ASSESSING THE IMPACT OF RECESS ON ACADEMIC ACHIEVEMENT IN MATHEMATICS AND READING AMONG THIRD AND FOURTH GRADERS: A CAUSAL-COMPARATIVE INQUIRY

A Dissertation

by

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This dissertation meets the standards for scope and quality of
Texas A&M University-Corpus Christi and is hereby approved.

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ABSTRACT

Improving students' achievement scores has been a critical issue for both educators and legislators. Eliminating or reducing recess to increase instructional time has become a common practice. The purpose of the study was to examine the impact of recess on the academic achievement in reading and mathematics among third and fourth grade students.

The study employed an ex post facto, causal-comparative/group comparison research design and included two elementary schools in Northeast Texas. The characteristic-present group consisted of a non-probability sample of 168 third and 167 fourth grade students at elementary school "A" that incorporated recess as part of the daily master schedule in 2016-2017. The comparison group consisted of 165 third and 170 fourth graders at elementary school "B" that did not incorporate recess. State of Texas Assessments of Academic Readiness (STAAR) scores were used to measure academic achievement.

A detailed analysis of the data, which included univariate, multivariate, and co-variate statistical techniques, as well as an examination of the practical significance of the findings, did not indicate that recess participation was associated with academic achievement. Although at the fourth grade, the recess group outperformed the no recess group based on one STAAR mathematics category, the randomness of the finding could not be ruled out.

The results of the study support the notion that the conversation about recess and the role of free play in the development of children and school schedules should be continued. Even though the results did not support the a priori hypotheses, favoring recess, it is important to remember that recess participation did not appear to hinder the students' academic performance. Policy makers, parents, and educators must review policies and procedures regarding recess, and

note the role recess plays in the social and emotional well-being of children. Therefore, this study must be reviewed in relation to the existing body of literature, and hopefully, researchers will continue conducting scientific inquiries in assessing the role of recess in school. As school districts are asked to make data-driven and research-based instructional decisions, it is important to consider recess in the development of master schedules and plans of action.

DEDICATION

I dedicate this dissertation to my first teachers, my parents. Thank you for teaching me to love public education and encouraging me to- overcome obstacles. I can remember the nights that we spent at the dining room table working on homework. You never let me use my dyslexia as an excuse or a crutch; instead, you provided me with countless hours of support. You taught me that attitude, effort, compassion, and persistence were the best predictors of success. Thank you for your wisdom, love, and support.

I also dedicate my dissertation to my husband and children. I know this pursuit has caused each of you to sacrifice your time and take on extra responsibilities. To my children Christy, Justin, Olivia, and Hannah, thank you for your understanding and encouragement. To my husband, Charlie, thank you for your love, support, and encouragement. I would have given up a long time ago without your consistent motivation and support.

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CHAPTER I: INTRODUCTION

Background and Setting

Do you remember school recess? The time during the school day that you were free to play and engage with your friends in the manner that you chose. There may have been a mad dash to the swings or slide. Sometimes you might have joined a game of tag or kickball. On other days, you might have created your own game and taught your friends how to play. Think back - can you hear the sing song of jump rope chants and the voices of children at play? Do you recall voices cheering as a spontaneous race took place? All work and no play is not good for the health and wellbeing of children. However, is recess truly necessary during the school day or could it be just a built-in break for teachers and an excuse to get kids out of the classroom?

Recess has obviously been considered an integral part of an elementary students' school day. In 1884, a paper by W.T. Harris was presented to the Department of Superintendents of the National Education Association. Harris declared that the usefulness of recess was the complete suspension of tension brought on by academics. In addition, Harris stated that the physical needs of students outweighed concerns over injuries or student misconduct (Harris, 1884). The American Academy of Pediatrics stated that free unstructured play or recess is an essential component for social, emotional, and cognitive development (Ginsburg, 2007).

Health Benefits of Recess

Play and physical activity has obvious health benefits for children. The U.S. Surgeon General, Richard H. Carmona, declared an obesity epidemic in America, stating: "Because of the increasing rates of obesity, unhealthy eating habits and physical inactivity, we may see the first generation that will be less healthy and have a shorter life expectancy than their parents"

(Carmona, 2004, p. 1). Between 1988 and 2008, the rate of obesity continued to climb in children 6 - 11 years old; from 2008- 2014, it remained stagnant (Ogden, Carroll, Fryar, & Flegal, 2016). According to the Child and Adolescent Health Measurement Initiative (CAHMI, 2016), one in three Texas students is overweight or obese, indicating that approximately 33.00% of Texas school children have a body mass index greater than or equal to the 85th percentile. Texas ranks 35th in overweight and obesity rates in children among the states (CAHMI, 2016).

According to C. S. Mott Children's Hospital's National Poll on Children's Health, childhood obesity was the number one health concern of parents from 2011 to 2015 (Mental Health, 2016). In 2016, obesity remained the number one concern among Caucasian parents, the number two concern among Hispanic parents, and the number six concern among African American parents (Mental Health, 2016). Obesity claims 300,000 American lives each year, making it the leading cause of preventable death (Cleveland Clinic, 2017). The U.S. spent $190 billion on obesity-related health care cost, with childhood obesity accounting for $14 billion (Cawley & Meyerhoefer, 2012). In addition, physical and mental health concerns, such as Type II diabetes, depression, bipolar, schizophrenia, Attention Deficit Disorder, and Attention Deficit Hyperactivity Disorder have increased in children (Madigan, 2004; Gray, 2013; Perrin, Bloom, & Gortmaker, 2007).

Overweight children suffer other consequences. Overweight and obese students scored lower than did their peers on standardized tests (Bezold, et al., 2014; Datar, Sturm, & Magnabosco, 2004). The California Department of Education (2003) examined the relationship between physical fitness and academic achievement. Relationships between reading and mathematics scores from the Stanford Achievement Test (SAT) and the Cooper Institute's FitnenessGram scores were examined. The study included 353,000 5th graders, 322,000 7th

graders, and 279,000 9th graders. A positive relationship was observed between academic achievement and FitnenessGram scores across all three grade levels and showed that higher fitness levels were associated with higher academic achievement (California Department of Education, 2003). Woodward (2009) also found that students with higher FitnenessGram scores had higher grade point averages and academic test scores than did their less fit peers.

Benefits of Recess

Brain research strongly supports a link between physical activity and learning (Chaddock, Erickson, Prakash, Vanpatter et al., 2010; Chaddock-Heyman, Hillman, Cohen, & Kramer, 2014; Pesce, Crova, Cereatti, Casella, & Bellucci, 2009). When humans sit for longer than 20 minutes, blood begins to pool in the hamstrings and robs the brain of needed oxygen and glucose (Rhea, 2014). This process changes the physiology of both the brain and the body. When this occurs, students lose concentration and begin to get restless or sleepy.

Brain-derived neurotrophic factor, also known as BDNF, is a protein that allows one neuron to communicate with another. Brain-derived neurotrophic factor improves the function of neurons, encourages new neurons to grow, and protects neurons from stress and cell death (Ratey & Hagerman, 2013). The growth and development of neurons in the brain occurs anytime a human being learns something new. Exercise and play increase the brains level of the available BDNF, which Dr. John Ratey called the Miracle Grow for the brain (Ratey & Hagerman, 2013).

Additionally, recess provides an opportunity for students to practice appropriate social skills while engaging with their peers. Researchers agree that children learn valuable skills, such as negotiation, cooperation, sharing, problem solving, coping, perseverance, and self-control through play (Murray, Ramstetter, Council on School Health, & American Academy of

Pediatrics, 2012). Children that learn to play interactive games, such as tag or chase form their own mini societies. According to Riney-Kehrberg (2008), students that develop their own rules and social structures do well academically. Unfortunately, public policy demonstrates a different perspective of recess.

Recess at Risk

In the 1990s, improving achievement scores became a critical issue for both educators and legislators. This issue has only grown with the high stakes testing climate that defines public education after the passage of the No Child Left Behind Act of 2001. School districts are grappling with higher standards and increased accountability. Student achievement on state assessment impacts district and campus accountability ratings, student promotion, and graduation.

In hopes of improving test scores, school districts have been looking for ways to increase student performance. The quest for improving student performance has placed recess under the microscope. In addition, student discipline, injury, and the belief that physical education is a substitute for recess have helped justify the reduction of recess (Anderson-Butcher, Newsome, & Nay, 2003; Borinstein, 2011). Schools across the United States vary in the scheduled number of days of recess per week and in the length of recess during the school day (Parsad & Lewis, 2006; Barros, Silver & Stein, 2009). Eliminating or reducing recess has become a common practice. According to Hightshoe, LaRue, Northup, Pellergin, and Ridgeway (2003), 40% of schools in the United States have eliminated, or were considering eliminating, recess. Researchers agree that children have lost the opportunity for free play, estimated as much as 12 hours per week when compared to the 1970s (Juster, Stafford, & Ono, 2004; Gray, 2013). In 2012, Syracuse elementary schools eliminated recess (Kirst, 2012). The fourth largest school district in the

country, Miami-Dade County, requires two, 20-minute or three, 15-minute recess times a week for pre-k through fifth grade, and in spite of pressure from parents for 20 minutes of daily recess, the policy has not changed (Veiga, 2016).

From 2001 to 2007, recess declined by as much as 50 minutes a week (Center on Educational Policy, 2008). A nationwide study on recess found that 21% of children did not have recess (Roth, Brooks-Gunn, Linver & Hofferth, 2003). In addition, the study noted demographic disparities in students' access to recess. Nearly 39% of African American children, compared to 15% of Caucasian children, did not have recess. The disparity became even larger when comparing the socioeconomic levels of students. Forty-four percent of students living below the poverty line were denied access to recess as compared to seventeen percent of their more affluent peers. Twenty-five percent of students that scored below the mean on standardized test were denied recess, while 15% of those performing above the mean were denied recess.

Geographic location also plays a role in students' access to recess. According to Taboada (2016), students at a majority of the schools in Austin ISD's low-income neighborhoods got little to no recess time, while the children at more than 80% of the district's more affluent elementary campuses enjoyed recess time daily. A National Center for Education Statistics (NCES) survey found that students in rural and more affluent schools were more likely to have recess than did their urban and low-income counterparts (Gershon, 2017; Parsad & Lewis, 2006). Chang and Coward (2015) found that U.S. students had significantly less recess than did students in China, Finland, Japan, and New Zealand.

In short, it appears that if policy makers, school district administrators, and influential stakeholders want to have a stronger impact on student academic performance, they may want to reconsider the role of recess and other physical activity as part of school curricula.

Statement of the Problem

The Academy of Pediatrics stated that recess is a crucial and necessary component of a child's development and should not be withheld for punitive or academic reasons (Murray, Ramstetter, Council on School Health, & American Academy of Pediatrics, 2012). The health and cognitive benefits of recess are significant. According to Richard H. Carmona, a former US Surgeon General, obesity has become an epidemic in America. The increasing rates of obesity, unhealthy eating habits, and physical inactivity may lead to the first generation that would be less healthy and have a shorter life expectancy than did their parents (Carmona 2004; Dockterman, 2014). Brain research strongly supports a link between physical activity and learning (Chaddock, Erickson, Prakash, Kim et al., 2010; Chaddock-Heyman, Hillman, Cohen, & Kramer, 2014; Pesce, Crova, Cereatti, Casella, & Bellucci, 2009). However, school districts across the nation are reducing or eliminating recess. Therefore, the implications of increasing or decreasing recess for students may be significant to students' academic achievement, health, and wellbeing.

Theoretical Framework

This research was framed by Bjorklund and Green's Cognitive Immaturity Hypothesis, CIH (1992). Bjorklund and Green's CIH suggests that playful breaks and peer interaction maximize learning by distributing effort over time as opposed to being concentrated and continuous (Jarrett et al., 1998, Pellegrini & Blatchford, 2002; Sindelar, 2004). The CIH has two elements. The first element is cognitive interference, which relates to the immaturity of

children's nervous systems and keeps them from being able to perform higher level cognitive tasks with efficiency. The second element is peer play, which refers to the social interaction that take place during peer play.

The CIH is limited to childhood and suggests that children need playful breaks after sustained cognitive tasks to reduce cognitive interference and facilitate optimal learning. Cognitive interference is defined as any thought or activity that interferes with the required task. The more irrelevant thoughts and activities, the greater the negative impact on recall and performance (Sarason, 1982). Children's immature and limited cognitive processing skills may be an adaptive measure designed to reduce the amount of stimulation children receive, making the process of sensory or language development easier (Hertzig & Farber, 2013). The CIH indicates that children's tendency to overestimate their cognitive and social standing is an adaption unique to childhood that allows children to learn new skills and behaviors (Bjorklund & Pellegrini, 2000).

In addition, the CIH suggests free play may maximize student performance by reducing the cognitive interference associated with the preceding instruction (Bjorklund & Harnishfeger, 1987). Cognitive interference occurs when attention is diverted from a required task impeding or preventing effective performance (Eysenk & Calvo, 1992; Sarason, 1982). The immaturity of children's nervous systems keeps them from being able to perform cognitive tasks with same efficiency of adolescents or adults. This inefficiency has a direct impact on academic performance; therefore, children are highly susceptible to cognitive interference after sustained periods of work (Dempster, 1992). Breaks during sustained cognitive tasks should reduce cognitive interference and maximize learning and achievement (Toppino, Kasserman & Mracek, 1991).

Purpose of the Study

The purpose of the study was to examine the impact of recess on the academic achievement of third and fourth grade students as measured by the reading and mathematics sections of the State of Texas Assessment of Academic Readiness (STAAR). The third and fourth grades were chosen for two reasons. First, recess traditionally takes place at the elementary level. Second, federal law requires that students are tested, beginning in grade three, on a standardized reading and mathematics test. Many schools are reducing or eliminating recess to optimize instructional time; therefore, this study focused on students enrolled in third and fourth grade.

The study was guided by the following research questions: (1) What is the impact of recess on student achievement in mathematics among third and fourth grade students? (2) What is the impact of recess on student achievement in reading among third and fourth grade students?

The study took place in two rural school districts in Northeast Texas. At the time of conducting the study, District "A" had an enrollment of approximately 2,425 students in five campuses (67.00% white, 22.80% Hispanic, 5.40% African American, and 4.70% other). Nearly 64.00% of the students were economically disadvantaged and 40.00% at-risk. The average student to teacher ratio was fifteen to one. District "B" had an enrollment of approximately 4,400 students in eight campuses (26.40% white, 46.30% Hispanic, 23.00% African American, and 3.90% other) (74.00%). The majority of the students were economically disadvantaged (74.00%) and at-risk (58.00%). The average student to teacher ratio was sixteen to one.

Operational Definitions

In the state of Texas, mathematics and reading achievement is measured by the State of Texas Assessment of Academic Readiness (STAAR). The STAAR is a rigorous testing program

that emphasizes readiness standards, which are the knowledge and skills considered most important for success at the next grade level and for college and career (TEA 2012). Achievement in STARR mathematics for third and fourth grades is measured by four reporting categories: (1) Numerical Representations and Relationships, (2) Computations and Algebraic Relationships, (3) Geometry and Measurement, and (4) Data Analysis and Personal Financial Literacy (4 items). Achievement in STARR reading for third and fourth grades is measured by three reporting categories: (1) Understanding/Analysis Across Genres, (2) Understanding/Analysis of Literary Texts, and (3) Understanding/Analysis of Informational Texts.

Glossary of Terms

The following definitions and acronyms are provided to assist the reader to better understand the terms and acronyms used throughout the study:

ADHD - Attention Deficit Hyperactivity Disorder

Brain-derived neurotrophic factor is a protein that plays an important role in the survival and growth of neurons essential for learning and memory (Ratey & Hagerman, 2008).

BDNF - Brain-Derived Neurotrophic Factor

Cognitive interference includes any task or activity that inhibits one's ability to complete a required task (Eysenk & Calvo, 1992).

CIH – Cognitive Immaturity Hypothesis

Dorsa striatum is the portion of the brain that helps with motor integration such as hand-eye coordination and one's ability to focus on a task (Aron, Poldrack, & Wise, 2009).

FitnenessGram is a health-related physical fitness assessment developed by the Cooper Institute that uses criterion referenced standards (California Department of Education, 2003).

Hippocampus is the portion of the brain responsible for moving short term memory into long term memory and spatial memory such as the location of objects (Chaddock, Erickson, Prakash, Kim et al., 2010).

Limited English proficiency is a code used by the Texas Education Agency to identify students who speak a language other than English at home and have yet to demonstrate mastery of the English language (TEA, 2012).

MRI - Magnetic Resonance Imaging

NT – Novelty Theory

RT – Relaxation Theory/Recreation Theory

SET – Surplus Energy Theory

Delimitations, Limitations, and Assumptions

The study was delimited to academic achievement measures in mathematics and reading of third and fourth grade students in two Texas school districts. The study included a non-probability sampling; thus, external validity was limited to the participants of the study. Due to the non-experimental nature of the study, no causal inferences regarding recess participation and academic achievement were drawn. The study used existing data and it was assumed that all had been accurately measured and collected. It was also assumed that the required protocol had been followed in conducting the physical education classes in the study's participating schools. It was assumed that the researcher remained objective throughout the study.

Significance of the Study

Public schools have grappled with the increased emphasis on academic performance and standardized testing. The quest for higher test scores has made recess a luxury in some American school systems. Despite evidence that free play or recess is an important part of

child's physical, cognitive, and social development, many schools have eliminated or reduced recess for additional instructional time. The study's results add to the body of information on recess and academic achievement in mathematics and reading. The results of this study may provide teachers, parents, and administrators the necessary justification for increasing, decreasing, or maintaining recess. Careful analysis of recess trends allows educators and policy makers to understand the possible importance of a system that includes recess as an integral part of educating children. Even though the results of this study did not support the a priori hypotheses, favoring recess, it is important to remember that recess participation did not appear to hinder the students' academic performance. With growing concerns over academic progress and the health and wellbeing of children, campuses should continue to consider recess practices. As school districts are asked to make data-driven and research-based instructional decisions, it is important to consider recess in the development of master schedules and plans of action for a well-balanced curriculum.

CHAPTER II: REVIEW OF LITERATURE

Introduction

Most adults can remember the excitement of recess, the opportunity to run free and play. Recess lets children enter the world of fantasy. Children use their imagination to become a firefighter, mother, or pro athlete. They may travel back in time and become a cowboy, conquering the Wild West or sail the ocean blue with Columbus. Sports are organized and rules are negotiated while children play the role of coach, player, and referee. Moreover, recess is a place to practice conflict resolution, cooperation, taking turns, problem solving, and communication. However, recess is disappearing from the landscape of public schools despite the vital role it plays in the development of a child.

The purpose of the study was to examine the impact of recess on academic achievement of third, and fourth grade students as measured by the reading and mathematics sections of the State of Texas Assessments of Academic Readiness (STAAR). A systematic review of the literature was conducted. In reviewing the literature, the following databases, facilities, and search engines were used: EBSCO's Discovery Service, Communication Source, the Bell Library at Texas A&M University-Corpus Christi, WorldCat, Google Scholar, and Google. This chapter is organized into four major categories: (1) theories of play, (2) factors contributing to the loss of recess, (3) studies related to recess, and (4) summary.

Theories of Play

Surplus Energy Theory

Friedrich von Schiller, an 18th century poet and philosopher, suggested that play was evidence of surplus energy that remains after the primary needs of children and young animals were satisfied (Rubin, Fein & Vandenberg,1983). British philosopher and psychologist, Herbert

Spencer, however, is credited with the Surplus Energy Theory (SET). According to Spencer (1873), physiological changes take place while the body is at rest, leading to a buildup of surplus energy. The surplus energy must be released and Spencer suggested the release may take place through physical activities. According to the SET, students need a break to work off excess energy that has accumulated form prolonged periods of sitting in class (Pellegrini & Smith, 1993). Physical activity would be necessary to deplete surplus energy and allow students to concentrate on more sedentary tasks in the classroom (King, 1987).

Teachers have been indicating that the need for children to expend excess energy is evident in their behavior. For example, off task behavior, lack of concentration, and fidgeting tend to increase when children need to release energy (King, 1987). In addition, teachers have noted that students become grumpy, agitated, and difficult to manage when denied the opportunity to play (Evans & Pellegrini, 1997). There appears to be a common belief among educators that recess is good for children because they can run off their excess energy and maintain focus while in the classroom (Evans & Pellegrini, 1997).

Evans and Pellegrini (1997) challenged the SET and questioned the criterion for energy to be considered surplus. According to Smith and Hagen (1980), the idea of built-up energy is physiologically unsound. Evans and Pellegrini (1997) argued that SET could not be the reason for play. If SET were the reason for play, children would stop playing when they become tired; however, children will continue to play despite being tired. According to SET the longer children were asked to wait between play sessions, the more energy they would need to expend. However, some children continue to play past the point of fatigue while others would prefer to play a board game, indicating that the need to release stored energy may not be the reason for the play (Tizard et al., 1989; Blatchford, Creeser, & Mooney, 1990). Researchers (Pellegrini &

Davis, 1993; Smith & Hagan, 1980) agreed that children become restless after sitting for long periods of time. Pellegrini and Davis (1993) believed the Novelty Theory (NT) is a more plausible reason for children's behaviors and need for play.

Novelty Theory

The Novelty Theory suggests that children's behavior during an activity is tied to the novelty of the task (Pellegrini, 1995). Researchers (Pellegrini & Davis, 1993; Smith & Hagan, 1980) agreed that children become restless after sitting for long periods of time, and the longer they are required to sit, the more restless they become. The NT argues that when children become bored with a task, they lose concentration, resulting in performance decline and seeking novelty by changing activities. Novelty is described by Pellegrini and Davis (1993) as an opportunity to do something different. Children often seek novelty through some form of play (Baldwin & Baldwin, 1978). Ridgeway (2004) indicated that people of all ages perform best when activities change throughout the day. Recess provides novelty to children and allows them to return to class ready to work, thereby improving learning.

Relaxation Theory

German Philosopher Moritz Lazarus' (1883) Relaxation Theory/Recreation Theory (RT) suggests that play is a necessary break to renew the mind after prolonged tasks. During free play, the mind and body relax and store information previously taught (Pellegrini & Blatchford, 2002). Furthermore, the physical activity involved in recess enables the brain to renew its ability to concentrate (Kraus, 2005).

Cognitive Immaturity Hypothesis

The Cognitive Immaturity Hypothesis (CIH) is limited to childhood and suggests that children need playful breaks after sustained cognitive tasks to reduce cognitive interference and

facilitate optimal learning. Children's immature and limited cognitive processing skills may be an adaptive measure designed to reduce the amount of stimulation children receive, making the process of sensory or language development easier (Hertzig, & Farber, 2013). For example, young children's cognitive immaturity creates a limited capacity for working-memory, which may be beneficial in language acquisition by restricting how much language information can be processed. The cognitive immaturity of the brain simplifies what is analyzed, making the task of language acquisition easier for children, compared to mature adolescents or adults (Bjorklund, 1997).

Children tend to overestimate their cognitive and social skills, believing they can perform tasks at a higher level, leading to perceived success. The CIH suggests that children's tendency to overestimate their cognitive and social standing is an adaption unique to childhood that allows children to learn new skills and behaviors (Bjorklund & Pellegrini, 2000). Children can continue attempting tasks that they do not do very well due to their perceived success. Self-perceived success may help children learn complicated skills (Bandura, 2012). Children begin to more accurately identify their level of skill in the late elementary years (Hertzig, & Farber, 2013).

In addition, the hypothesis suggests free play may maximize student performance by reducing the cognitive interference associated with the preceding instruction (Bjorklund & Harnishfeger, 1987). Cognitive interference occurs when attention is diverted from a required task, impeding or preventing effective performance (Eysenk & Calvo, 1992; Sarason, 1982). The immaturity of children's nervous systems keeps them from being able to perform cognitive tasks with the same efficiency of adolescents or adults. This inefficiency has a direct impact on academic performance; therefore, children are highly susceptible to cognitive interference after

sustained periods of work (Dempster, 1992).

Cognitive interference is defined as any thought or activity that interferes with the required task. The more irrelevant thoughts and activities, the greater the negative impact on recall and performance (Sarason, 1982). Breaks during sustained cognitive tasks should reduce cognitive interference and maximize learning and achievement (Toppino, Kasserman & Mracek, 1991). Simply changing from one type of cognitive task to another is not enough to reduce cognitive interference in children; therefore; greater benefit is gained from a drastic change like recess (Pellegrini & Bohn, 2006). It is important to note that the structured nature of a physical education class does not serve the same purpose. Recess provides a highly motivating opportunity for children to be involved in a demanding social and cognitive environment.

Sievertsen, Gino, and Piovesan (2016) analyzed the impact of breaks and fatigue on students' performance on the Danish National Test. Data from 2,105 Danish public schools and 570,376 students were analyzed. The results showed that fatigue influenced test scores; specifically, for every hour later in the school day, test scores decreased by 0.90 standard deviation. In addition, a break of 20-30 minutes improved average test scores by 1.70 standard deviation. According to Sievertsen, Gino, and Piovesan (2016), struggling students appear to have greater levels of fatigue, thus benefitting more from breaks.

The opportunity for peer interaction during recess helps children to gain confidence while learning important social skills necessary for successful relationships in and out of school (Pellegrini & Bohn, 2006). The CIH places a special importance on the role of peer play+ (Bjorklund & Pellegrin, 2000). This indicates that play serves an important role in childhood (Bateson, 2005).

During recess, children often take on imaginary roles that cannot be obtained in real life

(Fein, 1979; Vygotsky, 1967). For example, when children take turns being Superman or Wonder Woman at some point, the bigger, stronger, and faster child may allow the smaller, weaker, and slower child to be the hero. Taking on different roles allows children to develop social skills (Pellegrini & Smith 1998). In order to participate with peers during recess, children must learn to pick up on social cues, listen to others perspectives, communicate effectively, control their behavior, and follow negotiated rules (Pellegrini & Bohn, 2006). These behaviors are cognitively demanding; however, the high motivation of play eliminates cognitive interference (Pellegrini, 1982). The reduction of cognitive interference helps children return to the classroom; ready to learn. Facilitating student learning is the primary role of an educator. Therefore, educators must consider the implications of CIH when developing classroom schedules.

Each theory of play is unique; however, the theorists agree that play is a vital and necessary part of child development. Play is not wasted time or luxury; it is an important factor in cognitive, social, and physical growth. In an age where educators are expected to make data-driven decisions and employ research-based interventions, the reduction or elimination of recess appears to be counterproductive.

Factors Contributing to the Loss of Recess

At one time, the primary goal for school districts was the education of good citizens, who were prepared to contribute to society. However, with the publication of *A Nation at Risk* (United States, 1983), policies and priorities began to change. The *A Nation at Risk* report created a new public commitment to excellence and education reform anchored in higher expectations for all students. The report was the precursor to tougher high school graduation requirements, and more rigorous and measurable standards of student performance. Prior to *A*

Nation at Risk, the federal government's role in education was minimal. Now federal legislation is a driving force in education reform. Much needed federal grant funds are dependent upon compliance and student outcomes. Today, educators are focused on state and federal standards, achievement test scores, and students learning concepts at a faster rate and earlier age (File, Mueller & Wisneski, 2012; Ginsburg, 2007; Jarett & Waite-Stupiansky, 2009; Santa, 2007).

The pressure to perform has pushed the belief that the more uninterrupted time on task leads to better the academic outcomes (Jarrett, 2003; Pellegrini, 2008). Educators, however, are not experiencing the desired results as students fidget and stay off task (Rhea, 2015). Brain research indicates that continuous instructional periods can inhibit learning and retention. Children need breaks just as members of the workforce need breaks for maximum productivity (Cromwell, 2008; Kennedy, 2006). Continuing a task for long periods of time slows down the brain and people become less productive (Sutterby, 2007). However, students are sitting for longer periods of time with fewer breaks (Jarett & Waite-Stupiansky, 2009). The pursuit for additional instructional time is not the only reason administrators have reduced or eliminated recess; student behavior and fear of injury litigation has also impacted educator's decisions (Pellegrini, 2008).

The fear of injury or student behavior issues is not a new concern. In 1884, W.T. Harris told the Department of Superintendents of the National Education Association that the needs of students outweighed concerns over injuries or student misconduct during recess. The safety of students is always a concern. Consequently, proponents for eliminating or reducing recess often cite student safety and possible injury litigation as a reason for the reduction or elimination of recess (Adams, 2011; Jarett & Waite-Stupiansky, 2009). According to Bossenmeyer, a retired elementary school principal and expert witness on playground safety and supervision, 90% of

injuries on playgrounds are minor and do not require follow up care (2012). Despite the minor nature of most playground injuries, some schools that offer recess are banning balls, tag, cartwheels, and the like (Jenkins, 2017; Jaslow, 2013; Kiggins, 2015). However, many playground injuries can be prevented by following the Consumer Products Safety Commission's Playground Safety Guidelines (Bossenmeyer, 2012).

Litigation over playground injuries suggest that schools are negligent as long as rules are established and students are monitored. For example, in *Collins v. Bossier Parish School Board* (*Collins v. Bossier Parish*,1986), Collins, a kindergarten student, fell from the monkey bars when another student grabbed his legs. The fall resulted in a broken femur and an extended hospital stay. The court found that the school was not negligent in its supervision even though the teacher on duty did not see the accident occur. The trail judge, Fred Jones Jr. stated that "constant supervision of all pupils is not required. In fact, it is virtually impossible absent a ball and chain" (p.1).

In the case of *Norman v. Turkey Run Community School Corp.* (Ind. 1980), Norman, a 7-year-old, was running and bumped heads with another child. The State Supreme Court found that running and playing tag were normal recess activities and there was no unreasonable risk of injury. Therefore, the district was not liable for the injury.

In *Olvera v. Pajaro Valley Unified School District* (Cal. 2007), Olvera, a fourth grader, broke his leg in a fight with a fifth grader during recess. The California Court of Appeals found that the school was not negligent for what Olvera claimed was a lack of supervision.

These cases suggest that the courts view children's play or recess as an appropriate part of the school day. Despite the risk of injury, the courts seem to indicate that children are expected to run and play. In each case, school personnel were actively monitoring the

playground area and playground rules had been established.

Finally, some educators believe that physical education classes are a safe and appropriate alternative to recess (Durbroc, 2007). A nationwide study found that schools are substituting one form of physical activity for another rather than providing physical education and recess (Slater et al., 2012). For example, a school that has physical education (PE) three days a week and recess two days week is substituting one form of physical activity for the other. The Society for Health and Physical Educators (SHAPE, 2015) stated that physical education is a required course with standards, benchmarks, and grades, while recess provides an opportunity for unstructured free play.

Students need the opportunity for unstructured free play for optimal development (Ginsburg, 2007). Recess provides children with the ability to choose what they want to do by establishing their own games and rules. This unstructured play allows children to explore their environment and develop multiple responses for the situations they create (Bateson, 2005; Rhea, 2015). During play, children develop physical and emotional flexibility by practicing the emotions and actions related to feelings such as surprise or fear in a safe environment (Spinka, Newberry, & Bekoff, 2001; Pellis & Pellis, 2013). Finally, play is enjoyable for children, leading to greater social attachments and flexibility for problem-solving and self-control (Holder & Coleman, 2009).

There are multiple factors that have contributed to the reduction or elimination of recess. However, the research is clear that recess plays an important role in the overall development of children. Educators must have a clear understanding of the benefits of recess before eliminating or reducing play time.

Studies Related to the Benefits of Recess

Social Benefits of Recess

Educators indicate that students need to learn and practice social skills (Merrell & Gimpell, 2014). There are few opportunities during the school day for students to make decisions solely based on their personal choice; however, recess gives students the opportunity to choose what they would like to do and with whom. Researchers agree that children learn valuable skills such as negotiation, cooperation, sharing, problem solving, coping, perseverance, and self-control through play (Canning, 2007; Murray, Ramstetter, Council on School Health, & American Academy of Pediatrics, 2012).

Panksepp (2008) suggested that children need culturally rich environments that support a variety of self-generated activities. Play is a tool that allows the social brain to develop. Children that play naturally with each other in culturally rich environments facilitate frontal lobe growth and the healthy development of social skills. A child's future depends greatly on how we recruit, use, and invest in the social skills that jump-start optimal development (Sunderland, 2008). For children that struggle socially, play offers an opportunity to develop social skills. According to Lynch and Simpson (2010), there are four stages of social development during play, namely, onlooker, isolation, parallel play, and cooperative play. During cooperative play, children develop social skills such as communication, negotiation, and empathy. Therefore, play should be part of the daily social diet of all children throughout grade school (Panksepp, 2008). It stands to reason that students who lack the ability to manage their behavior would struggle with the cognitive demands of academic skills.

The ability to interact with peers inhibits antisocial behavior and helps children build relationships and develop friendships. Children that do not have the opportunity to meet their

need for affiliation may become loners (Bergen & Fromberg, 2009). A loner child is more likely to become involved in a gang activity or bullying behavior (Bergen & Fromberg, 2009). The increase in single parent homes and higher crime rates often keep children from playing outside in their neighborhood. Therefore, for some children, recess may be one of their only opportunities to develop self-directed peer relationships (Dubroc, 2007). Furthermore, children's social competency with their peers is an excellent predictor of school performance and adjustment (Pellegrini & Bohn, 2006; Jones, Greenberg, & Crowley, 2015).

A 20-year national study found that children with prosocial competencies such as cooperating with peers, problem-solving, helping others, empathy, and listening in kindergarten were more likely to be successful young adults (Jones, Greenberg, & Crowley, 2015). The study included 753 participants from urban and rural communities. When teachers rated students' social skills on a five-point scale, for every one-point increase in a child's social competence score in kindergarten, s/he was twice as likely to attain a college degree in early adulthood; 54% more likely to earn a high school diploma; and 46% more likely to have a full-time job at the age of 25. For every one-point decrease in a child's social competence score in kindergarten, s/he had a 67% higher chance of having been arrested by early adulthood; 82% higher rate of recent marijuana usage; and 82% higher chance of being in or on a waiting list for public housing (Jones, Greenberg, & Crowley,2015). Developing proper social skills improves academic achievement and increases a student's ability to transition to a work environment successfully (Lynch & Simpson, 2010).

Recess impacts student behavior by promoting brain-mind maturation and may decrease incidents of depression and Attention Deficit Hyperactivity Disorder (ADHD) (Panksepp, 2008). Researchers agree that recess reduces off task fidgety behavior (Rhea, Rivchun & Clark, 2017;

Ridgeway et al., 2003). In fact, when children are asked to sit for long periods of time, behaviors such as bullying, lack of confidence, talking out, moving around the room, and daydreaming occur. Often these behaviors are attributed to children that have been identified as frequent discipline problems, as opposed to children that need physical activity and a cognitive break (Turner, Chriqui & Chaloupka, 2013).

The Liink Project, a multiyear experimental study in public and private schools in in the greater Fort Worth area, analyzed the impact of recess on behavior. Students in the intervention group received four 15-minutes recess breaks daily, two before and two after lunch, in addition to a 45-minute physical education class and a character-building curriculum taught three times a week. Data on students' behavior were collected and compared to their baseline behavior. There was a 25% decrease in all off-task behaviors while students in the comparison school maintained higher percentages of off task behaviors (Rhea, Rivchun & Clark, 2017). According to Rhea, Rivchun, and Clark (2017), students in the intervention showed a 30% increase on attentional focus and demonstrated social growth. Building positive peer relationships is a key factor in the success and wellbeing of children. Recess provides an opportunity for children to build peer relationships and practice social skills necessary for current and future success. Children appear to benefit socially and cognitively from recess.

Cognitive Benefits of Recess

The cognitive benefits of free play and physical activity are numerous. The idea of giving up instructional time for play time may seem counterproductive to some educator; however, the cognitive benefits appear to be well worth reallocating instructional minutes for free play. Physical activity and higher fitness levels have been found to benefit brain structure, brain function, and cognition (Chaddock-Heyman, Hillman, Cohen, & Kramer, 2014).

Researchers have continued to note a correlation between physical fitness and increased academic performance (Chomitz et al., 2009; Etnier et al., 1997; Grissom, 2005; NASPE, 2002; Sallis et al., 1999; Symons, Cinelli, James & Goff 1997; Trudeau & Shephard, 2008).

Exercise and play increase the brain's level of the available brain-derived neurotrophic factor (BDNF). The BDNF is a protein that allows one neuron to communicate with another. The BDNF improves the function of neurons, encourages new neurons to grow, and protects neurons from stress and cell death. The growth and development of neurons in the brain occurs anytime a human being learns something new. Dr. John Ratey referred to the BDNF as the Miracle Grow for the Brain (Ratey & Hagerman, 2013).

Children with higher levels of aerobic fitness have been found to have structurally different brain volumes, using magnetic resonance imaging (MRI), when compared to children with lower aerobic fitness levels (Chaddock, Erickson, Prakash, Kim et al., 2010; Chaddock, Erickson, Prakash, VanPatter et al., 2010). Higher fitness levels among 9- and 10-year-old children showed larger bilateral hippocampal volumes and higher-ranking relational memory. This is not surprising when considering that the hippocampus is located in the medial temporal lobe of the brain and is responsible for moving short term memory into long term memory, as well as spatial memory.

Raine et al. (2013) examined the effects of fitness learning and memory in 9- to10-year-old children. Higher and lower fit children were asked to learn the names of specific regions on a factious map. There was no noted difference between the two groups during the initial learning. One day later, the children's retention of the information was tested, using cued and free recall. The higher fit children outperformed the lower fit children, particularly when using

free recall, such that fitness appears to enhance learning. The authors suggested that the benefits of fitness may occur during the initial encoding of new information.

In addition, Chaddock, Erickson, Prakash, Kim et al. (2010) found that superior cognitive control among physically fit children appeared to be related to differences in the volume of the dorsal striatum region of the basal ganglia. When 9- and 10-year-old children were tested, using flanker tasks, physically fit children outperformed their unfit peers. During a flanker tasks, participants must respond to images shown one at a time with a simple motor response. For example, when a specific image or visual cue appears, children would respond by hitting a specific key on a keyboard. Each visual cue is surrounded by unnecessary visual stimuli. The physically fit children showed greater inhibitory control and a larger dorsal striatum (Chaddock, Erickson, Prakash, Kim et al., 2010). Inhibitory control relates to the ability to control one's attention, behavior, thoughts, and emotions in order to do what is most appropriate or needed (Diamond, 2013). The basal ganglia is located at the base of the forebrain and has five major components. One of those components is the dorsa striatum. The dorsa striatum plays an important role in cognitive control and motor integration (Aron, Poldrack, & Wise, 2009). Cognitive control relates to one's ability to focus on a goal despite distraction and is critical for psychological health, learning, and everyday psychological functioning (Morton, Ezekiel, & Wilk, 2011). Motor integration is the ability of multiple sensory systems to work together. An example of motor integration is hand-eye coordination. In this study, fit children were able to outperform their less fit peers by responding with the appropriate motor response to the visual cues despite being distracted.

The California Department of Education (2003) examined the relationship between physical fitness and academic achievement. Relationships between reading and mathematics

scores from the Stanford Achievement Test (SAT) and the Cooper Institute's FitnenessGram scores were examined. Cooper Institute's FitnenessGram tested students' aerobic capacity, body composition, muscular strength, muscular endurance, and flexibility. Students' scores were classified as (1) in the healthy fitness zone (HFZ) ,which means students met the fitness target or (2) needs improvement,which means students failed to meet the target.

The California Department of Education (2003) study included 353,000 fifth graders, 322,000 seventh graders, and 279,000 ninth graders. A positive relationship was observed between academic achievement and FitnenessGram scores across all three grade levels such that higher fitness levels were associated with higher academic achievement (California Department of Education, 2003).

Woodward (2009) also found that students with higher FitnenessGram scores in multiple FitnenessGram tests had higher grade-point-averages and academic test scores than did their less fit peers. The study participants were 259 sixth grade students and 245 seventh grade students.

Wittberg, Northrup, and Cottrell (2009) studied 968 fifth grade students in West Virginia. The researchers compared the participants FitnenessGram scores with the West Virginia Educational Standards Test. When gender and social economic status variables were controlled, the researchers found that scoring in the healthy fitness zone for aerobic capacity was the only statistically significant indicator for academic achievement.

Physical activity and higher level of fitness have been found to benefit brain structure, brain function, cognition, and academic achievement (Chaddock-Heyman, Hillman, Cohen, Kramer; 2014). Educators would be remiss to overlook the compelling positive cognitive benefits of free play and physical fitness. Recess participation cannot guarantee that students

will be physically fit; however, recess provides students with the opportunity to participate in activities that can improve their fitness.

Physical Benefits of Recess

Play and physical activities have obvious health benefits for children. One in three Texas students is overweight or obese, indicating that approximately 33% of Texas school children have a Body Mass Index (BMI) greater than or equal to the 85th percentiles (CAHMI, 2016). Texas ranks 35th when comparing overweight and obesity rates in children among the states (CAHMI, 2016). Childhood obesity has become a top health concern of parents (Mental, 2016). Obesity claims 300,000 American lives each year, making it the leading cause of preventable death (Cleveland Clinic, 2017).

The Robert Wood Johnson Foundation (2007) found that recess provided the best opportunity for physical activity; 42% of physical activity occurred at recess, 32% during physical education, and 26% during after school programs or activities. In addition, children who are not active during the school day do not compensate for their lack of activity after school. In fact, children are less active after school when they do not have opportunities for physical activity (Jarrett, 2013).

In addition, the American Association of Pediatrics urged schools to allow for more recess time during the school day, noting the importance of play in stress management for children (Murray, Ramstetter, Council on School Health, & American Academy of Pediatrics, 2012). Children experience stress from multiple sources and too much stress can be detrimental to the health and wellbeing of children (Jewetts, & Peterson, 2002; Peltokorpi, Maatta, & Uusiautti, 2011; Swick, 1987). Finally, it appears that the health benefits of physical activity in childhood carryover into adulthood (Singh, Uijtdewilligen, Twisk, Mechelen, & Chinapaw

2012). The benefits of physical activity are significant for children's overall health and wellbeing. Providing opportunities for students to be physically active appears to impact their current and future health.

Summary

Educators hope to witness students grow academically, socially, and physically. The consistently increasing standards for student and teacher performance have created a fight for every possible instructional minute. Teachers and administrators find themselves battling between increasing standards, liability concerns, and the belief that kids need the opportunity to play. The review of the literature showed that recess should be an integral part of the school day.

There are few opportunities during the school day for students to make decisions solely based on their personal choice; however, recess gives students the opportunity to choose what they would like to do and with whom. During recess, children learn and practice valuable skills such as negotiation, cooperation, sharing, problem-solving, coping, perseverance, and self-control through play. These social skills are important for successful, personal and professional relationships throughout life.

Physical activity and a higher level of fitness appear to have a positive impact on academic performance, health, and wellbeing of children. Some devalue recess because they assume additional instructional time would be more beneficial, however, there is no theory or empirical evidence to support this point of view (Pellegrin, 2008).

Recess has the potential to reduce stress, increase academic performance, and decrease the risk of heath related issues. After a thorough review of the existing literature, this study adds additional perspectives to the current body of research. Specifically, the study investigated the impact of recess participation on academic achievement in reading and mathematics.

CHAPTER III: METHODS

Introduction

The purpose of the study was to examine the impact of recess on academic achievement of third and fourth grade students, as measured by the reading and mathematics sections of the State of Texas Assessments of Academic Readiness (STAAR). The following research questions guided the study:

- What is the impact of recess on student achievement in mathematics among third and fourth grade students?
- What is the impact of recess on student achievement in reading among third and fourth grade students?

Research Design

The study employed an ex post facto, causal-comparative/group comparison research design. Ex post facto studies can be defined as retrospective. During an ex post facto study, the researcher attempts to better understand an occurrence or condition that already exists (Cohen, Manion, & Morrison, 2000). Causal-comparative/group comparison research attempts to identify a reason or cause for previously identified differences among comparison groups. Specifically, groups that differ on the independent variable are compared to determine if they also differ on the outcome measure(s). For the purpose of the study, a causal-comparative/group comparison research design was chosen because the absence or presence of the independent variable, recess, already existed. In causal-comparative/group comparison research, causal inferences are not drawn because the independent variable is not manipulated (Gall, Gall, & Borg, 2015).

In this study, the independent variable was recess participation with two levels. The characteristic-present group was identified as the group in which recess was utilized. The comparison group was identified as the group in which recess was non-existent. The outcome measures were the third and fourth grade State of Texas Assessments of Academic Readiness (STAAR) mathematics and reading achievement scores from the Spring of 2017. The study was designed to determine if there were a link between recess participation and academic achievement in reading and mathematics.

Subject Selection

The subjects for the study were from two elementary schools in Northeast Texas. At the time of conducting the study, Schools A and B had an enrollment of approximately 556 and 600 students, respectively. There were some similarities and differences in the demographic characteristics. The attendance rates for School A and School B were 96.40% and 95.90%, respectively. The special education population for School A was 10.10% and 10.80% for School B. The overwhelming majority of the students in both schools were socioeconomically disadvantaged, 69.40% and 74.00% in A and B, respectively. Ethnicity percentages for School A were 20.50% Hispanic, 68.00% White, and 6.20% African American. School B's ethnicity percentages were 42% Hispanic, 27% White, and 26% African American. The average teaching experience in both campuses was 11 years. In 2017, both campuses were rated Met Standard for state accountability.

The characteristic-present group consisted of a non-probability sample of 168 third grade students and 167 fourth grade students at School A that incorporated recess as part of the daily master schedule in 2016-2017. The comparison group consisted of 165 third and 170 fourth graders at School B. Students in School B participated in a daily, 48-minute physical education

class; however, recess had not been incorporated into the 2016-2017 schedule. The sample sizes were approximately equal (largest sample size/smallest sample size < 1.50); thus, the statistical analyses of the data were considered robust with respect to the homogeneity of variances assumption (Stevens, 2009). Permission to conduct the study was obtained from the two participating school districts and the Institutional Review Board at Texas A&M University-Corpus Christi (Appendix A).

Intervention

The characteristic-present group had a daily 50-minute physical education class in addition to a 30-minute daily recess. Recess took place outdoors on the school's playground. Students had access to playground equipment such as slides, swings, and monkey bars. In addition, students had access to jump ropes, soccer balls, footballs, and the like. Recess was supervised by certified teachers and students were free to participate in the activity of their choice with the peers of their choice.

Instrumentation

In the state of Texas, the core subject areas of reading, writing, mathematics, science, and social studies in grades 3 – 11 are tested, using the State of Texas Assessments of Academic Readiness (STAAR). The STAAR is a rigorous standardized testing program that emphasizes readiness standards, which are the knowledge and skills considered most important for success at the next grade level and for college and career (TEA, 2012). For the purpose of this study, the Spring 2016-2017 STAAR scores in mathematics and reading for third and fourth grade students were used. The proportion of correct answers to the total number of test items was used to measure academic achievement in each STAAR Reporting Category.

Achievement in STAAR grade three mathematics was measured by four Reporting Categories and a total of 32 items. Reporting Category One contained eight items and assesses numerical representations and relationships. Reporting Category Two consisted of 13 items, covering computations and algebraic relationships. Reporting Category Three consisted of seven items associated with geometry and measurement. Reporting Category Four had four items, covering data analysis and personal financial literacy. Analysis of the data showed that the category scores were correlated with each other.

Achievement in STAAR grade four mathematics was measured by four Reporting Categories and a total of 34 test items. Reporting Category One contained nine items and assessed numerical representations and relationships. Reporting Category Two consisted of 11 items, covering computations and algebraic relationships. Reporting Category Three consisted of ten items associated with geometry and measurement. Reporting Category Four had four items, covering data analysis and personal financial literacy. Analysis of the data showed that the category scores were correlated with each other.

Achievement in STAAR third grade reading was measured by three Reporting Categories and a total of 34 items. Reporting Category One targeted understanding across genres with five items. Reporting Category Two concentrated on the understanding/analysis of literary texts; there were 15 items in this section. In Reporting Category Three, there were 14 items designed to measure understanding/analysis of informational texts. Analysis of the data showed that the category scores were correlated with each other.

Achievement in STAAR Grade 4 reading was measured by three Reporting Categories and a total of 36 items. Reporting Category One targeted understanding across genres; there were eight items in this category. Reporting Category Two concentrated on the

understanding/analysis of literary texts with 15 items. In Reporting Category Three, there were 13 items designed to measure understanding/analysis of informational texts. Analysis of the data showed that the category scores were correlated with each other.

In accordance with HB 734, the STAAR test has been evaluated by an independent organization to ensure external validity and reliability. Human Resources Research Organization (HumPRO) was contracted by the Texas Education Agency (TEA) to ensure test validity and reliability. Each item was reviewed for appropriateness, level of difficulty, potential bias, and reporting category/student expectation match. After an extensive evaluation of the STAAR test, HumPRO reported that test results can be interpreted as representing what a student knows and can do with on grade curriculum requirements. Further, HumPRO determined that STAAR sores met the requirements for validity and reliability (HumPRO, 2016)

Data Collection

The data were obtained from the administration offices of the participating school districts. The STAAR data included raw scale scores for each of the reporting categories in mathematics and reading. Data on gender, ethnicity, special education status, limited English proficiency status, and socioeconomic status were also provided to the researcher by the school districts. For the purpose of the study, ethnicity was coded as either White or non-White; socio-economic status was coded as either free/reduced lunch or non-free/reduced lunch.

Data Analysis

The raw data were exported into the Statistical Package for the Social Sciences (SPSS), which was used for the purpose of data manipulation and analysis. Descriptive statistics, which included frequency and percentage distribution tables and the most appropriate measures of central tendency and variability, were utilized to organize and summarize the data (Field, 2013).

The level of significance was set, a priori, at 0.01 to reduce the probability of making Type I Errors due to performing multiple tests.

A series of chi-square (χ^2) tests of independence were performed to compare the two groups on the basis of gender, ethnicity, special education status, limited English proficiency status, and socio-economic status. All contingency tables were 2 by 2; thus, Yates' corrected χ^2 was used to test the null hypotheses that the two binary variables were independent of each other (Field, 2013).

The proportion of the total number of test questions answered correctly to the total number of questions in each reporting category was used to measure student achievement in mathematics and reading. The various STAAR category scores were correlated with each other; consequently, multivariate statistics were used to analyze the academic achievement data. Additionally, ethnicity and limited English proficiency status were correlated with some of the outcome measures and were treated as confounding variables; thus, co-variate analysis had to be incorporated in the analysis of data. There is a mathematical expression called a *vector*, which represents each subject's score on more than one response variable. The mean of the vectors for each group is called a *centroid*. A series of Multivariate Analysis of Variance (MANOVA) and Multivariate Analysis of Co-variance (MANCOVA) was performed to analyze the STAAR category scores (Stevens, 2009). Box's M test was used to examine the equality of co-variance matrices assumption. Univariate F-Test was employed for the purpose of post hoc analysis.

Co-variate analysis is a procedure for data analysis that adjusts the outcome measure on the basis of a confounding (also called extraneous or concomitant) variable that is correlated with the dependent variable. That is, a linear relationship is assumed between the dependent variable and the co-variate. It also assumes that the confounding variable does not interact with the independent

variable (i.e., recess in the present study). It is an analysis of that portion of the variability of the dependent variable that is not due to the confounding variable. The general linear model (GLM) is $Y_{ij} = Y + T_j + b(X_{ij} - X) + e_{ij}$, where Y_{ij} = the score of subject i under treatment j, Y = the grand mean on the dependent variable, T_j = the effect of treatment j, b = a common regression coefficient for Y on X, X_{ij} = the score on the covariate for subject i under treatment j, X = the grand mean of the covariate, and e_{ij} = the error associated with the score of subject i under treatment j. Adjusted means are computed by: Adjusted mean = Unadjusted mean for level j – b (the mean of the covariate for level j – the grand mean of the covariate), where b is the common regression coefficient (Stevens, 2009).

The analysis of the data also included One-way Analysis of Variance (ANOVA), Factorial ANOVA, One-way Analysis of Co-variance (ANCOVA), Independent Sample t-test, Pearson Product-Moment Correlation Coefficient, and Point-Biserial Correlation Coefficient (Stevens, 2009; Field, 2013). Mean difference effect size, Cohen's d, characterized as 0.20 = small effect, 0.50 = medium effect, and 0.80 = large effect, and Partial Eta Squared (0.01 = small effect, 0.06 = medium effect, 0.14 = large effect), were used to examine the practical significance of the findings (Cohen, 1988).

Summary

A series of univariate and multivariate statistical techniques were used to analyze the existing data. All the required assumptions were tested and appropriate adjustments were made. Statistical and practical significance of the findings were examined.

CHAPTER IV: RESULTS

The purpose of the ex post facto causal-comparative study was to compare academic achievement in mathematics and reading objective test scores of third and fourth grade students who had participated in daily recess to the academic achievement in mathematics and reading objective test scores of third and fourth grade students who had not participated in recess. It was hypothesized that the students with access to recess would outperform the students that did not have recess on the basis of the outcome measures. The study was guided by the following research questions:

- What is the impact of recess on student achievement in mathematics among third and fourth grade students?
- What is the impact of recess on student achievement in reading among third and fourth grade students?

The data were obtained from the participating school districts, coded, entered into the computer, and analyzed by using the Statistical Package for the Social Sciences (SPSS). Achievement in mathematics and reading was measured by the 2016-2017 State of Texas Assessments of Academic Readiness (STAAR) test. The level of significance was set, a priori, at 0.01 to reduce the probability of making a type I error due to performing multiple tests.

Third Grade Results

A Profile of Subjects

The characteristic-present group (n = 168) included third grade students who had participated in recess and the comparison group (n = 165) consisted of third grade students who had not participated in recess. All participants were born between January 2007 and August 2008.

The two groups were compared on the basis of the demographic variables that were made available to the researcher by the school districts. The recess participation group included more males (53.60%, $n = 90$) than females (46.40%, $n = 78$) while the no recess participation group included more females (53.30%, $n = 88$) than males (46.70%, $n = 77$). The group differences were not statistically significant, χ^2 (1, $N = 333$) = 1.32, $p = 0.25$. Ethnicity was coded as either White or non-White. The majority of the students in the recess participation group were White (60.70%, n = 102); the majority of the students in the no recess participation group were non-White (80.60%, $n = 133$), and the difference was statistically significance, χ^2 (1, $N = 333$) = 57.40, $p < 0.01$. Economically disadvantaged students, as determined by free and reduced lunch eligibility, were similar for the recess participation group (71.40%, $n = 120$) and the no recess participation group (78.80%, $n = 130$); the difference was not statistically significant, χ^2 (1, $N = 333$) = 2.03, p = 0.15. The differences in the number of Limited English Proficient (LEP) students in the recess participation group (16.70%, $n = 28$), compared to the no recess participation group (31.50%, n = 52), was statistically significant, χ^2 (1, $N = 333$) = 9.26, $p < 0.01$. The difference between the number of special education students in the recess participation group (8.30%, $n = 14$) and the no recess participation group (6.70%, $n = 11$) was not statistically significant, χ^2 (1, $N = 333$) = 0.14, p = 0.71. Results are summarized in Table 1.

Table 1

A Profile of Subjects, third Grade

	Recess Group (n = 168)		No Recess Group (n = 165)	
Demographic Characteristics	F	%	F	%
Gender[a]				
Female	78	46.40	88	53.30
Male	90	53.60	77	46.70
Ethnicity[b]				
White	102	60.70	32	19.40
Non-White	66	39.30	133	60.70
Socio-economic Status[c]				
Free/Reduced Lunch	120	71.40	130	78.80
Non-Free/Reduced Lunch	48	28.60	35	21.20
Limited English Proficiency[d]				
LEP	28	16.70	52	31.50
Non-LEP	140	83.30	113	68.50
Special Education[e]				
SPED	14	8.30	11	6.70
Non-SPED	154	91.70	154	93.30

[a] χ^2 (1, N = 333) = 1.32, p = 0.25
[b] χ^2 (1, N = 333) = 57.40, p < 0.01
[c] χ^2 (1, N = 333) = 2.03, p = 0.15
[d] χ^2 (1, N = 333) = 9.26, p < 0.01
[e] χ^2 (1, N = 333) = 0.14, p = 0.71

Outcome Measures

The outcome measures included STAAR reporting Categories for mathematics and reading. Mathematics included Reporting Category 1: Numerical Representations and Relationships (8 items), Reporting Category 2: Computations and Algebraic Relationships (13 items), Reporting Category 3: Geometry and Measurement (7 items), Reporting Category 4: Data

Analysis and Personal Financial Literacy (4 items). Reading included Reporting Category 1: Understanding across Genres (5 items), Reporting Category 2: Understanding/Analysis of Literary Texts (15 items), Reporting Category 3: Understanding/Analysis of Informational Texts (14 items).

The scores were correlated. Specifically, the bivariate associations among the mathematics scores, as computed by Pearson Product-Moment Correlation Coefficient, ranged from 0.56 to 0.72; among the reading scores ranged from 0.64 to 0.73. All were statistically significant at the 0.01 level. Thus, multivariate statistical techniques were used to collectively analyze the reporting category data.

Mathematics Achievement

Achievement in mathematics was measured by the proportion of the correct answers to the total number of test items in each reporting category. As reported earlier, group differences on the basis of ethnicity and LEP status were statistically significant. However, neither was statistically correlated to the total mathematics scores; thus, both were ruled out as confounding variables. A MANOVA showed group differences on the basis of centroids were not statistically significant, *Wilks' Lambda* = 0.98, $F(4, 328) = 1.23$, $p = 0.30$. The effect size, as measured by Partial Eta Squared, was small (0.02). The equality of co-variance matrices assumption was met, *Box's M* = 12.31, $p = 0.28$.

The largest sample size divided by the smallest sample size (168/165 = 1.02) was less than 1.50; thus, the linear models used to analyze the mathematics data were considered robust with respect to the homogeneity of variances assumption for the various outcome measures (Stevens, 2009). The means and standard deviations are reported in Table 2

Table 2

STAAR Mathematics Achievement Scores, third Grade

STAAR Reporting Category	Recess Group (n = 168)		No Recess Group (n = 165)	
	M*	SD	M*	SD
Category 1	0.62	0.26	0.58	0.29
Category 2	0.63	0.27	0.59	0.29
Category 3	0.53	0.26	0.52	0.28
Category 4	0.53	0.29	0.55	0.31

*M = Proportion of correct answers

Note: Category 1: Numerical Representations and Relationships
Category 2: Computations and Algebraic Relationships
Category 3: Geometry and Measurement
Category 4: Data Analysis and Personal Financial Literacy

A t-test for Independent samples showed that the differences between the recess group (M = 0.59, SD = 0.23) and the no-recess group (M = 0.57, SD = 0.26) based on the total mathematics scores were not statistically significant, $t(331) = 0.73$, $p = 0.64$. The effect size was negligible (*Cohen's d* = 0.08).

Reading Achievement

Achievement in reading was measured by the proportion of correct answers to the total number of test items in each reporting category. The LEP status ($r = -0.25$, $p < 0.01$) and ethnicity ($r = -0.16$, $p < 0.01$) were correlated with the total reading scores, as determined by Point Biserial Correlation Coefficient. Thus, they were treated as co-variates and used to adjust the reading test scores. The observed means, adjusted means, and standard deviations are summarized in Table 3.

Table 3

STAAR Reading Achievement Scores, Third Grade

STAAR Reporting Category	Recess Group (n = 168)			No Recess Group (n = 165)		
	M1	M2	SD	M1	M2	SD
Category 1	0.65	0.63	0.30	0.60	0.62	0.29
Category 2	0.56	0.55	0.25	0.53	0.54	0.25
Category 3	0.55	0.54	0.24	0.55	0.56	0.25

M1 = Proportion of correct answers, observed scores
M2 = Proportion of correct scores, adjusted scores
Note: Category 1: Understanding across Genres
Category 2: Understanding/Analysis of Literary Texts
Category 3: Understanding/Analysis of Informational Texts

The equality of co-variance matrices assumption was met, *Box's M* = 6.59, $p = 0.37$. A MANCOVA showed the differences between the recess and no-recess groups, based on the centroids, were not statistically significant, *Wilks' Lambda* = 0.99, $F(3, 327) = 0.75$, $p = 0.52$. Partial Eta Squared showed that the effect size was negligible (< 0.01).

A one-way ANCOVA, with the LEP status and ethnicity as the co-variates, showed that the differences between the recess group (*observed mean* = 0.57, *adjusted mean* = 0.56, *SD* = 0.23) and the no recess group (*observed mean* = 0.55, *adjusted mean* = 0.56, *SD* = 0.23) based on the total reading scores were not statistically significant, $F(1, 329) = 0.03$, $p = 0.87$. The effect size was negligible (*Cohen's d* = 0.02). The largest sample size divided by the smallest sample size (168/165 = 1.02) was less than 1.50, indicating that the sample sizes were approximately equal (Stevens, 2009). Consequently, the linear models used to analyze the data were considered robust with respect to the homogeneity of variances assumption.

Fourth Grade Results

A Profile of Subjects

The characteristic-present group (n = 167) included fourth grade students who had participated in recess and the comparison group (n = 170) consisted of fourth grade students who had not participated in recess. Participants were born between January 2006 and August 2007. The recess participation group and the no recess participation group included more males than females. The recess participation group included (52.70%, n=88) males and (47.30%, n = 79) females. The no recess participation group included (52.40%, n=89) males and (47.60%, n=81) females. The group differences were not statistically significant, χ^2 (1, N = 337) = 0.00, p = 1.00. Ethnicity was coded as either White or non-White. The students in the recess participation group were predominantly White (67.70%, n = 113); the students in the no recess participation group were predominantly non-White (76.50%, n = 130), and the difference was statistically significant, χ^2 (1, N = 337) = 64.43, p < 0.01. Economically disadvantaged students, as determined by free and reduced lunch eligibility, were similar for the recess participation group (69.50%, n = 116) and the no recess participation group (78.80%, n = 134); the difference was not statistically significant, χ^2 (1, N = 337) = 3.38, p = 0.06. The difference in the number of Limited English Proficient (LEP) students in the recess participation group (9.00%, n = 15) and the no recess participation group (20.00%, n = 34) was statistically significant, χ^2 (1, N = 337) = 7.37, p < 0.01. The difference between the number of special education students in the recess participation group (6.60%, n = 11) and the no recess participation group (8.20%, n = 14) was not statistically significant, χ^2 (1, N = 337) = 0.14, p = 0.71. Results are summarized in Table 4.

Table 4

A Profile of Subjects, Fourth Grade

	Recess Group (n = 167)		No Recess Group (n = 170)	
Demographic Characteristics	F	%	F	%
Gender[a]				
Female	79	47.30	81	47.60
Male	88	52.70	89	52.40
Ethnicity[b]				
White	113	67.70	40	23.50
Non-White	54	32.30	130	76.50
Socio-economic Status[c]				
Free/Reduced Lunch	116	69.50	134	78.80
Non-Free/Reduced Lunch	51	32.30	36	21.20
Limited English Proficiency[d]				
LEP	15	9.00	34	20.00
Non-LEP	152	91.00	136	80.00
Special Education[e]				
SPED	11	6.60	14	8.20
Non-SPED	156	93.40	156	91.80

[a] χ^2 (1, N = 337) = 0.00, p = 1.00
[b] χ^2 (1, N = 337) = 64.43, $p < 0.01$
[c] χ^2 (1, N = 337) = 3.38, p = 0.06
[d] χ^2 (1, N = 337) = 7.37, $p < 0.01$
[e] χ^2 (1, N = 337) = 0.14, p = 0.71

Outcome Measures

The outcome measures included STAAR reporting Categories for mathematics and reading. Mathematics included Reporting Category 1: Numerical Representations and Relationships (9 items), Reporting Category 2: Computations and Algebraic Relationships (11 items), Reporting Category 3: Geometry and Measurement (10 items), Reporting Category 4:

Data Analysis and Personal Financial Literacy (4 items). Reading included Reporting Category 1: Understanding across Genres (8 items), Reporting Category 2: Understanding/Analysis of Literary Texts (15 items), Reporting Category 3: Understanding/Analysis of Informational Texts (13 items).

The scores were correlated, as noted by Pearson Product-Moment Correlation Coefficient. Among the mathematics scores, the associations ranged from 0.61 to 0.74; the range was from 0.68 to 0.72 among the reading scores; all were statistically significant at the 0.01 level. Thus, multivariate statistical techniques were used to analyze the reporting category data.

The sample sizes were approximately equal, because the largest sample size divided by the smallest sample size (170/167 = 1.02) was less than 1.50 (Stevens, 2009). Thus, the linear models were considered robust with respect to the homogeneity of variances assumption (Stevens, 2009).

Mathematics Achievement

The proportion of the correct answers to the total number of test items in each reporting category was used to measure mathematics achievement. Group differences on the basis of ethnicity and LEP status were statistically significant. Point Biserial Correlation Coefficient showed that the LEP status ($r = -0.33$, $p < 0.01$) and ethnicity ($r = -0.14$, $p < 0.01$) were correlated with the total mathematics scores, favoring the Whites and non-LEP students. Therefore, these variables were treated as co-variates and used to adjust the mathematics test scores. The observed means, adjusted means, and standard deviations are summarized in Table 5.

Table 5

STAAR Mathematics Achievement Scores, fourth Grade

STAAR Reporting Category	Recess Group (n = 167)			No Recess Group (n = 170)		
	M1	M2	SD	M	M2	SD
Category 1	0.67	0.66	0.25	0.56	0.58	0.24
Category 2	0.53	0.51	0.26	0.56	0.57	0.28
Category 3	0.56	0.54	0.26	0.60	0.61	0.29
Category 4	0.65	0.64	0.30	0.66	0.67	0.32

M1 = Proportion of correct answers
M2 = Proportion of correct scores, adjusted scores
Note: Category 1: Numerical Representations and Relationships
Category 2: Computations and Algebraic Relationships
Category 3: Geometry and Measurement
Category 4: Data Analysis and Personal Financial Literacy

The assumption of equality of co-variance matrices was met, *Box's M* = 1.27, $p = 0.24$. A MANCOVA showed that group differences based on the centroids were statistically significant, *Wilks' Lambda* = 0.87, $F(4, 331) = 12.56$, $p < 0.01$, and the effect size was large (*Partial Eta Squared* = 0.13). Post hoc analyses showed that the statistically significant differences were due to Category 1: Numerical Representations and Relationships, $F(1, 334) = 8.69$, $p < 0.01$, favoring the recess participation group. The examination of total mathematics scores, adjusted by ethnicity and the LEP status, showed that differences between the recess group (*observed mean* = 0.59, *adjusted mean* = 0.57, *SD* = 0.23) and the no-recess group (*observed mean*= 0.59, *adjusted mean* = 0.60, *SD* = 0.24) were not statistically significant, $F(1, 334) = 1.06$, $p = 0.30$. The mean difference effect size was negligible (*Cohen's d* = 0.11)

Reading Achievement

Achievement in reading was measured by the proportion of correct answers to the total number of test items in each reporting category. The LEP status ($r = -0.34$, $p < 0.01$) and

ethnicity (r = -0.25, $p < 0.01$) were correlated with the overall reading scores, favoring the Whites and non-LEP students. Both were used to adjust the outcome measures. The observed means, adjusted means, and standard deviations are summarized in Table 6.

Table 6

STAAR Reading Achievement Scores, fourth Grade

STAAR Reporting Category	Recess Group (n = 167)			No Recess Group (n = 170)		
	M1	M2	SD	M1	M2	SD
Category 1	0.69	0.67	0.24	0.61	0.64	0.26
Category 2	0.62	0.60	0.22	0.57	0.59	0.23
Category 3	0.53	0.50	0.24	0.50	0.52	0.25

M1 = Proportion of correct answers, observed scores
M2 = Proportion of correct scores, adjusted scores
Note: Category 1: Understanding across Genres
Category 2: Understanding/Analysis of Literary Texts
Category 3: Understanding/Analysis of Informational Texts

The equality of co-variance matrices assumption was met, *Box's M* = 10.71, p = 0.10. A MANCOVA showed the differences between the recess and no-recess groups, based on the centroids, were not statistically significant, *Wilks' Lambda* = 0.98, $F(3, 331) = 2.41$, p = 0.07. Partial Eta Squared showed that the effect size was negligible (0.02).

A one-way ANCOVA, with the LEP status and ethnicity as the co-variates, showed that the differences between the recess group (*observed mean* = 0.60, *adjusted mean* = 0.58, *SD* = 0.21) and the no recess group (*observed mean* = 0.55, *adjusted mean* = 0.58, *SD* = 0.23) based on the total reading scores were not statistically significant, $F(1, 333) = 0.02$, p = 0.88. The effect size was negligible (*Cohen's d* = 0.02).

Analysis of Interaction Effect

The interaction effects of recess and grade level on the mathematics and reading total scores were examined. The sample sizes were approximately equal (largest/smallest < 1.50); thus, the factorial model was robust with respect to the homogeneity of variances assumption (Stevens, 2009). The means and standard deviations for mathematics are summarized in Table 7

Table 7

Means and Standard Deviations for Mathematics Total Scores by Recess and Grade

	Grade	Mean*	SD	n
Recess Group	3	0.59	0.23	168
	4	0.59	0.23	167
No Recess Group	3	0.57	0.26	165
	4	0.59	0.24	170

* Proportion of correct answers

A two-by-two Factorial ANCOVA, with ethnicity and the LEP status as the co-variates, showed that the recess effect, $F(1, 664) = 0.81$, $p = 0.37$, *Partial Eta Squared* = 0.00, the grade level effect, $F(1, 664) = 0.15$, $p = 0.70$, *Partial Eta Squared* = 0.00, and the recess by the grade level effect, $F(1, 664) = 0.20$, $p = 0.65$, *Partial Eta Squared* = 0.00, were not statistically significant.

Another co-variate analysis showed similar results for the reading total scores. The recess effect, $F(1, 664) = 0.01$, $p = 0.99$, *Partial Eta Squared* = 0.00, the grade level effect, $F(1, 664) = 0.06$, $p = 0.80$, *Partial Eta Squared* = 0.00, and the recess by the grade level effect, $F(1, 664) = 0.70$, $p = 0.40$, *Partial Eta Squared* = 0.00, were not statistically significant. The means and standard deviations are presented in Table 8.

Table 8

Means and Standard Deviations for Reading Total Scores by Recess and Grade

	Grade	Mean*	SD	n
Recess Group	3	0.57	0.23	168
	4	0.60	0.21	167
No Recess Group	3	0.55	0.23	165
	4	0.55	0.22	170

* Proportion of correct answers

Summary of the Results

A detailed analysis of the data, which included univariate, multivariate, and co-variate statistical techniques as well as an examination of the practical significance of the findings did not support the study's hypotheses. Although at the fourth grade, the recess group outperformed the no recess group based on one STAAR reporting mathematics category, the randomness of the finding could not be ruled out.

CHAPTER V: SUMMARY, CONCLUSION, AND DISCUSSION

Introduction

Educators strive to provide an environment where students mature and improve their physical health, social skill, and academic achievement. However, the accountability system tends to focus on students' academic achievement as measured by standardized tests. This study examined the impact of recess on the academic achievement of third and fourth grade students as measured by the reading and mathematics sections of the State of Texas Assessments of Academic Readiness (STAAR). The STAAR assessment results were obtained from two participating public schools in Northeast Texas. One school offered daily recess while the other did not offer recess. The causal-comparative/group-comparison ex post facto study was conducted to examine the reading and mathematics assessment data from 333 third grade students (168 in the recess group, 165 in the no recess group) and 337 fourth grade students (167 in the recess group and 170 in the no recess group). Due to non-experimental nature of the study, no causal inferences were drawn. The following questions guided the study:

- What is the impact of recess on student achievement in mathematics among third and fourth grade students?
- What is the impact of recess on student achievement in reading among third and fourth grade students?

The theoretical framework that guided the study was Bjorklund and Green's Cognitive Immaturity Hypothesis, CIH (1992). Bjorklund's CIH suggests that playful breaks and peer interaction maximize children's learning by distributing effort over time as opposed to being concentrated (Jarrett et al., 1998, Pellegrini & Blatchford, 2002; Sindelar, 2004).

The focus of the study was deemed significant because it had the potential to add to the body of information on recess and academic achievement in mathematics and reading. Academic achievement is a primary goal among educators; therefore, public schools have grappled with the increased emphasis on academic performance, as measured by standardized tests. The quest for higher test scores has made recess a luxury in some American school systems. Despite evidence that free play or recess is an important part of child's physical, cognitive, and social development (Ginsburg, 2007), many schools have eliminated or reduced recess for additional instructional time (Hightshoe, LaRue, Northup, Pellergin, & Ridgeway 2003; Juster, Stafford, & Ono, 2004; Gray, 2013). By studying the impact of recess on academic achievement in two rural school districts in Northeast Texas, the study offered insight on the academic impact of the presence or absences of recess during the school day.

Summary of the Results

The study examined non-probability samples of 168 third grade students and 167 fourth grade students that had the opportunity to participate in daily recess and physical education. The comparison subjects were 165 third and 170 fourth graders who had received daily physical education (PE) but did not have the opportunity to participate in recess.

Quantitative data from the spring 2016-2017 STAAR scores in mathematics and reading were obtained. The proportion of correct answers to the total number of test items in each STAAR Reporting Category measured academic achievement. Descriptive statistics were used to analyze and summarize the data. A series of chi-square (χ^2) tests of independence were performed to compare the two groups on the basis of gender, ethnicity, special education status, limited English proficiency status, and socio-economic status. The various STAAR category scores were correlated with each other; consequently, multivariate statistics were used to analyze

the academic achievement data. Additionally, ethnicity and limited English proficiency status were correlated with some of the outcome measures and were treated as confounding variables; thus, co-variate analysis had to be incorporated in the analysis of data.

In short, a detailed analysis of the data, which included univariate, multivariate, and co-variate statistical techniques as well as an examination of the practical significance of the findings did not support the hypothesis, that recess participation had a positive impact on academic achievement. Although at the fourth grade the recess group outperformed the no recess group based on one STAAR reporting mathematics category, the randomness of the finding could not be ruled out because all other findings were negligible.

Conclusions

The researcher had hypothesized that the third and fourth grade students who had access to recess would outperform those students that did not have access to recess on the basis of academic achievement in reading and mathematics STAAR test results. Analysis of the data did not support the hypotheses. Based upon the results, the researcher concluded that recess participation was not associated with academic achievement in mathematics and reading.

Discussion

The group comparisons indicated that in this non-experimental study, recess was not a statistically significant factor in the academic achievement scores on the STAAR mathematics and reading assessments. These findings contrast with the review of the literature on recess. However, the data appeared to suggest that giving up some instructional time for recess did not hinder the academic achievement of the recess participation group.

Both participating schools had mediocre STAAR scores. The overall low STAAR assessment performance of the schools might have resulted in homogenous samples, which could have impacted the results of the study. The schools both had a significant number of socioeconomically disadvantaged students. However, the number of English Language Learners and differences among the students' ethnicity in the recess participation and no recess participation groups created confounding variables. In spite of attempts to statistically control the confounding variables, their adverse impact on the results could not be ruled out.

Upon analyzing and interpreting the data, the researcher contacted both participating schools. During the follow up with each school, the researcher was able to identify some additional factors that might have impacted the study. The no recess participation group had a ten-minute break each morning. This break could have given students the opportunity to socialize, which might have mitigated the lack of recess, enjoyable enough for the students to reduce their cognitive interference, thus providing some of the same benefits as those of a recess break. In addition, the master schedule of the no recess participation group required students to move between classes more frequently than the students in the recess participation group.

The recess participation students had large blocks of time for instruction without breaks such as PE, lunch, or recess. The master schedule was designed in a manner that students remained in academic instruction for blocks of 90 to 120 minutes at a time. In addition, several teachers indicated that they used missing recess as a disciplinary technique. Teachers also stated that recess time was missed occasionally for makeup work and tutoring. These practices could have obviously impacted students' ability to participate in recess. The principal in the recess participation school indicated that recess was scheduled opposite PE. For example, students who

had recess in the morning, had PE in the afternoon. This practice should have helped to break up the school day.

Teachers in the recess participation group indicated that they believed the students enjoyed and needed recess. The faculty appeared to agree that students need the opportunity to blow off steam and return to class better prepared to pay attention and complete the assigned tasks. The campus principal noted that disciplinary referrals seem to increase when bad weather keeps students from being able to participate in recess for multiple days.

The no recess participation group had implemented recess into its academic year's schedule. The principal noted that adding recess was not a philosophical or researched-based decision; it due to a gap in the master schedule of about 25 minutes. This gap created an opportunity for the addition of recess time. Teachers in the no recess participation group said that adding recess had slightly reduced their class time; however, the reduction in time had not hindered their ability to adhere to the district's scope and sequence. Time may show if the addition of recess to the no recess participation campus provides a positive, negative, or no change to the campus achievement scores.

Implications

The study was designed to determine if there were a link between recess participation and academic achievement in non-probability samples of third and fourth grade students as measured by STAAR assessment scores in reading and mathematics. The review of the literature indicated that recess participation did not have a negative impact on academic performance. In fact, the literature indicated recess had a positive impact on academic achievement. The literature review also indicated that recess played an important role in the health, social skills, and behavior of children. Bjorklund and Green's Cognitive Immaturity Hypothesis (CIH) was the theoretical

framework that provided the platform for the possible link between recess and academic achievement (1992). Limited to childhood, the CIH suggests that children need playful breaks after sustained cognitive tasks to reduce cognitive interference and facilitate optimal learning.

Cognitive interference is defined as any thought or activity that interferes with the required tasks. Cognitive interference occurs when attention is diverted from a required task, impeding or preventing effective performance (Eysenk & Calvo, 1992; Sarason, 1982). The immaturity of children's nervous systems keeps them from being able to perform cognitive tasks with the same efficiency of adolescents or adults. This inefficiency has a direct impact on academic performance; therefore, children are highly susceptible to cognitive interference after sustained periods of work (Dempster, 1992). Breaks during sustained cognitive tasks should reduce cognitive interference and maximize learning and achievement (Toppino, Kasserman & Mracek, 1991). The framing of this study with Bjorklund and Green's Cognitive Immaturity Hypothesis was to ensure recess was considered as a part of the daily schedule as opposed to being dismissed as a waste of time.

The results of the study should help to continue the conversation about recess and the role of free play in the development of children and school schedules. Even though the study did not find statistically significant differences in the recess and non-recess participation groups, policy makers, parents, administrators, and educators should still review policies and procedures regarding recess. There is significant literature to indicate recess participation plays an important role in the social and emotional well-being of children. Therefore, this study must be reviewed in relation to the existing body of literature, and hopefully, researchers will continue conducting scientific inquiries in assessing the role of recess in school.

Recommendations for Further Research

The study's delimitations, limitations, and assumptions provide opportunities for additional research. The study employed non-probability sampling; thus, external validity was limited to the participants of the study. In addition, the study was delimited to academic achievement of third and fourth grade students in two Northeast Texas school districts. The researcher recommends replicating the study in other schools with varied demographics. Future studies should include students form rural and urban schools. Further research may investigate the length and timing of recess. An experimental intervention that includes age as a demographic characteristics would be valuable. Due to the quantitative nature of the study, a qualitative case study regarding students' and educators' perspectives on recess may provide greater insight.

Personal Reflections

I was dumfounded by the results of this study. I fully expected to find a difference between the characteristic-present group and the comparison group. The mediocre scores from both schools might have created more homogenous measures than had been anticipated and could explain the lack of significant results. As an educator, I have witnessed the benefits of recess for children and the review of the literature supported the link between academic achievement and recess participation. In conclusion, childhood is a very short period of time. Denying kids recess may not increase or decrease their academic performance; however, eliminating it may have a huge impact on a student's motivation, ability to maintain his/her behavior, and ability to navigate social situations. I believe educators have a responsibility to educate the whole child and content knowledge alone is not sufficient for future student success.

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APPENDIX A

ORC USE ONLY	
HSRP #:	142-17
Date Received:	11/20/2017

Human Subjects Research Protocol for Exempt, Expedited, or Full Board Review

TEXAS A&M UNIVERSITY CORPUS CHRISTI
RESEARCH COMMERCIALIZATION OUTREACH

Instructions and Researcher Certifications (Failure to follow may result in a delay in processing)

Complete this form if **"research"** will be conducted.

Do not complete this form for:
1. **non-research** activities; or
2. to **fulfill TAMUCC coursework only** without a research activity or element.

By signing this Human Subjects Research Protocol for Exempt, Expedited, or Full Board Review (HSRP), all Principal Investigators (PIs), co-PIs, and personnel (collectively, "Researchers") certify the following:

1. CITI Training "Social & Behavioral Research - Basic/Refresher" course has been completed and is current for **any research activity** regardless of source of funding or whether unfunded (expires after three years);

2. CITI Training "Responsible Conduct of Research Course" has been completed **in addition to** the "Basic/Refresher" and is current **only if** the source of funding is the **National Institutes of Health (NIH)** or the **National Science Foundation (NSF)** (expires after three years);

3. Have read and understood the responsibilities set forth in TAMUCC Rule 15.99.01.C1.01;

4. If the research is **in conjunction with the Corpus Christi Independent School District (CCISD)**, have followed CCISD processes and requirements for external research (e.g., consent or assent templates, translation or interpretation requirements, etc); will seek a **second, independent approval from CCISD** per its requirements - this approval may be sought simultaneously with and independently of TAMUCC IRB approval (see http://ccisd.us/DEPARTMENTS/District-Support/External-Research); for questions, contact Dr. Toni Moynihan-McCoy: toni.moynihan-mccoy@ccisd.us.

5. If the HSRP is submitted for a doctoral dissertation, have coordinated with the College of Graduate Studies (CGS) to meet its requirements;

6. Have read and reviewed this HSRP; any applicable supporting documentation or third-party approval has been obtained from the appropriate authority and has been included as an attachment to the HSRP (e.g., recruitment script, informed consent, parental consent, child assent, school permission, facility use permission, grant/proposal, Translator Certification, Interpreter Certification, etc); have signed the HSRP electronically;

7. Will immediately report any adverse event to the Institutional Review Board (IRB) or the Office of Research Compliance (ORC);

8. Have submitted the HSRP a **minimum of thirty (30) days in advance** of the anticipated start date (additional time is required for review at full board); will communicate whether there is a **firm start date or other deadline** associated with the HSRP; and

9. Will submit a Completion Report at the conclusion of research under this HSRP.

After completing the foregoing, submit the HSRP with supporting documentation via email to the IRB Mailbox: irb@tamucc.edu

For questions, email:

research.compliance@tamucc.edu

Researchers

	Name	Email (use TAMUCC email)	College	Category	Category (Other)
PI	Barbie McMath	bmcmath@islander.tamucc.ed	Education	Graduate Student	
Co-PI (1)	Kamiar Kouzekanani	kamiar.kouzekanani@tamucc.edu	Education	Faculty Adviser	
Co-PI (2)					
Co-PI (3)					
Co-PI (4)					
Co-PI (5)					

Overview

A. Research Classification: Doctoral Dissertation Other:

ORC and/or the IRB will ultimately be responsible for making the Research Classification and Level of Review. For guidance, see content at the end of the HSRP.

B. Anticipated Level of Review: Exempt (4)

C. Externally funded: No Award Start Date: Maestro #:

D. Title: Assessing the Impact of Recess on Academic Achievement in Mathematics and Reading Among 3rd, and 4th Graders: A Causal-Comparative Inquiry

E. Anticipated Start Date: Upon IRB Approval **F.** Estimated Completion Date: December 2018

Purpose and Objective

A. Describe the purpose of the research **in layman's terms.**

The purpose of the study is to examine the impact of recess on academic achievement of 3rd, and 4th grade students as measured by the reading and mathematics sections of the State of Texas Assessments of Academic Readiness (STAAR). The hypothesis is that 3rd and 4th grade students that have access to recess will perform differently than those students that do not have access to recess will be tested. The 3rd and 4th grades were chosen for two reasons. First, recess traditionally takes place at the elementary level. Second, federal law requires that students are tested, beginning in grade three on a standardized reading and mathematics test.

B. Describe the objective(s) and/or research questions **in layman's terms.**

The study is guided by the following questions: 1. What is the impact of recess on student achievement in mathematics among 3rd and 4th grade students? 2. What is the impact of recess on student achievement in reading among 3rd and 4th grade students?

Participants; Recruitment

Participants

A. Indicate whether any of the following populations will be **specifically targeted** for inclusion in the research. Each category must be answered. *Additional protections for participants may be required.*

Adults over the age of 18 (**able** to legally consent)	Yes ☐	No ☒	Prisoners (adults or minors)	Yes ☒	No ☐
Minors under the age of 18	Yes ☒	No ☐	Persons whose first language is **not** English (adults or minors)	Yes ☒	No ☐
Persons with mental disabilities (adults or minors)	Yes ☐	No ☒	Students enrolled in a researcher's course (adults or minors)	Yes ☒	No ☐

Persons with economical disadvantages (adults or minors)	Yes ☐	No ☒	Employees under the direct supervision of a researcher	Yes ☒	No ☐
Persons with educational disadvantages (adults or minors)	Yes ☐	No ☒	Persons who are sick or ill (physical or mental)	Yes ☒	No ☐
Persons with AIDS or HIV (adults or minors)	Yes ☐	No ☒	Other potentially vulnerable populations depending on the circumstances of the research (describe in "B")	Yes ☒	No ☐
Pregnant women, fetuses, and/or neonates Note: Research including this vulnerable population is *generally* health care/ medical studies specifically targeting research of pregnant women, fetuses, and/or neonates. Pregnant women can be included in research if all inclusion criteria is met and a specific exclusion is not part of the project design. Select "No," unless the research specifically involves the inclusion of pregnant women, fetuses, and/or neonates.	Yes ☐	No ☒			

B. Describe the criteria to determine who is included or excluded in the final participant population *(e.g., minimum age, grade range, physical characteristics, learning characteristics, professional criteria, etc)*.

3rd and 4th grade students from two elementary campuses in two North East Texas School districts. All students with STAAR data in both math and reading will be included.

C. Target number of participants *(use a minimum target if a specific target is not appropriate for the research design)*.

Approximately 345 3rd and 345 4th grade students.

D. Non-TAMUCC Participants or Facility
Complete this section **only if** the research will be conducted at a third-party facility **or** participants will be recruited from a third-party site (non-TAMUCC).

Provide the non-TAMUCC location or non-TAMUCC participants to be recruited here *(include any permission as an attachment)*.

Wills Point Independent School District and Terrell Independent School District. Data collected in 2016-2017.

Recruitment

E(1). Method. Describe methods that will be used to identify the potential participants.

Not applicable, existing data will be used. Flash drive backups will be stored in a locked cabinet.

E(2). Materials. Describe how potential participants will be recruited, what materials will be used *(include as an attachment)*, and how they will be distributed *(i.e., who, what, when, where, and how)*.

Not applicable, existing data will be used.

E(3). Incentives. If applicable, provide the amount, type, and time of distribution of any payment/incentive to participants.

Not applicable, existing data will be used.

Identification of Participants; Data Collection and Storage; Equipment; Records Retention and Destruction

A. Identification of Participants. Indicate whether the data collected may contain individual identifiers (need for "confidentiality"), or whether the data will be collected anonymously.

Confidential

B. Data Collection. Describe the method(s) or procedure(s) for data collection **in step-by-step, layman's terms** *(include collecting party, frequency, duration, location, etc)*. The use of audio or video recording must be justified by the research purpose/objective or future research.

The study employs an ex post facto, causal-comparative research design. The characteristic-present group is identified as the group in which recess was utilized. The comparison group is identified as the group in which recess was non-existent. The outcome measures are the State of Texas Assessments of Academic Readiness (STAAR) mathematics and reading achievement scores. The study uses existing data, which have already been obtained from the participating school districts. The permission to use the data for the purpose of the study has been obtained (attached).

C. Equipment. Describe any equipment to be used *(e.g., audio, visual)*, ownership *(e.g., TAMUCC, personal)*, and methods of storage *(e.g., password, location)*.

The principal investigator's computer will be used to store the data and perform data analysis. The computer is located at the principal investigator's home. The computer is locked and password-protected when not in use. Dr. Kouzekanani will also have access to the raw data, which will be saved in his TAMUCC computer in FC223, the computer is password-protected.

D. Data Storage. Describe how the data collected will be stored, location(s), how the confidentiality of individually identifiable information will be maintained (if applicable), and who will have access. *(For audio and video recordings, address recordings and transcripts)*.

The participating districts have already provided the PI with electronic copies of the data. The data did NOT include any identifiers. The PI and dissertation chair have saved the data in their computers, and have made backup copies of the data on flash drives.

E. Records Retention and Destruction. For data collected, describe how records will be maintained, duration *(justified by research design and/or future research)*, destruction mechanism, and responsible party for each. *(Include audio and video recordings and applicable transcripts)*.

The participating districts have already provided the PI with electronic copies of the data. The data did NOT include any identifiers. The PI and dissertation chair have saved the data in their computers, and have made backup copies of the data on flash drives. The data will be retained for the maximum of three years beyond the completion of the study. Computer and flash drive data will be destroyed by deleting the data from the hard drive and flash drive.

Risk to Participants; Mechanism of Protection; Outside Assistance

A. Risk to Participants. Indicate the level of risk to participants.

No risk	Yes ☐	No ☒
Minimal risk Definition: the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.	Yes ☒	No ☐
Greater than minimal risk	Yes ☐	No ☒

B. Mechanism of Protection. Describe **every potential risk** to human subjects that may result from participation in the research ("Risk"), and indicate the method or procedure to be used to mitigate the potential risk ("Protection Mechanism"). Consider physical, psychological, social, legal, and economic risks *(e.g., breach of confidentiality, injury, psychological distress, pressure to conform, pressure to participate, etc)*.

	Risk	Protection Mechanism
1.	Breach of confidentiality	Protection Mechanism: The quantitative data will be kept confidential. The electronic version of all data are stored in the PI's personal computer. Backup copies are stored in a USB flash drive. The Co-PI also has a copy of the data, which are stored in his TAMUCC computer. Both computers are kept locked and password-protected when not in use.
2.		
3.		

	Risk	Protection Mechanism
4.		
5.		

C. Outside Assistance. If applicable, describe any outside assistance available to participants to mitigate the Risks stated above and how it will be provided *(e.g., medical care, counseling, etc)*.

Not applicable, existing data will be used

Benefits to Participants; Benefits to Society

A. Benefits to Participants. If applicable, describe the potential benefits to participants as a result of taking part in the research *(exclude payments/incentives)*. If there are no benefits, then state so.

There are no direct benefits to the participants whose already collected data will be used for the purpose of the study.

B. Benefits to Society. Describe the potential benefits to society or contribution to generalizable knowledge as a result of the research.

Results of the study will be used to examine the link between recess and academic achievement, which may be of practical importance to educators and other concerned individuals.

Waiver of Informed Consent; Waiver of Signed Informed Consent; Informed Consent Process

A(1). Is a **waiver or alteration** of informed consent requested? (i.e., entire process is waived, or basic element(s) are altered) *See Criteria for Waiver of Informed Consent at the end of the HSRP for guidance.* If **"yes,"** go to C. If **"no,"** go to A(2).	Yes ☒	No ☐	**A(2).** If **"no,"** is a waiver of **documentation of** informed consent requested? (i.e., informed consent will be obtained without participants' signatures) *See Criteria for Waiver of Documentation of Informed Consent at the end of the HSRP for guidance.* If **"yes,"** go to C. If **"no,"** go to B.	No ▾

B. Informed Consent Process. If **"no"** to both A(1) and A(2), describe below **step-by-step** how informed consent will be obtained. If the "short form" will be used, describe below *(See Informed Consent Documentation at the end of the HSRP for guidance)*.

Note:
1) Participants must be given time to review the informed consent and supporting documents and ask questions.
2) For **minor participants**, researchers must obtain both parental informed consent and a separate child assent written at an appropriate reading level.
3) For participants whose **first language is not English**, informed consent may be required in English and non-English. In addition, submission of a **Translator Certification** or **Interpreter Certification** form may be required.
4) For research conducted in conjunction with **CCISD**, follow those requirements, as applicable. ORC and the IRB cannot advise on CCISD requirements.

Not applicable. Existing data will be used & permission has already been obtained to use the data for the purpose of the study.

C. Waiver of Informed Consent; Waiver of Documentation of Informed Consent. If **"yes"** to either A(1) or A(2), describe below why a waiver or alteration of informed consent **and/or** a waiver of documentation of informed consent is requested and how the applicable criteria are met based on the circumstances of the research *(see Criteria for Waiver of Informed Consent or Criteria for Waiver of Documentation of Informed Consent at the end of the HSRP for guidance)*.

The research involves no more than minimal risk to the subjects. Existing data will be used, for which permissions have been obtained (attached). Therefore, the waiver will not adversely affect subjects rights. Due to using existing data, obtaining informed consent can not be carried out. Participating schools will be provided with pertinent information upon completion of the study.

Researcher Qualifications

A. Describe qualifications or attach CVs/resumes for **all personnel listed** on the HSRP.

The principal investigator is a doctoral student at Texas A&M University-Corpus Christi and has completed the CITI course on the protection of human research participants. Dr. Kamiar Kouzekanani is the faculty advisor and dissertation chair; he is a professor of quantitative methods in the College of Education & Human Development at Texas A&M-Corpus Christi.

Researcher Signatures

By signing this HSRP, the Researcher(s) certifies that he/she has read and understood the requirements and responsibilities set forth in the section entitled "Instructions and Researcher Certifications" in relation to the research. In addition, the Researcher (s) certifies that he/she will abide by any and all applicable federal, state, and/or institutional regulations, including any requirements from the Institutional Review Board (IRB) and/or the Office of Research Compliance (ORC).

	Name	Conflict of Interest (select one)	Date
	Name	Conflict of Interest (select one)	Date
	Name	Conflict of Interest (select one)	Date
	Name	Conflict of Interest (select one)	Date
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	Name	Conflict of Interest (select one)	Date
	Name	Conflict of Interest (select one)	Date
PI	Barbie McMath	No conflict of interest with this proje	
	Signature:	Barbie McMath — Digitally signed by Barbie McMath Date: 2017.11.12 20:43:18 -06'00'	
Co-PI (1)	Kamiar Kouzekanani	No conflict of interest with this proje	
	Signature:	Kamiar Kouzekanani — Digitally signed by Kamiar Kouzekanani Date: 2017.11.10 12:54:22 -06'00'	
Co-PI (2)			
	Signature:		
Co-PI (3)			
	Signature:		
Co-PI (4)			
	Signature:		

	Name	Conflict of Interest (select one)	Date
Co-PI (5)			
Signature:			

Determination of Level of Review

Studies involving audiotaping and/or videotaping **do not qualify** for exempt review and will be reviewed at the level of expedited or full board.

Minimal risk means that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.

Additional protections for participants may apply to research involving: pregnant women, human fetuses, and neonates; prisoners; children; and/or other vulnerable populations.

Exempt Review

(1) Research conducted in established or commonly accepted educational settings, involving normal education practices, such as (i.) research on regular and special education instructional strategies, or (ii.) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless (i.) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii.) any disclosure of human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under the previous paragraph, if (i.) the human subjects are elected or appointed public officials or candidates for public office; or (ii.) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

5) Research and demonstration projects that are conducted by or subject to the approval of federal department or agency heads, and that are designed to study, evaluate, or otherwise examine (i.) public benefit or service programs (ii.) procedures for obtaining benefits or services under these programs (iii.) possible changes in or alternatives to those programs or procedures; or (iv.) possible changes in methods or levels of payment for benefits or services under those programs.

6) Taste and food quality evaluation and consumer acceptance studies (i.) if wholesome foods without additives are consumed or (ii.) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

Expedited Review

(1) Clinical studies of drugs and medical devices only when condition (a) or (b) is met.
   a. Research on drugs for which an investigational new drug application (21 CFR Part 312) is not required. (Note: Research on marketed drugs that significantly increases the risks or decreases the acceptability of the risks associated with the use of the product is not eligible for expedited review).
   b. Research on medical devices for which (i) an investigational device exemption application (21 CFR Part 812) is not required; or (ii) the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling.

(2) Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture as follows:
   a. from healthy, nonpregnant adults who weigh at least 110 pounds. For these subjects, the amounts drawn may not exceed 550 ml in an 8 week period and collection may not occur more frequently than 2 times per week; or
   b. from other adults and children, considering the age, weight, and health of the subjects, the collection amount of blood to be collected, and the frequency with which it will be collected. For these subjects, the amount drawn may not exceed the lesser of 50 ml or 3 ml per kg in an 8 week period and collection may not occur more frequently than 2 times per week.

(3) Prospective collection of biological specimens for research purposes by noninvasive means.
   Examples: (a) hair and nail clippings in a nondisfiguring manner; (b) deciduous teeth at time of exfoliation or if routine patient care indicates a need for extraction; (c) permanent teeth if routine patient care indicates a need for extraction; (d) excreta and external secretions (including sweat); (e) uncannulated saliva collected either in an unstimulated fashion or stimulated by chewing gumbase or wax or by applying a dilute citric solution to the tongue; (f) placenta removed at delivery; (g) amniotic fluid obtained at the time of rupture of the membrane prior to or during labor; (h) supra- and subgingival dental plaque and calculus, provided the collection procedure is not more invasive than routine prophylactic scaling of the teeth and the process is accomplished in accordance with accepted prophylactic techniques; (i) mucosal and skin cells collected by buccal scraping or swab, skin swab, or mouth washings; (j) sputum collected after saline mist nebulization.

(4) Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves. Where medical devices are employed, they must be cleared/approved for marketing. (Studies intended to evaluate the safety and effectiveness of the medical device are not generally eligible for expedited review, including studies of cleared medical devices for new indications).

   Examples: (a) physical sensors that are applied either to the surface of the body or at a distance and do not involve input of significant amounts of energy into the subject or an invasion of the subject's privacy; (b) weighing or testing sensory acuity; (c) magnetic resonance imaging; (d) electrocardiography, electroencephalography, thermography, detection of naturally occurring radioactivity, electroretinography, ultrasound, diagnostic infrared imaging, doppler blood flow, and echocardiography; (e) moderate exercise, muscular strength testing, body composition assessment, and flexibility testing where appropriate given the age, weight, and health of the individual.

(5) Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis).

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies. (NOTE: Some research in this category may be exempt from the HHS regulations for the protection of human subjects. 45 CFR 46.101(b)(2) and (b)(3). This listing refers only to research that is not exempt).

(8) Continuing review of research previously approved by the convened IRB as follows:
   a. where (i) the research is permanently closed to the enrollment of new subjects; (ii) all subjects have completed all research-related interventions; and (iii) the research remains active only for long-term follow-up of subjects; or
   b. where no subjects have been enrolled and no additional risks have been identified; or
   c. where the remaining research activities are limited to data analysis.

(9) Continuing review of research, not conducted under an investigational new drug application or investigational device exemption where categories two (2) through eight (8) do not apply but the IRB has determined and documented at a convened meeting that the research involves no greater than minimal risk and no additional risks have been identified.

Criteria for Waiver of Informed Consent

(c) An IRB may approve a consent procedure which does not include, or which alters, some or all of the elements of informed consent set forth above, or waive the requirement to obtain informed consent provided the IRB finds and documents that:
   (1) The research or demonstration project is to be conducted by or subject to the approval of state or local government officials and is designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs; and
   (2) The research could not practicably be carried out without the waiver or alteration.

(d) An IRB may approve a consent procedure which does not include, or which alters, some or all of the elements of informed consent set forth above, or waive the requirement to obtain informed consent provided the IRB finds and documents that:
(1) The research involves no more than minimal risk to the subjects;
(2) The waiver or alteration will not adversely affect the rights and welfare of the subjects;
(3) The research could not practicably be carried out without the waiver or alteration; and
(4) Whenever appropriate, the subjects will be provided with additional pertinent information after participation.

Criteria for Waiver of Documentation of Informed Consent

(c) An IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either:
(1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern; or
(2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

In cases in which the documentation requirement is waived, the IRB may require the investigator to provide subjects with a written statement regarding the research.

Informed Consent Documentation

(a) Except as provided in paragraph (c) of this section, informed consent shall be documented by the use of a written consent form approved by the IRB and signed by the subject or the subject's legally authorized representative. A copy shall be given to the person signing the form.

(b) Except as provided in paragraph (c) of this section, the consent form may be either of the following:

(1) A written consent document that embodies the elements of informed consent required by §46.116. This form may be read to the subject or the subject's legally authorized representative, but in any event, the investigator shall give either the subject or the representative adequate opportunity to read it before it is signed; or

(2) A short form written consent document stating that the elements of informed consent required by §46.116 have been presented orally to the subject or the subject's legally authorized representative. When this method is used, there shall be a witness to the oral presentation. Also, the IRB shall approve a written summary of what is to be said to the subject or the representative. Only the short form itself is to be signed by the subject or the representative. However, the witness shall sign both the short form and a copy of the summary, and the person actually obtaining consent shall sign a copy of the summary. A copy of the summary shall be given to the subject or the representative, in addition to a copy of the short form.

TEXAS A&M UNIVERSITY
CORPUS CHRISTI

OFFICE OF RESEARCH COMPLIANCE
Division of Research, Commercialization and Outreach
6300 Ocean Drive, Unit 5844
Corpus Christi, Texas 78412
O 361.825.2497 · F 361.825.2

Date: January 29, 2018

TO: Barbie McMath, Graduate Student
College of Education and Human Development

CC: Kamiar Kouzekanani
Professor, College of Education and Human Development

FROM: Office of Research Compliance

SUBJECT: Exempt Determination

Human Subject Research Activities that do not meet one or more exempt categories are subject to IRB oversight.

On January 27, 2018, the Texas A&M University-Corpus Christi Institutional Review Board reviewed the following submission:

Type of Review:	Exempt Determination
Title:	Assessing the Impact of Recess on Academic Achievement in Mathematics and Reading Among 3rd, and 4th Graders: A Causal-Comparative Inquiry
Project Lead:	Barbie McMath, Graduate Student
IRB ID:	142-17
Funding Source:	None
Documents Reviewed:	IRB application received 11/20/17; revised on 1/27/2018

Texas A&M University-Corpus Christi Institutional Review Board reviewed the project and based on the information provided has determined the research meets exempt category 45 CFR 46.101(b)(4) (Research involving the collection of existing data/biospecimens).

Therefore, this project has been determined to be exempt from IRB review. You may proceed with this project.

Reminder of Investigator Responsibilities: As principal investigator, you must ensure:

1. Informed Consent: **Ensure informed consent processes, if applicable, are followed** and information presented enables individuals to voluntarily decide whether or not to participate in the research project.
2. Amendments: This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. **Any planned changes that would impact the criteria in which the exempt determination was made, requires submission by the investigator to the IRB to ensure that the research continues to meet criteria for exemption.** Changes to the protocol must be requested by submitting an Amendment Application to the Research Compliance Office for review. The Amendment must be approved before being implemented.
3. Completion Report: **Upon completion of the research project (including data analysis and final written papers), a Completion Report must be submitted** to the Research Compliance Office.

4. Records Retention: **All research related records must be retained for three (3) years** beyond the completion date of the study in a secure location. At a minimum these documents include: the research protocol, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to participants, all correspondence to or from the IRB or Office of Research Compliance, and any other pertinent documents.
5. Adverse Events: Adverse events must be reported to the Research Compliance Office immediately.
6. Post-approval monitoring: Requested materials for post-approval monitoring must be provided by dates requested.

Please do not hesitate to contact me with any questions at Rebecca.Ballard@tamucc.edu or 361-825-2497.

Rebecca Ballard, JD, MA, CIP

Digitally signed by Rebecca Ballard, JD, MA, CIP
Date: 2018.01.29 12:45:02 -06'00'

Respectfully,
Rebecca Ballard, JD, MA, CIP
Director, Research Compliance and Export Control Officer
Division of Research, Commercialization and Outreach