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Aerobic Capacity Fitness Level Impact on NWEA/MAP Reading and Math Scores

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Aerobic Capacity Fitness Level Impact on NWEA/MAP Reading and Math Scores

A Correlational Research Methods Proposal

A Project Presented to the Graduate Faculty of

Minnesota State University Moorhead

By

Andrew Jipson

In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in
Curriculum and Instruction

May 5, 2021

Moorhead, Minnesota

Abstract

This 2020 study focuses on the impact aerobic capacity can have on individual academic test scores. This study focuses on determining if there is any correlation between above average aerobic capacity levels in 4th grade students using Fitnessgram software analysis and above average reading and math scores collected from Northwest Evaluation Association/ Measures of Academic Progress. Fourth grade students were assessed by their physical education teacher on their aerobic capacity levels by performing the 20-meter pacer test the weeks of September 8, 2020 and October 5, 2020. Their scores were entered into the Fitnessgram software when all the tests are completed. Fourth grade took their NWEA/MAP reading test on September 25, 2020 and math on September 27, 2020. Percentages were calculated to determine whether or not students were in the healthy fitness zone or fell below for aerobic capacity and if they scored above the Minnesota state standard average or below on the individual NWEA reading test. The second portion of data focused on the individual math scores. These scores were analyzed using the same process as the reading scores. The categories used were students who were in the healthy fitness zone or fell below for aerobic capacity and if they scored above the Minnesota state standard average or below on the individual MAP math test. This study took place in a Minnesota elementary school, specifically fifty-three 4th grade students who are split into three different sections. Data were collected to determine there is a correlation between higher aerobic capacity levels and higher academic performance.

Dedication

I would like to thank my wife, family and co-workers who have helped me along this journey to fulfill my degree and stuck by my side.

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Chapter 1

Introduction

Introduction

There are some states that are deciding to cut physical education and not looking into the importance of physical activity on our adolescent population. Physical education can have a major impact on our society's health in the future. Research is continually taking place providing data supporting how physical activity and personal fitness levels can increase brain development and cognitive abilities. In turn, these advantages can also increase student test scores.

Brief Literature Review

There have been multiple studies done showing the correlation between individuals with higher fitness levels and how it can result in higher test scores. Martin and Chalmers (2007) state most recently, the California Department of Education (2002; 2005) reported the results of two studies that examined the relationship between scores on achievement tests and Fitnessgram scores. In the first study, performance on the Stanford Achievement Tests and scores on the Fitnessgram for 884,715 students in grades 5, 7, and 9 were investigated. A composite score, ranging from zero to six, was created for physical fitness, in which a student obtained one point for each of the six test items for which the student was determined to be in the "healthy zone." In each of the three grades, higher levels of fitness were related to higher academic achievement. The relationship was stronger for math achievement and fitness, especially at higher fitness levels. This study has yet to be published.

Statement of the Problem

This paper focuses on the impact of aerobic capacity levels on individuals academic achievement. The study performed in this paper provided data to determine if there was a

correlation between higher aerobic capacity levels resulting in higher individual reading and math test scores.

Purpose of the Study

This study was done to determine if there is any correlation between aerobic capacity levels impacting individual reading and math test scores. Being a physical education teacher, I strive to provide a curriculum that keeps my students physically fit and encourages them to live a healthy lifestyle outside of school. If my study turns out the way I believe it will, it will provide reinforcement for all of my students and administrators to do their best to increase their fitness levels.

Research Question

Do aerobic capacity levels have an impact on individuals' reading and math test scores?

The variables for my study are individual NWEA/MAP reading and math tests scores and individual aerobic capacity levels developed from Fitnessgram.

Significance of the Study

This study will provide physical education teachers with data to determine if aerobic activities in physical education can improve students' cognitive abilities. This will allow bystanders to understand the importance of physical activity and personal fitness levels on cognitive abilities and possibly increase their individual test scores. Physical education classes and PE class times have been cut in some states to focus on core academics. This study will prove how important physical education is to all of our students and the importance of having increased physical activity.

Definition of Variables

Northwest Evaluation Association/ Measures of Academic Progress (NWEA/MAP) is the reading and math assessment used in this study. Fitnessgram is a web based database physical education teachers use to enter individual fitness scores. This program provides the physical education teacher with how each student's fitness levels compare to others their same age.

Research Ethics

Permission and IRB Approval. In order to conduct this study, the researcher will seek MSUM's Institutional Review Board (IRB) approval to ensure the ethical conduct of research involving human subjects (Mills & Gay, 2019). Likewise, authorization to conduct this study will be sought from the school district where the research project will be taking place (See Appendix 4).

Informed Consent. Protection of human subjects participating in research will be assured. Participant minors will be informed of the purpose of the study via the Method of Assent (See Appendix 2) that the researcher will read to participants before the beginning of the study. Participants will be aware that this study is conducted as part of the researcher's Master Degree Program and that it will benefit his teaching practice. Informed consent means that the parents of participants have been fully informed of the purpose and procedures of the study for which consent is sought and that parents understand and agree, in writing, to their child participating in the study (Rothstein & Johnson, 2014). Confidentiality will be protected through the use of pseudonyms (e.g., Student 1) without the utilization of any identifying information. The choice to participate or withdraw at any time will be outlined both, verbally and in writing.

Chapter 2

Literature Review

Introduction

Personal fitness has always been a big part of my life. I have always believed a healthy body will lead to a healthy mind. My belief in this statement was the main reason I decided to do this study. As a physical education teacher, I want to prove how important fitness and movement is to our youth and how it can help them academically. I focused on determining if aerobic capacity levels had an impact on Northwest Evaluation Association/ Measures of Academic Progress (NWEA/MAP) reading and math test scores. I did this by taking my fourth grade students' individual aerobic capacity test scores from Fitnessgram, which is our database we use in physical education for fitness testing and cross referenced them with their NWEA/MAP reading and math scores. By doing this, I was able to determine if there was any correlation with higher aerobic capacity resulting in higher test scores. This study was done to provide more data supporting the notion of being physically active and maintaining a healthy lifestyle will increase academic performance.

Body of the Review

Context

The articles in this review focus on multiple studies relating personal fitness levels to academic achievements and higher test scores. There were many articles that supported the fact that being physically active increased academic performance, but some of the studies did not provide much data to support the findings. The main source of research was done through the Minnesota State University Moorhead's Livingston Lord Library online database. The topics

being searched were personal fitness and academic performance. These two topics yielded a lot of data pertaining to my study.

Personal Fitness and Academic Achievement

Personal fitness levels and movement have led to many advantages for students academically. Physical education teachers and general education teachers have been noticing the benefits associated with allowing movement in their classrooms. Some schools are starting to provide movement interventions incorporated with academics to boost students' learning. Erwin et al. (2013) found allotting 20+ minutes per day to provide curricular-based physical activity breaks to students does not appear to detract from students performance outcomes, behavior or physical activity levels. In fact, reading and math scores significantly improved, while physical activity levels showed a trend of increasing due to this type of intervention. Kreider (2019) stated research shows that students who engage in more physical activity perform better in class. The Centers for Disease Control reviewed 43 studies of the associations between academic performance and physical activity and found physical activity to be positively related to students' academic achievement, classroom behaviors, cognitive skills, and attitudes. Students who are emotionally and physically healthy do better in school. They are also less likely to miss school or engage in risky behavior, and their stress levels decrease. Healthy, fit students have better focus and concentration. Physical activities benefit students by improving physical skill While we are seeking new ways to ensure students' academic success, we must ensure that we are not neglecting their need for physical activity. As we innovate to improve academic success, we can also seek ways to overcome the challenges of space, time, and behavior management to reap the benefits of movement, which include increased student learning. Physical activities benefit students by improving physical skill development, while also building cognitive and judgment

skills, strengthening peer relationships, improving self confidence and self-esteem, and teaching goal setting. Physical activity also can help with sleep patterns, which are important to children's development.

Lorenz et al. (2016), Wittber et al. (2013) and Blom et al. (2011) were articles that focused on using Fitnessgram and individual test scores to determine if there was any correlation between the two. They found high aerobic capacity and abdominal strength levels had a significant influence on reading, writing, mathematics and science grades. Students with the highest number of healthy fitness zones achieved were approximately three to four times more likely to have high levels of academic achievement (high test scores) compared to those with zero healthy fitness zone achieved. In some of my other research, I found aerobic capacity being the main area to show the most significant advantage to increase academic performance. Looking at the literature it brings me to think the increased supply of oxygen and blood flow going to the brain during aerobic exercise may be the most beneficial activity to see a result in academic performance.

As a physical education teacher, I believe what I teach has a major impact on the lifestyle my students will adhere throughout their lives. Showing them the importance of being physically and mentally healthy has major benefits. While I was doing my review of the literature I found an article titled, "Why We Should Not Cut P.E." The article did a great job of showing how important physical education is and the result it can have. Trost and Van Der Mars (2009) found studying 311 4th grade students in two schools, students who received 56 or more hours of physical education per school year scored significantly higher on Massachusetts' standardized tests in English and language arts than did comparable students who received 28 hours of physical education per year. There were no significant differences on mathematics scores.

Multiple meta-analyses and other studies which compiled studies together to come up with a conclusion on how personal fitness relates to academic performance came to the conclusion physical activity has a positive influence on academics. Alvarez-Bueno et al. (2017) and Donnelly et al. (2016) all found that physical fitness, single bout of physical activity, and physical activity interventions benefit children's cognitive functioning. On the basis of the evidence available, the authors concluded that physical activity has a positive influence on cognition as well as brain structure and function.

Fitness Levels and Brain Development

There have been many research studies done on the importance of physical activity and brain development. Chaddock-Heyman et al. (2014) found specifically, physical activity and higher levels of aerobic fitness in children have been found to benefit brain structure, brain function, cognition, and school achievement. For example, higher fit children have larger brain volumes in the basal ganglia and hippocampus, which relate to superior performance on tasks of cognitive control and memory, respectively, when compared to their lower fit peers. Higher fit children also show superior brain function during tasks of cognitive control, better scores on tests of academic achievement.

John J. Ratey published a book titled *Spark: The Revolutionary New Science of Exercise and the Brain*. In his book he elaborated on the importance of physical activity on influencing brain structure and cognitive development. Ratey (2008) states moving our muscles produces proteins that travel through the bloodstream and into the brain, where they play pivotal roles in the mechanisms of the highest thought processes. Having a healthy body will result in having a healthy mind and in turn could lead to high cognitive abilities. Dr. Charles Hillman developed a brain scan to support the findings of Ratey in 2007. Appendix 1 shows a brain scan, this scan

supports Ratey's findings of physical activity having a positive influence on learning. The picture represents a brain that has been sedentary and one that has just performed 20 minutes of walking. Based off of this picture, if a student maintains a healthy lifestyle and is physically fit their body will be producing more proteins which travel to the brain and should increase learning more than an individual who is not as physically fit.

Hypothesis

Based on this research, Morris Area fourth grade students whose aerobic capacity is in the healthy fitness zone should test above average on their NWEA/MAP reading and math tests.

Research Question

What is the impact that aerobic capacity levels have on individuals' reading and math test scores?

Conclusion

There have been multiple studies done and books published in support of how higher fitness levels in individuals can increase their cognitive abilities. There has also been studies done which contradict those findings with results of no effect on cognitive ability. With this study, it will determine if Morris Area fourth grade students show any correlation between student's who tested above in aerobic capacity and on their NWEA/MAP reading and math scores compared to students who tested below average in those same categories. The next chapter will be focusing on how the study was performed, the participants, data collection and how the data was analyzed to determine the results.

Chapter 3

Methods

Introduction

This study will focus on determining if aerobic capacity had an impact on NWEA/MAP reading and math test scores. The study was performed by taking Morris Area fourth grade students individual Fitnessgram test scores and cross referencing them with their NWEA/MAP reading and math scores. This study provided data to determine if there was a correlation with above average aerobic capacity resulting in higher test scores. I am doing this study because I am a physical education teacher and my goal is to teach students how to live a healthy and active lifestyle. Allowing my students to see the results if there is a correlation between being physically fit and higher test scores will encourage my students to do their best to maintain their own fitness levels.

Research Question

What is the impact that aerobic capacity levels have on individuals' reading and math test scores?

Research Design

This study will be using a correlational research design. This design was used because two different variables were measured. The two variables are the students' individual NWEA/MAP reading and math scores and their aerobic capacity scores generated through Fitnessgram. The design was used to determine if there was a positive correlation between higher aerobic capacity and higher reading and math scores. Data collected produced four different bar graphs for both reading and math. The bar graphs used show if there is a correlation between higher aerobic capacity resulting in higher test scores or if there is no correlation.

Setting

The study will be taking place in the elementary school where I am currently employed. This community has a population of 5,351, a median age of 30.7 and median household income of \$49,875. This community is located in an area surrounded by agriculture with an emphasis on crop land and dairy farming. The community is also home to two major manufacturing plants located within city limits. The elementary where this study will be conducted has 560 students enrolled. Of those 560, 73.7% are White, 18.7% Hispanic or Latino, 2.1% American Indian or Alaska Native, 1% Asian, 1.6% Black or African American and 2.9% are two or more races. There are 130 students who qualify for free and reduced meals out of the 560.

Participants

The fourth grade consists of 12 English Language Learners, 6 with IEPs, 39 male students and 37 females. The total number of students in fourth grade is 76, but with distance learning not all of those students were able to be tested.

Sampling

Non-probability sampling will be used in this study. This study will be done using fourth grade students at Morris Area Schools. This sampling method was used based on convenience and access to the fourth grades Fitnessgram scores.

Instrumentation

I will be using the test scores collected from each student's individual NWEA/MAP reading and math scores along with their healthy fitness zone levels for aerobic capacity and muscle fitness from our Fitnessgram software. Our Fitnessgram software data is entered by myself and my two colleagues. The software analyzes the scores and places them into three different categories. The categories the software uses are healthy fitness zone, needs

improvement and health risk. The software does this by using their age, height, weight and fitness test score record by the person who administered the test.

Data Collection

Morris Area fourth grade students were tested on the 20-meter Pacer test by their physical education teacher. The Pacer test is a test made by the Cooper Institute to measure an individual's aerobic capacity. The test is based on the number of laps an individual can get throughout the testing period. Each individual's score was entered into the Fitnessgram software. The software takes the individuals age, height and weight to calculate the aerobic capacity. Access was given to review each student's NWEA/MAP scores from the Morris Area Schools database after informed consent letters were received from each student participating in the study. The students' scores from both areas were analyzed to see if there was a correlation between each area.

Data Analysis

Data were collected for each student's NWEA/MAP reading and math test scores along with their aerobic capacity levels from Fitnessgram. The first data analyzed were the students reading scores. Percentages were calculated to determine whether or not students were in the healthy fitness zone or fell below for aerobic capacity and if they scored above the Minnesota state standard average or below on the individual NWEA reading test. The second portion of data focused on the individual math scores. These scores were analyzed using the same process as the reading scores. The categories used were students who were in the healthy fitness zone or fell below for aerobic capacity and if they scored above the Minnesota state standard average or below on the individual MAP math test. These categories were represented by using a bar graph for both reading and math.

Table 1.0

Research Question and System Alignment

Research Question	Variables	Design	Instrument	Validity & Reliability	Technique	Source
RQ 1	IV: Individual fitness levels DV: Fitnessgram scores	Correlational	NWEA/MAP Reading and Math Scores Fitnessgram test scores	NWEA/MAP scores will be evaluated by myself from the schools database. Fitnessgram scores will be assessed by the students physical education teacher and entered into Fitnessgram by the same teacher who administered the assessment. . Fitnessgram scores will be analyzed by myself using our Fitnessgram software.	Individual test for NWEA/MAP and Fitnessgram	Fourth grade students Sample size: 76

Procedures

Fourth grade students were assessed by their physical education teacher on their aerobic capacity levels by performing the 20-meter pacer test the weeks of September 8, 2020 and October 5, 2020. Their scores were entered into the Fitnessgram software when all the tests were completed. Fourth grade took their NWEA/MAP reading test on September 25, 2020 and math on September 27, 2020. Once all of the scores were in Fitnessgram and NWEA/MAP test results were received the process of analyzing the data began.

Ethical Considerations

Each student's scores were only reviewed by me. The students' names were not revealed at any point during this study. Students were given a number to represent their individual scores for both tests.

Conclusion

In this chapter, the demographics of the community where the study will be performed were described, the demographics of the fourth grade students involved in the study and how the data was collected and analyzed. The next chapter will focus on the results from the study to determine if aerobic capacity levels impacted academic test scores.

Chapter 4

Results

This study was done to determine if there was any correlation between higher aerobic capacity levels in fourth grade students yielding higher academic test scores. Aerobic capacity was measured by the student performing the 20-meter pacer test. The academic test scores that were used were the NWEA/MAP for reading and math.

Data Collection

Data were collected in four different categories. The categories used were above average aerobic capacity levels and above average reading scores, above average aerobic capacity levels and below average reading scores, below average aerobic capacity and above average reading scores and below average aerobic capacity and below average reading scores. The math scores were measured using the same four categories. The scores were assessed and used to develop a bar graph representing each category for reading and math (See appendix 3).

Results

Research Question

Do aerobic capacity levels have an impact on individuals' reading and math test scores?

Table 2.0*Aerobic Capacity and NWEA/MAP Reading and Math Scores*

Category of Assessment	Number of Students Out of 53
Above average aerobic capacity/above average reading score	21
Above average aerobic capacity/below average reading score	17
Below average aerobic capacity/above average reading score	7
Below average aerobic capacity/below average reading score	8
Above average aerobic capacity/above average math score	23
Above average aerobic capacity/below average math score	15
Below average aerobic capacity/above average math score	7
Below average aerobic capacity/below average math score	8

Aerobic capacity was determined by the individuals 20-meter pacer score which was calculated by using Fitnessgram software. NWEA/MAP reading and math scores were determined by using the mean RIT score from the state of Minnesota. The mean RIT score for reading was 196.7 and the mean RIT score for math was 199.5. (See appendix 3 for a bar graph representing the data for each category)

Note 13 out of the 17 students 76%, who tested in the above average aerobic capacity and tested below average in reading were within 10 or fewer points of testing above average in their reading scores. In the categories of above average aerobic capacity and below average math scores, 13 out of 15 students 86%, tested within 10 points of testing above average and 10 out of those same 15 students 66%, tested within 5 points of testing above average in math.

Data Analysis

Data supports the notion that higher aerobic capacity levels in fourth grade students can lead to higher academic performance scores in reading and math. A T-test was run on the data to determine the percentage in each area. Above average aerobic capacity and above average reading scores yielded a T-test score of .3695 with 45.6% confidence. Above average aerobic capacity and above average math scores yielded a T-test score of 2.0187 with 84.46% confidence. These data showed higher aerobic capacity levels had more of an impact on math scores than reading. These findings support the research and data collected from Martin and Chalmers (2007) which found personal fitness levels had more of an influence on math related performance.

COVID-19 did have an impact on this study by limiting the number of students able to participate. The students who were distance learning were not able to perform the 20-meter pacer test to determine aerobic capacity. COVID-19 also provided an accurate baseline for the data following distance learning.

Conclusion

Analyzing the data collected proved a direct correlation with higher aerobic capacity levels and above average test scores in reading and math. The data did not show as much correlation as research suggested, but providing data to support maintaining healthy personal fitness in fourth grade students will lead to higher academic performance. The data showed a higher correlation in math than in reading.

Chapter 5

Implications for Practice

Action Plan

This study has provided data to support the notion that higher aerobic capacity levels have a positive impact on academic performance. This study proves the importance of continuing to have all of my students perform their daily warm-up to increase their aerobic capacity levels. Continued reflection will take place on different lessons and units taught to incorporate running or any cardiovascular exercise to benefit all students. This data will help students understand the importance of why we do cardiovascular activities for a warm-up when indoors or one of the designated runs when outdoors. This study provides evidence to families on the importance of maintaining a healthy lifestyle not only in school, but outside of school as well. Administration will be able to recognize the importance of physical education and the impact it has on our students' futures academically and physically. Physical education provides students with the opportunity to keep their mind and body healthy throughout their educational career and the resources to do so outside of school.

Plan for Sharing

The data collected in this study was provided to administration and staff in my district. Doing this will encourage staff to keep the students physically healthy by either taking them outdoors for walks or getting them moving in the classroom doing brain breaks. Administrators will be able to see the evidence supporting physical education and how it relates to higher academic test scores. An email will be sent to parents in the district discussing the importance of getting their child/children outside and moving during the summer months. In the letter, the data will be provided to support the importance of staying physically active.

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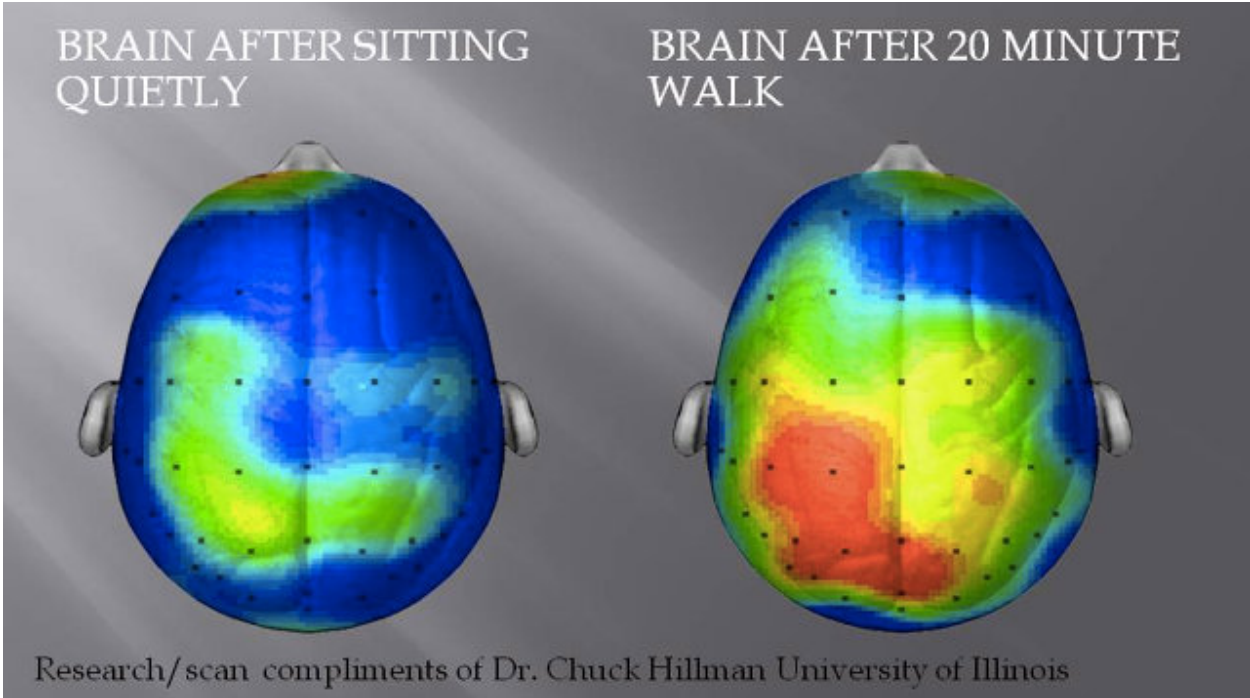
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Appendix 1



Appendix 2 Consent Form

Please read this consent agreement carefully before agreeing to participate in this study.

Title of Study: Aerobic Capacity Fitness Level Impact on NWEA/MAP Reading and Math Scores

Purpose of the study: Determining if there is any correlation between higher aerobic capacity levels and higher individual reading and math test scores.

I am writing to you today to obtain your permission to review your child's NWEA/MAP math and reading test scores. I will be using these test scores to cross reference if there is any correlation between aerobic capacity levels and above average test scores. I am doing this analysis of your child's NWEA/MAP reading, math and Fitnessgram scores to complete my thesis paper for my masters degree. The scores will be categorized into four different areas, above or below MN state NWEA/MAP standards for both reading and math and above or below the national average for aerobic capacity determined by your son or daughters 20-meter pacer test . It is greatly appreciated in obtaining your permission to analyze these scores to provide me with enough data to support my research and findings. If you do not feel comfortable allowing me to review your child's scores that is your right as a parent. Please return the second page of this letter to Mr.Jipson or the elementary office by Friday, February 5th.

Risks: Participation in this study provides minimal risk.

Benefits: This study will provide data for physical education teachers and school administrators to determine if there is any correlation between students with higher aerobic capacities testing higher on academic tests.

Confidentiality: Each student's name will remain confidential throughout the study and will be given a number to represent their score.

Thank you for your time,

Andrew Jipson

Morris Area Elementary Physical Education Teacher

_____ I give Andrew Jipson permission to review my child's NWEA/MAP reading and math test scores.

_____ I do NOT give Andrew Jipson permission to review my child's NWEA/MAP reading and math test scores.

Student Name: _____

Parent Signature: _____

If additional information is requested you can reach out to me by email or phone. If you would like to reach out to my university supervisors I have provided contact information.

Andrew Jipson

Email: ajipson@morris.k12.mn.us

Phone: (320) 585-2046

Whom to contact about your rights in this experiment:

Ximena Suarez-Sousa, Department of Leadership and Learning MSUM

Email: suarez@mnstate.edu

Phone: 218-477-2007

Dr. Lisa I. Karch, Chair of MSUM Institutional Research Board

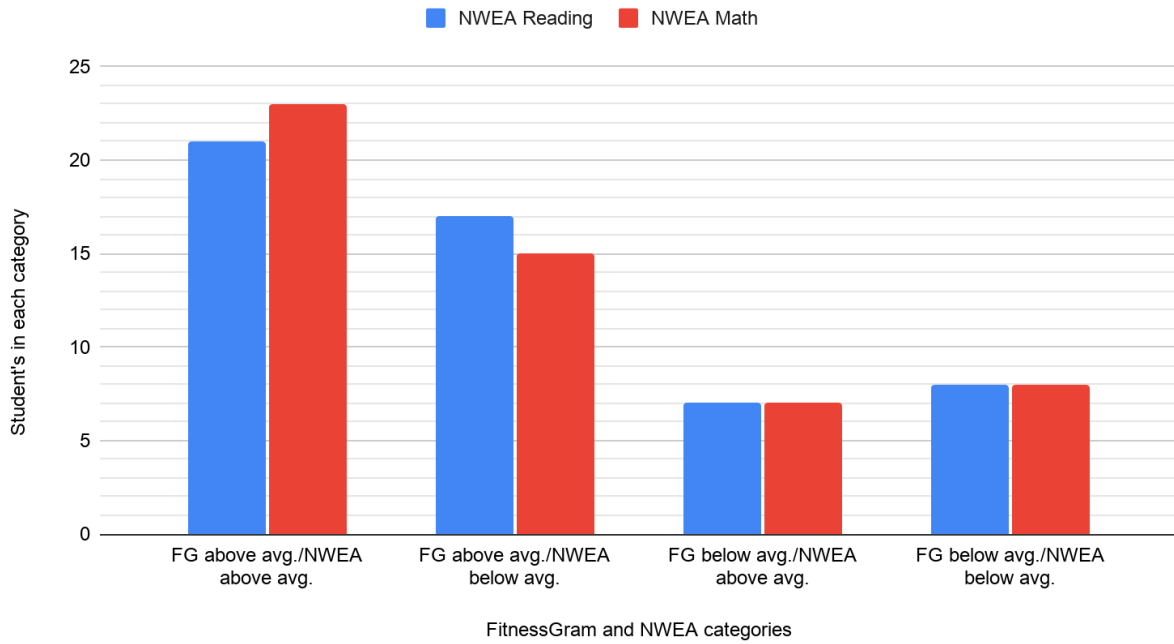
Email: irb@mnstate.edu

Phone: 218-477-2699.

Appendix 3

Fitnessgram and NWEA/ MAP Bar Graphs

FitnessGram Aerobic Capacity vs. NWEA Reading and Math



Appendix 4
IRB Approval

Institutional Review Board



DATE: February 1, 2021

TO: Ximena Suarez-Sousa, Principal Investigator
Andrew Jipson, Co-Investigator

FROM: Lisa Karch, Chair
Minnesota State University Moorhead IRB *Lisa Karch*

ACTION: DETERMINATION OF EXEMPT STATUS

PROJECT TITLE: [1712016-1] Aerobic Capacity Fitness Level Impact on NWEA/MAP Reading and Math Scores

SUBMISSION TYPE: New Project

DECISION DATE: January 28, 2021

Thank you for your submission of New Project materials for this project. The Minnesota State University Moorhead IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations under 45 CFR 46.104.

We will retain a copy of this correspondence within our records.

If you have any questions, please contact the [Minnesota State University Moorhead IRB](#). Please include your project title and reference number in all correspondence with this committee.

This letter has been issued in accordance with all applicable regulations, and a copy is retained within Minnesota State University Moorhead's records.

Appendix 5
District Permission



Morris Area Elementary School
151 South Columbia Avenue
Morris, MN 56267
www.morris.k12.mn.us

Shane Monson, Principal
320-589-1250 ext. 2000
smonson@morris.k12.mn.us
Fax: 320-589-3920

January 8, 2021

To Whom It May Concern,

This letter is to grant Andrew Jipson permission to conduct an action research study at Morris Area Elementary School during the 2020-2021 academic year. I understand that this study poses no risk to those involved or to Morris Area Schools. I also understand that all information will be kept confidential and will only be used for the purpose of this study.

Sincerely,

A handwritten signature in cursive script that reads "Mr. Shane Monson".

Mr. Shane Monson

Elementary Principal

320-585-2000

Morris Area Elementary School