The trainings will take place in the first three weeks of October before data collection begins. During the first training, each individual will learn how to turn on, charge, program, clear, and turn off the pedometers. During the second training, observers will be taught how to verbally record situational data (i.e., date, time, student number, temperature, humidity, recess number) and the observations. The observers will watch videos of recess (the Liink Project has already been granted permission to use these) during this training to practice how to reliably record data. Then, observers will be trained how to transfer the information from voice-recordings to typed data, and how to then code the behaviors according to the operational definitions.

After the trainings are complete, K-2 students and pedometers will be assigned numbers. A trained individual will program and charge the pedometers prior to wear. The same individual will provide the same directions to teachers and students across grades and across schools regarding pedometer wear (see Appendix C for script). This individual will instruct the participants and teachers on how the device is properly managed, stored, and worn on the Friday before data collection begins. Once the participants are aware of how to fasten the device to their wrists and manage the device, they will be instructed to wear the pedometer from the time they arrive at school each morning (approx.8:00 am) until they depart school (approx.3:00 pm) each afternoon. After the Friday of instruction, the participants will be able to place the devices on their wrists beginning the next Monday morning and start recording time each day for a five day period (i.e., Monday-Friday). At the end of each school day, the students will remove the wrist pedometer and a trained individual will record the information (steps and distance traveled) from each pedometer. This will also allow the researchers to check for malfunctioning devices. The pedometers will then be fully charged and cleared of the data from the day. This information will be downloaded to a number representing a student, never to the student's name. At no time will someone be able to identify the student based on that number.

Approximately 125 pedometers will be obtained for this study. A rotation will be set up so that 56 students at the intervention school and 56 students at the comparison school will be wearing the pedometers at the same time. For each school, 56 students from each grade will be randomly assigned to wear the pedometers. Each pedometer will be assigned to a student number, and this information will be recorded. The same child will wear the same pedometer for the duration of the week. The information obtained from the pedometers will be kept anonymous and confidential. During the first week of the study, 56 kindergarteners (28 males, 28 females) at the intervention school and 56 kindergarteners (28 males, 28

females) at the comparison school will wear the pedometers. During the second week, 56 first graders (28 males, 28 females) at the intervention school and 56 first graders (28 males, 28 females) at the comparison school will wear the pedometers. During the last week, 56 second graders (28 males, 28 females) at the intervention school and 56 second graders (28 males, 28 females) at the comparison school will wear the pedometers. Teachers will check pedometers to ensure they are still being worn and are working. The pedometers will be reset and assigned to a new student number after each week, before the new grade level wears the pedometers. Weather will be checked ahead of time to avoid bad weather weeks in which the children cannot have outdoor recess. In the case of weather-related recess cancellations, physical activity will still be recorded (when the children have indoor recess), but will be tested differently than physical activity levels on fair weather days. Teachers at the intervention school and the comparison school will report recess adherence and recess type (indoor or outdoor). Approximately 10.7% attrition has been accounted for: Three extra males and three extra females from each grade level at each school have been included in this study to account for possible pedometer malfunctions or school absences during data collection.

Observations will be conducted at recess to measure positive emotional expressions among K-2 children. In order to ensure that observers are recording similarly, pilot work will be conducted. The three observers will separately observe and verbally record the behaviors of the same child for a full 15-minute recess. Each observer will then individually type and code the observation data. Then, the three graduate students will meet and compare their observation scripts for identified responses. Then Dr. Rhea will come in to validate that the observers are recording and coding similarly and validly.

The observations will be voice-recorded with a device that also monitors time, so the exact duration of the observation will be recorded. The observers will watch each child's emotional expressions and verbally record what is observed (e.g. "smiling with two other friends," "frowning"). After the recordings are complete, the voice-recorded data will be typed and then assigned to "positive", "not-positive", or "other" categories according to operational definitions constructed from current literature. The frequency of positive and not-positive expressions will be counted and compared to total expressions observed. During the first week at the intervention school, nine different students will be observed each day for three days (Monday, Wednesday, Friday). This will yield a total of 27 observations at the intervention school. To achieve this, three coders will each observe one randomly selected child at each recess for three recesses. Each recess is 15 minutes. Coders will observe for three days. At the comparison school, the same process will be followed. Three coders will observe a different child at each recess over the course of nine days. Because the comparison school only has one recess daily, only three students can be observed daily. It will take nine school days to complete 27 observations at the comparison school. For this reason, observations at the comparison school will be collected for three weeks instead of one. The same three individuals will conduct observations across grades and across schools and will be trained to code uniformly.

In order to validate the observations, children may wear a LENA digital voice recorder during recess. This is a non-invasive device placed around a child's neck or in a shirt pocket that will audio record what the child verbally expresses. Only two of the three children will wear the LENA digital voice recorder during each recess. The LENA recordings will be

compared to the observations to make sure that observers are accurately reporting emotional expressions during recess. No names will be attached to this information, only numbers.

15. <u>Data Analyses:</u> Describe how you will analyze your data to answer the study question.

In order to test the hypotheses and exploratory question, analytical statistics will be conducted for each hypothesis using SPSS version 23. The statistical analysis will be as follows: H1) An independent T-test will be conducted to determine if there is a significant difference in physical activity levels between the intervention school and the comparison school, H2a) a 2-way ANOVA will be conducted to determine if there are significant differences in physical activity level between grade level and gender, H2b) a 2-way ANOVA will be conducted to determine if there are significant differences in emotional states between grade level and gender, H3) an independent t-test will be conducted to determine if there is a significant difference in emotional states between the intervention school and the comparison school, H4) correlations will be conducted to determine if there is a positive correlation between physical activity and positive emotional states, and H5) a MANOVA will be conducted to determine if there is a significantly higher interaction between physical activity levels and positive emotional states in the intervention school than in the comparison school.

16. <u>Potential Risks and Precautions to Reduce Risk:</u> Indicate any physical, psychological, social, or privacy risk which the subject may incur. <u>Risk(s) must be specified</u>. Also describe what measures have been or will be taken to prevent and minimize each of the risks identified. If any deception is to be used, describe it in detail and the plans for debriefing.

There are minimal risks associated with this study. School administrators, teachers, and counselors will be made aware of the protocols and will be available for assistance. No deception will be used at all. Teachers will be monitoring behaviors during class time and recess per usual. This study will maintain confidentiality so that all students' names remain anonymous. Confidentiality will be maintained by storing data in a secure location and deleting all student names off of files kept in SPSS. Pedometers may radiate small amounts of electromagnetic energy, which could possibly affect individuals who have a pacemaker. This is included in the consent form and will be discussed with teachers and parents when describing the study so that a student will be eliminated from the sample if this is a problem.

17. <u>Procedures to Maintain Confidentiality:</u> Describe how the data will be collected, de-identified, stored, used, and disposed to protect confidentiality. If protected health information is to be re-identified at a later date, describe the procedure for doing so. All signed consents and hard data must be stored for a minimum of 3 years in a locked filing cabinet (and locked room) in the principal investigator's office, lab, or storage closet at TCU. Your professional society may recommend keeping the materials for a longer period of time.

Students' names will only be used to assign pedometer numbers. Once this step is complete, students' names will be erased from the SPSS file. Observations are anonymous:

Research observers will not know the names of any of the children being monitored at the playground. All data will be kept on a secure hard drive that is password protected and will remain in a secure office. Only the principle investigators will have access to the information collected throughout this study.

18. Potential Benefits: Describe the potential benefits of the research to the participants, to others with similar problems, and to society.

A potential benefit of this research for the students participating is that they become more aware of how active they are on a daily basis. This study will determine how physically active children are during play, and how their physical activity levels influence their positive emotional states (e.g., happiness, joy). The results from this study could be applied to academic settings: If this study indicates that children who receive more physical activity through play are generally happier, then school administrators and reformers could use this information to benefit young children improve academically as well as enhance physical and psychological health.

19. Training for Protecting Human Research Participants: Submit training certificates for all the study investigators. The training link is available on the TCU IRB webpage at www.research.tcu.edu.

20. Check List for the Items That Need to be Submitted: Please combine all the files into one pdf document before submitting the materials electronically to the IRB. To prevent any delay in the approval of your protocol, use the most recent template for the protocol, consent document, and HIPAA form by downloading them from www.research.tcu.edu each time you prepare your materials.

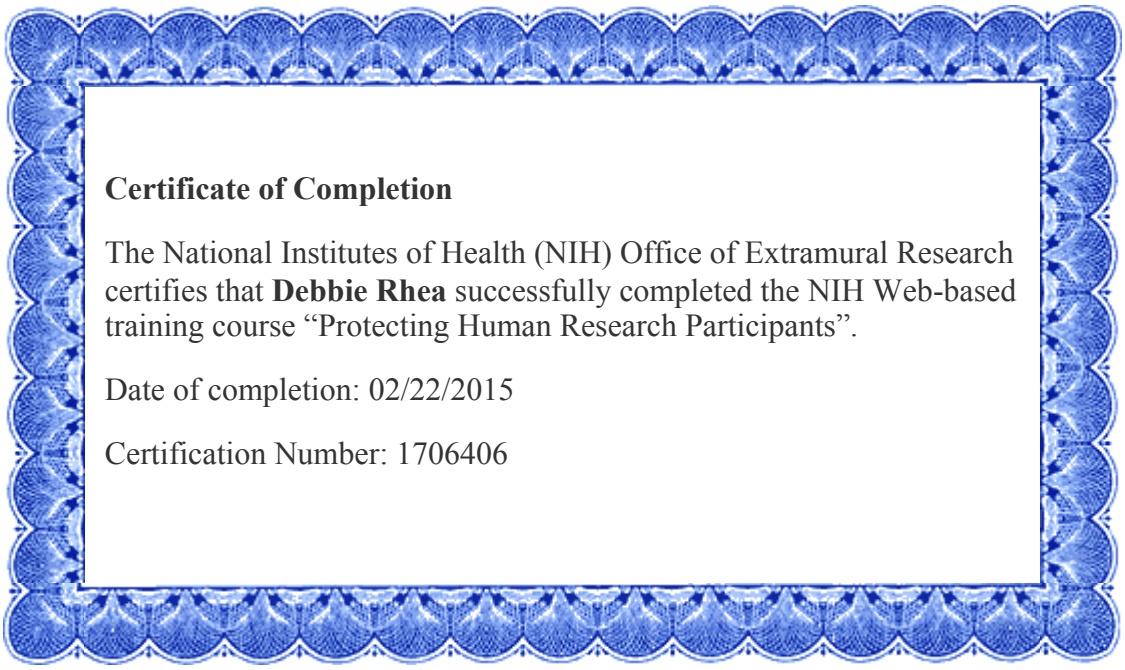
a. Protocol ☐
b. Consent document ☐
c. HIPAA form if applicable ☐
d. Protecting Human Research Participants Training certificate for each investigator ☐
e. Recruitment fliers, letters, ads, etc. ☐
f. Questionnaires or other documents utilized in screening and data collection ☐

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Laura Clark** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 10/06/2014

Certification Number: 1585895



Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Debbie Rhea** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 02/22/2015

Certification Number: 1706406

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **David Farbo** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 09/30/2015

Certification Number: 1876781

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **April Long** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 09/29/2015

Certification Number: 1872947

APPENDIX B

PARENT CONSENT FORM

Texas Christian University
Fort Worth, Texas

PARENT'S PERMISSION TO PARTICIPATE IN RESEARCH

Title of Research: The relationships between recesses, physical activity levels, and emotional states among grades K-2 aged children

Funding Agency/Sponsor: The Liink Project

Study Investigators: Laura Clark, April Long, Dave Farbo, Dr. Debbie Rhea

What is the purpose of the research? The purpose of this research is to explore how physically active children are throughout the school days (according to daily step counts), and to observe positive emotional states of children at recess.

How many children will take part in this study? Approximately 300 children will participate in this study.

What is my and my child's involvement for taking part in this study? Your child may be wearing a pedometer for the duration of one school week (Monday-Friday). Also, your child may be observed at recess for positive emotional states (e.g., smiling, laughing). No changes in your child's school schedule will occur because of this study. Your child may also wear a digital voice recorder during recess, which is a small device that can be worn like a necklace or placed in a shirt pocket. The verbal recordings obtained will not be attached to any names. This information will only be reviewed by key researchers to make sure the researcher's observations are accurate.

For how long is my child expected to be in this study, and how much of my child's time is required? Your child will participate in this study during school hours, over the course of one week (Mon-Fri). Your child will not devote any time to this study during non-school hours.

What are the risks of taking part in this study and how will they be minimized? There are minimal risks associated with this study. School administrators, teachers, and counselors will be made aware of the protocols and will be available for assistance. No deception will be used at all. There will be no incentives to participate in this study, and your child will not be pressured to participate in any way. Teachers will be monitoring behaviors during class time and recess per usual. This study will maintain confidentiality so that all students' names remain anonymous.

Pedometers can potentially radiate electromagnetic energy, which could possibly affect any individual who wears a pacemaker. If your child has a pacemaker or wears any electrical devices (e.g., hearing aids), please consider the potential risks of pedometer wear.

What are the benefits for taking part in the study? A potential benefit of this research for the students participating is that they may become more aware of how active they are on a daily basis. If physical activity levels are shown to improve psychological and emotional states among children,

then this study could add to the knowledge base of why play physical activity are essential components of childhood.

Will I be compensated for taking part in the study? No students or parents will be compensated for taking part in this study.

What is an alternate procedure(s) that I can choose instead of having my child take part in this study? If you choose for your child to not participate in this study, your child will not be included in data collection. There is no alternate procedure. There is no punishment or ridicule for non-participation.

How will my child's confidentiality be protected? Only the listed study investigators will have access to the names of students. This data will be kept anonymous by removing all student names from data files entered into SPSS and by keeping the data password protected and locked in a secure location.

Is my child's participation voluntary? Yes.

Can my child stop taking part in this research? Yes. Your child can choose to withdraw from the study at any time.

What are the procedures for withdrawal? Children or parents can withdraw from the study at any time by directly informing the primary researcher (Laura Clark) or the student's teacher.

Will I be given a copy of the permission document to keep? Yes.

Who should I contact if I have questions regarding the study? Laura Clark, 972-890-4303, l.clark@tcu.edu

Who should I contact if I have concerns regarding my child's rights as a study participant?
Dr. Tim Barth, Chair, TCU Institutional Review Board, Phone 817-257-6427.
Dr. Bonnie Melhart, TCU Research Integrity Office, Telephone 817-257-7104.

Your signature below indicates that you have read or been read the information provided above, you have received answers to all of your questions and have been told who to call if you have any more questions, you have freely allowed your child to participate in this research, and you understand that you are not giving up any of your legal rights.

Child's Name (please print): _____ Date of birth:_____

Parent's Name (please print): _____

Parent's Signature: _____ Date:_____

Investigator's Signature: _____ Date:_____

APPENDIX C

Pedometer Wear Instructions

SCRIPT for Pedometer Wear

As an addition to the Liink Project, we are interested in how physically active the children are as a result of the added recesses. To measure this, children from grades K-2 will wear pedometers during school hours over the course of one school week.

The pedometer is called The Robic M339, and it is worn loosely around the neck and under the shirt. It uses a precise and sensitive accelerometer sensor, so it will be able to track walking steps. We will assign each student who is going to be a part of this study a pedometer number.

When students arrive to class in the morning (8:30 am), they will get their pedometer (with his or her pedometer number), and place it around their and under the shirt. They don't need to push any buttons. They will put it back in the pedometer box right before school dismisses (3:30 pm).

No one is going to see how many steps each student took except for the student and the researcher. All information will be kept confidential. Also, this is not a competition.

APPENDIX D

Finalized Operational Definitions

Category	Emotions	Behaviors
Positive		
	Happiness/joy, content, excitement, surprise, celebration	Smiling, laughing, giggling, positive statement, jumping, clapping, hopping, skipping, cheering
Not-positive		
	Sad/upset, angry, aggressive, annoyed/irritated, frustrated	Frowning, scowling, pouting, negative statements, kicking, hitting, angry or frustrated expressions
Other		
	Concentrated, perplexed, element of surprise	Determined expression, hit in the face with object and surprised reaction