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# Investigating the Impacts of Remote Learning During Covid-19 on Student Athletes' End-of-Course Assessments

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**SHAWNEE STATE UNIVERSITY**

# Investigating the Impacts of Remote Learning During Covid-19 on Student Athletes' End-of-Course Assessments

A Thesis

By

**Hillary Moreland**

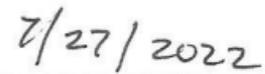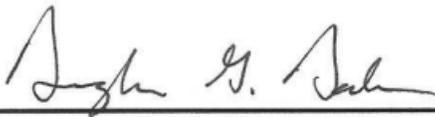Department of Mathematical Sciences

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The thesis entitled 'Investigating the Impacts of Remote Learning During Covid-19 on Student Athletes' End-of-Course Assessments' presented by **Hillary Jean Moreland**, a candidate for the degree of **Master of Science in Mathematics,** has been approved and is worthy of acceptance.

_7/27/2022_
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**ABSTRACT**

The education system has been in disarray since the disruption caused by the Covid-19 pandemic. This research project plans to evaluate the learning process of in-person learning verses online learning. The purpose of this project is to provide an insight into online learning and the hope is to spark a conversation to improve it. The data for the project was collected from a high school located in Huntersville, North Carolina. The findings from this study are: (a) there is a statistically significant difference in means between the 2020-2021 and 2021-2022 school year state EOC scores, (b) there is a statistically significant difference in means of the 2020-2021 EOC scores across at-risk level, (c) there was not a statistically significant difference in means of the 2020-2021 EOC scores across grade levels of juniors and seniors, (d) there was a statistically significant difference in means of the 2020-2021 EOC scores across team or individual sport type, (e) gender, ACT scores, 8th grade EOG scores and 2020-2021 EOC scores is the best model to predict the 2021-2022 EOC scores. These results imply there is a large learning gap in online learning that needs to be reevaluated.

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I would like to acknowledge my committee chair, Professor Douglas Darbro, for all his guidance. He clearly has a passion for education, and without his knowledge and patience this would not have been possible. I am extremely grateful to have a wonderful wife whom I love dearly. She has been by my side every step of this journey and has stepped up in every way possible while I was busy working on this project. I would also like to thank my parents for their love, support, and guidance in my educational career. Thank you.

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**Introductory Paragraph**

Education and the world have been in a disruptive state since the start of the Covid-19 pandemic. Disruption in education has been a regular occurrence since the concept of education originated. The most common disruptions in education that educators have grown accustomed to have been caused by chronic absenteeism, natural disasters, and wars. The pandemic caused by the Coronavirus has been the world's largest disruption in education to date (Islam, 2021). In March of 2020 the education system as we know it was changed forever.

The intention of this study is to dive deep into the known impact of Covid-19 on student athletes. Therefore, examining the impact that Covid-19 has had on high school student-athletes is crucial. This study will evaluate the impact of Covid-19 on student athletes' End of Course scores over the course of three years and plans to discover if there was a major impact from the drastic change to online learning on their End of Course scores.

**Background of the Problem**

Covid-19 is a virus that has drastically impacted the world in a multitude of ways since it was first discovered. The world first learned of its existence late 2019. In February and March of 2020, each state had its own unique challenges to face. In March of 2020, North Carolina's Governor, Roy Cooper, declared a state of emergency. This epidemic closed K-12 public schools statewide, and mandated a stay-at-home order, unless there was an emergency (Covid-19 Orders & Directives, 2020). This had an enormous, unprecedented impact on the North Carolina school system.

As a result of these circumstances, all teachers and students were required to teach and learn fully online. For many teachers, it was the first time and they had to learn how to effectively teach students from a distance. The North Carolina Virtual Public School (NCVPS) employs more than 700 well-trained teachers to deliver online learning as opposed to the roughly 98,590 in-person teachers (Teaching and Learning, 2021; Public Education in North Carolina, n.d.). This is just one of the many obstacles the United States faced as a result of the Covid-19 pandemic.

The world is approaching year three of living with Covid-19. There are still many limitations in place to attempt to protect people from the virus. We are limited because the Covid-19 virus is mutating and creating many different variants, each with its own set of specific problems (*Covid Variants: What You Should Know,* 2022). This continues to add to the unknowns of the virus. Stuart Ray M.D., who is the vice-chair of medicine from data integrity and analytics was asked if there would be more variants of the Covid-19 virus and his response was "New variants of the SARS-CoV-2 virus are detected every week" (*Covid Variants: What You Should Know,* 2022).

Further, he also stated "Most come and go — some persist but don't become more common; some increase in the population for a while, and then fizzle out. When a change in the infection pattern first pops up, it can be very hard to tell what's driving the trend — changes to the virus, or changes in human behavior" (*Covid Variants: What You Should Know,* 2022, para. 24).

There are currently two prominent variants of Covid-19: Delta and Omicron. Both are very contagious and spread extremely easily (*Covid variants: What You Should Know,* 2022). Fortunately, there are now several different vaccines and booster options from which to choose. Like any virus, vaccines are not 100% preventative for everyone.

A student athlete is a student first. However, the student participates in sports at their school. Student-athletes make up approximately 57% of a school's population (Kositsky and Peele, 2021). There is an abundant amount of research regarding the correlation between high school student-athletes and student grades. This topic has been examined at length and has two main results. One of the key findings follows.

Hauser and Lueptow (1978) evaluated the relationship between student-athletes and student success by comparing high school athletes' grade point averages versus the grade point average of students who do not participate in athletics. They found that the grade point average of non-athletes was lower than the grade point average of student athletes (Klein, 2011). In spring of 2020 high school athletics started as usual prior to the disruption. For instance, most local softball teams played three games at the beginning of the season. Subsequently, due to Covid-19's policies and procedures implemented by the Governor, school sports were shut down completely. Likewise, in the fall semester of 2020, due to the precautions and protocols associated with Covid-19, all football games were rescheduled to the spring semester of 2021.

However, non-contact sports were unaffected. In all these sports, extra health precautions were implemented. Some of these precautions included temperature screenings, mask mandates while practicing and during games, shorter seasons, and the banning of all unnecessary contact between student athletes.

March of 2020 was the last time that the students and teachers of Charlotte-Mecklenburg Schools would go inside a school building for the rest of the 2019-2020 school year. Over the summer of 2020, Charlotte-Mecklenburg Schools decided they were going to begin the 2020-2021 school year with all education being provided strictly online. This meant that teachers would be completely restructuring the way they typically taught students. Teachers used online platforms like Zoom, Google Meets, or Canvas to deliver live instruction.

Another regulation that Charlotte-Mecklenburg schools implemented was there should be less assignments and no one could receive a grade of less than 50% on any graded assignments. The Charlotte-Mecklenburg School System was asked to elaborate on why they choose this, this is what they had to say, "CMS leaders argued the new grading policy changes are meant to promote flexibility during unprecedented times" (Goldner, 2021, para. 1). The North Learning Community Superintendent Matthew Hays said, "The student is still not passing the course, but what it does signify to the student is that there's still hope that the student can still pass the course" (Goldner, 2021, para.12).

Creating this policy during the Covid-19 pandemic made students feel less anxious about their schoolwork. In addition to this, being isolated at home and not interacting with their peers and others in society did take a toll on students' mental health. A survey organized by Society for Industrial and Applied Mathematics collected feedback from more than one thousand juniors and seniors across the United States. One of their many findings included, "The main drawbacks of

online learning? According to the majority of students, it's hard to stay focused (76 percent) and it can feel lonely or isolating due to the lack of in-person social interaction and connection to other students (66 percent)" (*One in Three High School Students,Survey Shows,* 2021, para. 9).

In March of 2021, parents decided if they wanted to send their children back into the school building to finish their last two months on the school campus or remain remote. There were only twelve students out of ninety in the researcher's three classes at Hopewell High School that returned to in-person learning at this time.

Since the majority of students were still online, this was still very challenging for teachers to teach to both audiences. Most teachers still taught their live lessons virtually using an online platform such as Zoom, Canvas, or Google Meet. At the time, there were strict rules for staying at least 6 feet apart, wearing face masks at all times and sanitizing anything the teachers or students touched.  This included students spraying and wiping down their desks with a disinfectant solution to clean and sanitize them. It was extremely challenging to be back in the classroom with all of these rules in place.

However, many teachers and students felt that it was nice to see each other again after being apart for so long.  The most important positive outcome of going back to in-person learning was being able to receive instant feedback from the students, just as it was in the past. The researcher seeks to bring awareness to all of the rules and regulations surrounding that year so this research paper can be transparent. With this being said, was there an academic impact from the Covid-19 pandemic on student-athletes, and if so, to what extent? If the findings are significant, which the researcher anticipates, then there has to be a drastic change.

**Statement of the Problem**

The purpose of the study is to determine the extent of the academic impact from the pandemic on student athletes. The researcher will examine the student athletes' grades over the course of three years. Using their eighth grade End-of-Course exam scores as the control, it will be determined if there is a significant difference between the year of remote learning and this academic year, again by examining End-of-Course exam grades from those years.

This is a study that has not been conducted previously. There have been some studies on the impact of Covid-19 and students, but none directly focusing on student athletes. There are many studies that have examined student athletes and grades. However, none of these studies took place during a disruption in learning like Covid-19.

**Purpose of the Study**

The purpose of this study is to examine the already existing research and to determine if there is a significant difference in the student athletes' grades over the course of two years. This information has the potential to inform everyone in the school community, i.e., principals, administrators, guidance counselors, athletic directors, teachers, and parents of the impact of the pandemic on student-athletes. This research could yield results that would allow the school administration to determine if measures taken to continue teaching students during the pandemic were effective. It also has the potential to improve teaching methods moving forward, particularly if in-person teaching is ever disrupted again. The purpose of this study is to examine the relationship between the disruption of Covid-19 and student athletes. More specifically, will

the disruption of Covid-19 and the pandemic take a toll on the student athletes' End-of-Course

test grades?

**Significance of the Study**

This study will address the gap that lies within there not being conclusive research

specifically related to the effects of Covid-19 and student athletes. Determining the differences

or similarities in student athletes' grades over the two years will help establish whether remote

learning was successful or if teachers need to re-evaluate the most effective way to teach online.

Teachers may also need to implement alternate practices, should something like this ever happen

again in the future.

The Covid-19 pandemic has only been relevant since late 2019, and there are not many

published studies on the topic. Nevertheless, each day more articles are published, which

indicates that this is a very important topic that needs to be examined thoroughly. There are

currently no reputable studies about how the Coronavirus has affected student-athletes. This

study will examine the effects of the pandemic on student-athletes.

With this in mind, the researcher will also be evaluating information retrieved as a result

of other disasters that have occurred which have disrupted in-person learning.  This will include

natural disasters. This is especially relevant for determining if a disruption in learning from the

Covid-19 pandemic has any effect on student-athletes, or on students in general. "It is important

to keep in mind throughout that data continues to be gathered and analyzed, and it will be some

time before COVID-19's full impacts on students come clearly into view" (Education in a

Pandemic - Ed.gov, para. 1). The proposed study's focus is on investigating the success of

student-athletes using their End-of-Course grades from their eighth-grade academic year, during the Covid-19 pandemic, and the year after the in-person learning disruption caused by the Covid-19 pandemic.

One of the researcher's goals for conducting this study is to bring awareness to how much Covid-19 affected students during the year learning was online. It is extremely imperative that the data from state testing, which was conducted throughout the year of online learning, is studied to a great extent. With these results, teaching could be changed forever. Since people cannot predict what the future holds, particularly with the virus constantly mutating, it is highly important to examine this data because the world may soon be in a situation where it will need to teach fully remotely again. This is why the researcher will be examining the differences in the End-of-Course test scores across three years with student-athletes. Hopefully, with the knowledge obtained, it can be determined if how students were taught online worked or if drastically different teaching strategies are needed.

**Primary Research Questions**

The primary research question of this study is as follows; Is there a significant difference in the End-of-Course test scores for student-athletes during and after the Covid-19 pandemic? Research question two seeks to answer whether or not there is there a significant difference in mean scores across students' at-risk level (low, moderate, high) and End-of-Course test result? Research question three seeks to answer whether or not there is a significant difference in mean scores across students' grade level (junior and senior) and End-of-Course test scores. The fourth research question asks if there a significant difference in mean End-of-Course test scores across

sport type (individual or team)? The last research question asks, are gender, ACT scores, 8th-grade End-of-Grade scores, and 2020-2021 state's End-of-Course scores significant predictors of academic success on the 2021-2022 state's End-of-Course scores?

**Hypothesis**

The hypothesis for the primary research question is that there is a significant difference between the disruption of in-person learning and lower End-of-Course test scores for student-athletes. The hypothesis for the second research question is that there will be a significant difference in End-of-Course test scores across students with differing at-risk levels. The hypothesis for the third research question is that there will not be a significant difference between student grade level and End-of-Course test scores. The hypothesis for the fourth research question is that there will not be a significant difference between End-of-Course test scores and sport type. Lastly, the hypothesis for the final research question is that gender, ACT scores, 8th grade End-of-Grade scores, and 2020-2021 End-of-Course scores will be significant predictors of academic success on the 2021-2022 state's End-of-Course exam.

**Research Design**

This study's research design is both predictive and hypothesis testing. This study will primarily examine the results of the End-of-Course state assessments from the Covid-19 school year (2020-2021) and the year after (2021-2022) using the students' eighth-grade state assessment scores as the control. The researcher will test a hypothesis on whether End-of-Course

test scores were significantly different during the school year of online learning versus the year after.

Data will be stored in an Excel spreadsheet. All of the statistical computations will be in R. This study will use R to compute dependent samples t-tests, unpooled independent samples t-tests, ANOVA, and multiple regression techniques to examine the data to explore whether there are differences in students End-of-Course scores from the year of online learning and the year after, when returned to the classroom, using the students' eighth-grade End-of-Grade assessment score as the control.

The data that is being used in this study is from Hopewell High School. Hopewell High School is a school located in Huntersville, North Carolina, which is on the outskirts of Charlotte, North Carolina. Hopewell is a part of one of the largest school districts in North Carolina, Charlotte-Mecklenburg School (CMS). Hopewell High School is comprised of approximately 1,900 students along with approximately nine administrative staff (i.e., principal, assistant principals, dean of students, and office secretary), 103 teachers, and 31 supporting staff members. Hopewell High School is a very diverse school, it is made up of approximately 44.7% African American, 30.6% Caucasian, 17.4% Hispanic, 4% with two or more races, 2.7% Asian, and 0.6% American Indian (*Hopewell High in Huntersville, NC - US News Best High Schools,* n.d.).

Hopewell High School's administration will provide the researcher with a student data set consisting of quantitative and qualitative data.  The information will include the gender, age, race, grade level, individual or team sport played, at-risk level to graduate, ACT score, 8th-grade End-of-Grade scores, 2020-2021 state's End-of-Course scores, and 2021-2022 state's End-of-Course scores.

**Theoretical Framework**

This study is embedded in the disruptive innovation/education theory.

A disruption is a sudden break or interruption. Disruptive education is, therefore, that which intends to break with the established model to improve the existing one. And many experts think the change is both necessary and urgent because the current system is anachronistic, in other words, it is still anchored in the last century and is failing to address the needs of the digital age" (Corporativa, 2022, para. 2).

By using the theoretical framework described above, the researcher seeks to determine the most beneficial way for educators to proceed, should a virus similar to Covid-19 or any other cause of long-term disruption in education present itself again in the future.

**Assumptions, Limitations, and Scope**

The assumption is that students completed the testing to the best of their ability in every End-of-Course test during the course of the three years of data collection.

There are two main limitations of this study. First, since the study requires three years of data to examine, it can only consider juniors and seniors at Hopewell High School.  Students will also have to be student-athletes. Unfortunately, this creates a relatively small sample size. The second limitation is that data is only being collected from one school and not from high schools across the county.

The scope of this study will be high schools on the outskirts of major cities made up of similar demographics with student athletes. The schools that can closely match these descriptors will benefit from this study.

**Definition of Terms**

The definitions of terms used throughout this paper are below.

Covid-19: Also known as, *Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus* (Coronavirus, para. 1).

Pandemic: "Occurring over a wide geographic area (such as multiple countries or continents) and typically affecting a significant proportion of the population" (Merriam-Webster, 2022).

Student athlete: Is a student who participates in a sport at their designated school.

End-of-Course Exam (EOC): This is an exam taken in high school at the end of the semester/year when the course has been completed. It is a standardized test made by The North Carolina Department of Public Instruction.

End-of-Grade Exam (EOG): This is a North Carolina state standardized exam taken at the end of the school year in elementary and middle school.

ACT score: Is defined as a four-part multiple-choice test consisting of an English, mathematics, reading, and science section. The scores of all four parts are then averaged and rounded to the nearest whole number. The scores can range from one to 36 (*Understanding Your Score*, 2021).

At-risk level: Is classified as at-risk to graduate. It is categorized into three categories: high, moderate, and low. Low indicates that there is a low chance a student will graduate from high

school, moderate means there is a moderate chance a student will graduate from high school, and high indicates that there is a high chance that a student will graduate from high school. Academic success: This will be determined by the grade a student gets on their End-of-Course exam. Where a 100-90 is an A, 89-80 is a B, 79-70 is a C, 69-60 is a D, and 59 and below is an F.

**Summary**

In conclusion, it does not appear that Covid-19 will be a crisis of the past soon. Although the virus is in its third year, one fatal mutation could send students and educators back to learning and teaching remotely. Thus, this researcher will examine the End-of-Course grades of selected junior and senior student-athletes from two separate years, while using the students' eighth-grade End-of-Grade scores as a control to determine if there is a significant difference in those End-of-Course scores. The significance of this study is to bring attention to empirical evidence regarding the effects of online learning at the high school level. The researcher hopes the education system does not end up in this predicament again. However, if it does, this study seeks to provide an ample amount of knowledge to send to the educators and leaders and make recommendations for the most appropriate direction moving forward.

The purpose of the literature review is to examine and review the existing literature in the researchers' field of study. There are five main subcategories of research for this study. Those subcategories are as follows: disruption in education, student athletes as learners, online learning in high school, the effects of Covid-19 on learning and technology access. By researching previous disruptions in education, the researcher seeks to evaluate the impact that those disruptions have had on education for students in order to draw comparisons for the disruption in learning due to Covid-19. Studying student athletes as learners will answer the question, "Apart from other circumstances, are student athletes' better learners?". Evaluating online learning in high school will compare pre Covid-19 online learning statistics to the statistics acquired during the Covid-19 pandemic. Researching the effects of Covid-19 will assist with this study by determining the impacts of the online year of learning due to Covid-19. Lastly, evaluating the effects of how accessible technology is within different communities allows the researcher to recognize the role that technology plays in online learning for students.

**Disruption in Learning**

Disruption in education has presented itself in many forms throughout the course of history. Gibbs et al. sought to determine the lasting impacts on children whose education was disrupted due to a natural disaster. In particular, the subject of this study examined the change in academic scores for children exposed to a major bushfire in Australia which occurred in 2009 (Gibbs, et al., 2019). One of the benefits of this study is that it evaluates the effects on students 2-4 years after the disaster occurred. Evaluating ongoing effects of educational disruptions is

imperative to educators' success in building a better educational system to prevent learning loss due to future pandemics or natural disasters.

Although long-term effects of the Covid-19 pandemic on academia are not known at this time, studies such as this one, which evaluates effects on education of major Australian bush fires, can offer possible comparisons to long-term effects from natural disasters. In this study, comparisons were also made between students who were in higher and lower affected areas. The results indicated that academic scores were reduced in areas with higher levels of bushfire impact (Gibbs, et al., 2019). This will be important in determining the effects of Covid-19 on students as well; Do children who were "more" affected by Covid-19 suffer more serious long-term education consequences? For example, is a student whose caregiver became seriously ill or even died from Covid-19 more likely to be affected academically than a child whose family remained well throughout the pandemic? The study also indicates that interruptions in the development of cognitive skills can certainly have adverse effects on individuals later in their education. While the subject of this study does differ in relation to the type of disaster as well as the age of students affected, it is still relevant to the researcher's overall thesis proposal.

In their 2020 study, Segarra-Almestica et al. examine educational attainment from school closures due to a variety of natural disasters that have impacted Puerto Rico, such as hurricanes, earthquakes and aftershocks. This study analyzes data over the course of four years beginning in September of 2017 when Hurricane Irma struck and continues on to the 2020 earthquakes. The researchers collected standardized test data from Puerto Rico's Department of Education Student Information System. The findings revealed that for the 2017-2018 school year that was affected by Hurricane Maria, the standardized test scores for students were significantly lower, between 14 and 20 percent, compared to students in areas not affected by Hurricane Maria. During their

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research, the researchers also found that after Hurricane Maria, eighth graders were 18 percent more likely to drop out if they were in a medium-impacted area (Segarra-Almestica et al., 2020). Although natural disasters often cause physical damage, which results in schools and other structures having to be repaired or entirely rebuilt, there are additional obstacles that recovering from a pandemic present.

In 1916 the United States of America experienced a polio epidemic. It was one of the first of its kind in the United States, effecting New York City and New Jersey first and quickly spreading across the USA. This outbreak had negative repercussions on the education system with many quarantines and extended school closures at the beginning of the 1916 school year (Meyers & Thomasson, 2020). Thirty-eight cities announced they would have school delays. 84 percent of these cities opened over 2 weeks late and only three cities (Milwaukee, Chicago, and Detroit) opened on time (Meyers & Thomasson, 2020).

During their research, Meyers, and Thomasson (2020) developed two ideas about how the polio epidemic may have reduced educational achievement. Firstly, children who contracted polio would have missed school due to the illness, which would have reduced their educational consumption. Secondly, the majority of schools experiencing a delay in starting the schoolyear would hinder a student's educational achievement. Many parents also waited to enter their children into formal schooling. Students that have their education disrupted, even though it may be a small amount of time, will likely still negatively affect their education. Meyers and Thomasson (2020) in their review noted that:

> Other research does suggest that interruptions in schooling at crucial points of
> development may have long-run impacts. Hernandez (2011) suggests that children in
> third-grade experience a pedagogical shift from "learning to read" toward "reading to

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learn." A failure to develop this proficiency in reading on time appears to inhibit human capital accumulation of students and limits the potential to keep pace with their peers. Lloyd (1978) suggests that students who perform at a lower level than their peers may be more likely to drop out of school, with third-grade academic performance accurately predicting whether an individual would drop out of school nearly 70% of the time (para. 23).

Meyers and Tomasson's (2020) findings were that there was a clearly negative impact of polio on education and that it was statistically significant for all students through the age of seventeen in 1916. Their study also revealed that children who lived in areas with larger polio outbreaks had more negative academic effects compared to students in smaller outbreak areas. Children under ten had the biggest education reduction associating with a 0.13-year reduction on average (Meyers and Thomasson, 2020).

Some of the gaps that this research has is that in the early 1900's the labor laws were far more lenient. Fourteen-year olds could join the job and labor force. Taking this into account could skew the data. In addition to this, early 1900 technology was obsolete compared to what we have now, making online learning not an option for students over a century ago. This made it much more difficult for students and educators at that time to have access to educational materials.

In 1918 and 1919, the world was greatly impacted by the influenza pandemic. The 1918-1919 influenza pandemic is recorded in history as one of the deadliest flu epidemics of all time. Half a billion people worldwide experienced the effects of the 1918 influenza pandemic.  In addition to this, approximately 50 million people died from the disease (*1918 pandemic (H1N1 virus),* 2019). Schools across the United States closed their doors at the beginning of the school

year due to the 1918-1919 flu pandemic. Some states ordered schools to close from October 10-26 and other states closed their schools from October 8th to November 16th. Other states ordered no closures and others urged the community to close schools if the flu became aggressive in the area (Austin, 2018). Ager, Eriksson, Karger, Nencka, and Thomasson (2020) studied the impact of school closures and absenteeism during the 1918 flu pandemic and found that the school closures had a small to no effect of the loss of education.

Swedish researchers André Richter and Per Olof Robling investigated the educational impacts on Swedish children who were in the womb during the 1918-1919 influenza pandemic. Richter and Robling's study evaluated the effects on people who were born during the pandemic. The results of this study will help determine if there will be generational education attainment issues. Richter and Robling's findings for women showed that their educational attainment reduced by approximately 3 to 4 months and their probability of attending college reduced by 3 to 5 percentage points. Men's educational attainment reduced by approximately 4 to 7 months of schooling and their probability of attending college reduced by 7 to 11 percentage points (Richter & Robling, 2016).

**Online Learning**

In order to have the highest chance of success in online learning, there are a number of things that students need. Students need access to reliable internet, a laptop, a separate space to do schoolwork with little to no distractions, tutors to assist with understanding the material and providing support, and a strong support system at home that consists of daily accountability check-ins to ensure students are on task (Squire, 2021).

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Prior to the pandemic, for the academic school year of 2017-2018, there was a total of 297,712 students enrolled in full-time virtual school and 132,960 students enrolled in a blended hybrid school across America (Molnar, et al., 2019). Blended schools' function by combining online learning and in-person education. Enrollment in virtual schools and blended learning schools from the 2016-2017 school year to the 2017-2018 school year were increasing tremendously, but the students enrolling were comprised of a smaller minority percentage and a lower socioeconomic status than that of the students enrolling in public schools nationally (Molnar, et al., 2019). The average graduation rate among all virtual schools is 50.1% while the average graduation rate is 61.5% for blended schools. By comparing these numbers to the national average graduation rate of 84%, this indicates that students are typically less successful in graduating high school without receiving their education fully in-person (Molnar, et al., 2019).

Virtual schools in Ohio have reported that students enrolled in online schools have lower growth in both their reading and mathematics scores as opposed to traditional public schools (Molnar, et al., 2019). The gap equates to approximately 47 less days of learning reading skills and 136 fewer days of leaning math (Molnar, et al., 2019). Only 36.4 percent of virtual schools obtained an acceptable performance rating. Michigan virtual students received a pass rate of 49 percent compared to a 78 percent pass rate for the same courses being taught in-person (Molnar, et al., 2019). These Michigan findings are very similar to findings in other states, which suggests that scores and graduation rates for virtual schools are substantially lower than traditional public schools throughout America.

North Carolina Department of Public Instruction (2021) made a statement regarding its 2020-2021 school year data results:

Results from state testing for the 2020-21 school year released today are an indicator of

the formidable challenges that students and educators across North Carolina faced during

one of the most severe disruptions to public education the state and nation have ever

confronted. Tests designed to be administered at the same time and based on typical face-

to-face classroom instruction were taken under widely varying conditions, often after an

entire year of atypical, remote instruction. Consequently, even while the outcomes are

predictably lower than past years, the results also are not objectively comparable to

previous years, given the many factors that disrupted instruction as well as the

administration of the assessments themselves (para. 1).

North Carolina Department of Public Instruction also reported that there was a small

decline on the ACT scores. For the 2018-2019 academic year, 55.8 percent of North Carolina

students achieved the minimum admissions requirement of a 17 for a composite score, whereas

only 55.2 percent of the students testing during the 2020-2021 academic year met that minimum

requirement. North Carolina's graduation rate for the academic year of 2020-2021 also fell to

86.9 from 87.6 percent the following school year (NC DPI, 2021).

Moliner, Lorenzo-Valentin and Alegre examined 68 grade 9 and 10 students in Spain

who participated in an online teaching participation for the first time in their lives. Overall, the

study determined that these students are probably not determined enough to entirely participate

in "E-learning", otherwise known as virtual learning. Many students even admitted during the

study that they found themselves becoming less responsible and not watching the recorded

lessons as the virtual learning progressed. Students must take responsibility in their own

learning, arguably even more-so with virtual learning (Moliner, et al., 2021).

Many students at this grade level require regular redirection from the instructor during in-person classes. Teachers are likely not able to offer this much redirection remotely. While students are watching pre-recorded lessons virtually, the responsibility ultimately falls on themselves to stay focused on the information presented to them (Moliner, et al., 2021). One of the gaps in this research is that older students in grades 11 and 12 were not a part of the study. The proposed research study will primarily include grades 11 and 12 to determine if there exists a difference in the disruption year of Covid-19 compared to the year after.

**Covid-19's effect on Students**

The purpose of this section is to evaluate different studies which examine how Covid-19 has affected students. The first study entitled "How Kids Are Performing" by Renaissance has provided an in-depth summary of the impacts that Covid-19 had on learning for roughly 3.3 million students who completed the Renaissance Star Assessment. Renaissance Star Assessments typically assess students three to four times throughout the school year in order to monitor progress. By using Renaissance's previously conducted studies, this study found that the pandemic had a clear negative impact on students' scores in reading, and even more significantly in mathematics (*How Kids Are Performing,* 2021).

The study revealed that Black, Hispanic, American Indian, and Alaskan Native students experienced greater negative impacts compared to the overall averages. Students with disabilities, English Language Learners, students from low-income families, and students in rural areas were also more negatively impacted. The recommendations of this study indicate that developing cultural competence and critical consciousness could help support learning for

students in vulnerable populations.  The study references a teaching program in which teachers in San Francisco and Tuscon focused on perspectives, histories, and experiences of marginalized communities, which resulted in positive academic improvements for the students who took part in the program.

The study also determined that students who attended private schools had reading growth consistent with pre-pandemic baselines, as opposed to students at public schools, who were four points below their baseline prior to the pandemic.  There were similar findings for Asian and Catholic students compared to the average (*How Kids Are Performing,* 2021).

Although the research clearly shows a negative impact on learning due to the pandemic, the study did note that, without "heroic efforts" made by educators, parents, and students, that the negative impacts could have been more severe (*How Kids Are Performing,* 2021).  Of note, the study referenced that the sample of students participating in the study contained many more remotely-testing students as opposed to previous school years.   The study also only included results from students who were able to maintain Star usage throughout the course of the last two school years.  This could have led to the results understating the negative impact of the pandemic on learning.

The research study titled, "Education in a Pandemic: The Disparate Impacts of COVID-19 on America's Students" evaluates the overall effects of Covid-19 on students in general. It also evaluates the effects on students who are considered to be more at-risk, such as students of color, students with disabilities, and LGBTQ students.  In February 2021, an estimated 37,300 to 43,000 children lost a parent due to Covid-19. Black children accounted for 20% of those yet they only account for 14% of all children in the US ("Education in a Pandemic - Ed.gov.", 2021).

In addition, more families of color reportedly fell out of contact with their children's schools during the pandemic, especially early on. In one nationally representative survey conducted in spring 2020, nearly 30% of principals from schools serving "large populations of students of color and students from lower-income households" reported that they had difficulty reaching some of their students and/or families—in contrast to the 14% of principals who said the same in wealthier, predominantly white schools ("Education in a Pandemic - Ed.gov.", 2021, p.14, para. 3).

This study is relevant to the researcher's study because most students participating in the study are children of color. This study also provides information regarding the impact of Covid-19 on students' mental health. This is important, as research strongly indicates that mental health plays a large factor in a student's academic success. One gap in this study is that it was published mid-2021 when many schools had not returned to in-person learning. Therefore, this study does not evaluate the year after returning to in-person learning on student test scores, which the researcher's study seeks to do.

**Student Athletes**

Most of the literature on student athlete academic performance indicates that student athletes do perform at a higher level than that of their nonathletic peers. There are many different reasons that the above statement is true. One of the reasons why athletes perform better is because there are many benefits for students who exercise. Exercise will increase cognitive function which promotes concentration, which leads to a better memory and classroom conduct. A study by Cahk, Pekel, and Aydos (2018) consisted of a sample size n = 243 children, where

they had the students complete sixty minutes of physical activity for three days a week over a total of fourteen weeks. Cahk, Pekel, and Aydos (2018) found students showed an increase in general, social, and academic self esteem levels as well as an increase in academics.

It is known that engagement in any type of athletic activity will have a positive impact on the overall physical health of most individuals. Not only do people who participate in sports attain physical health benefits; they also develop skills for leadership, teamwork, motivation, and responsibility. Knifsend and Graham (2012) conducted a study with a pool comprised of various ethnic groups consisting of eleventh and twelfth graders, (n=864) who participated in extracurricular sport activities. The study examined the correlation between athletic students' overall academic performances and pride in their school. Knifsend and Graham's (2012) study concluded that students who participated in extracurricular activities felt a greater sense of belonging. The study also determined that eleventh graders who participate in extracurricular activities had a significantly higher GPA and twelfth graders in the same category exhibited higher levels of academic engagement compared to their peers who did not participate in extracurricular activities (Knifsend & Graham, 2012).

Lumpkin and Favor (2012) compared academic performance between high school athletes and non-student athletes in Kansas. They had an extremely large sample size (n=139,000) comprised of all high schools' students in Kansas. 80.1 percent of athletes reported that they had a grade point average of a 3.0 or higher while only 70.5 percent of non-athletes reported their GPA as being higher than a 3.0. There was also a substantial difference in graduation rates. Non-athletes had a graduation rate of 88.1 percent whereas 97.6 percent of athletes graduated. The study also concluded that athletes who took the ACT scored notably higher than their non-athletic peers (Lumpkin and Favor, 2012). These findings suggest that

students who participate in athletics will surpass their non-athletic peers in most all academic settings.

Bowen and Greene noted that a literature review conducted revealed that students who are involved in high school athletics tend to have higher academic achievement. However, this research study sought to determine the overall effect of high school athletics on academic success for students who participate in sports in addition to those who do not participate. The population of this study included high schools in Ohio. The study concluded that a school's devotion to athletics is firmly related to academic performance. Furthermore, "a 10-percentage point increase in a school's overall winning percentage is associated with a 1.3 percentage point improvement" (Bowen and Greene, 2012, p. 10). This study found that schools perform better academically when they offer more athletic opportunities to more students and produce more winning teams. It will be interesting to evaluate the effects that the lack of athletic participation due to Covid-19 has had on students' academic success. While the effects of virtual learning rather than in-person learning have been evaluated, the researcher seeks to examine the effects of the lack of sports participation on students during the Covid-19 pandemic. Furthermore, the researcher plans to determine if students who participated in sports prior to the pandemic are more likely to suffer academically from the Covid-19 pandemic due to the inability to participate in team sports at school in addition to the challenges that virtual learning provides.

**Technology Access**

It is no surprise that not having access to technology would be detrimental to the success of a student throughout a year of online learning. Online learning consisted of many components

throughout the pandemic. There were many different types of technology utilized for education throughout the course of the pandemic.  Some examples of this included classes being taught over Zoom, instructional videos being viewed, students printing and later uploading work via scanners, students accessing instruction online through different mediums, and completing different types of assignments using an assortment of third-party online platforms.  Needless to say, having a working Chromebook or laptop with a video camera and microphone was of utmost importance. Although cell phones are beneficial for learning in certain situations, you cannot access and complete everything required in an online classroom setting using only a cell phone. In order to access everything needed, reliable internet would have to be available at all times. One of the important questions that the researcher hopes to answer is, did everyone have the same access to technology?

It was evident that, throughout America, there was a pattern of the larger suburban school districts already having readily available access to technology via Chromebooks or internet as opposed to the rural schools with lower support that were struggling to get their students online (Squire, 2021). In a recent survey for U.S adults they answered that they either often or sometimes experience problems with their internet reliability with 39 percent of upper class agreeing with this statement, 47 percent of middle class agreeing, and 60 percent of the low-income class agreeing (McClain et al., 2021). The same individuals were also asked if they worried a lot or some about being able to pay for their internet at home. Six percent of the upper class, twenty three percent of middle class, and forty six percent of the lower class agreed with that statement (McClain et al., 2021). Parents were also asked if their children encountered at least one of the following; couldn't complete their school work because they didn't have access to a computer, had to use public internet to complete schoolwork because their home internet

was not stable enough or had to complete their schoolwork using a cellular device, with 18 percent of upper class, 31 percent of middle class, and 46 percent of the lower class agreeing with this statement (McClain et al., 2021).

In other findings from Ong (2020) he states, "there are systematic and sizable differences in connectivity to virtual learning based on race/ethnicity, household income, education attainment and age". Ong's finding suggest that black and Hispanic households are around 1.4 times more likely to have limited access to technology as opposed to non-Hispanic whites. The Organization for Economic Co-operation and Development has stated that about half of 15-year-olds that are in school have an online learning support platform available to them (Janssen, 2022). During the pandemic roughly 1.6 billion students were impacted by school closures while 700 million students had no internet access at home, almost 800 million did not own a laptop or computer at home, and 56 million students' houses were out of mobile network range (Janssen, 2022).

A study conducted by the state of Missouri found that 26 percent of Black residents are in poverty, as are 11 percent of White residents (Arnett, 2021). Arnett suggests that since it's very common in the Black community to have a single parent household, it is often run by grandparents. Older generations are less likely to operate technology which will make the digital gap even larger for the Black community. The digital gap or digital divide is exhibited by students missing lessons, not having access to online material, and not completing assignments. This will have a significant impact for student learning and will create a larger gap in education. McDonald's (2020) findings fall in line with the previous discoveries, that low-income households are impacted the most significantly due to technology being absent. Putting it best, Ong states, "Falling behind increases the achievement gap, which has long-term social and

economic implications. To avoid this tragedy, we must act immediately and decisively to close the digital divide" (2020, para.3).

**Summary**

In summary, no matter the type of disruption in education, whether it be from a natural disaster or another pandemic that has occurred, learning loss appears to be inevitable. Although the pandemic is still running its course, preliminary data already demonstrates that learning loss is present. It is extremely likely that the online learning similar to that which took place in early 2020 will occur again at some point in the future. Therefore, it is imperative that all students have easy access to technology and internet. More concentration as to why student athletes tend to have better achievement scores on end of course tests may help solve the online learning dilemma.

# CHAPTER III: METHODOLOGY

**Introduction**

The purpose of this chapter is to summarize the research approach that the researcher utilized throughout the course of the study. This section will include information on the participants demographics, the sample, the procedure used, and the research design. This study's research design is both predictive and hypothesis testing. The foundation of the study will be rooted in the primary research question, "How did the Covid-19 pandemic impact student athletes' End-of-Course grades?"

There are five main research questions that will be answered at the conclusion of this study. The primary research question of this study is as follows; Is there a statistically significant difference in the End-of-Course test scores for student-athletes during and after the Covid-19 pandemic? Research question two seeks to answer, is there a statistically significant difference in mean scores across students' at-risk level (red, yellow, green) and End-of-Course test results? Research question three seeks to answer, is there a statistically significant difference in mean scores across students' grade level (junior and senior) and End-of-Course test scores? The fourth research question asks; is there a statistically significant difference in mean End-of-Course test scores across sport type (individual or team)? The last research question is, are individual or team sport played, at-risk level to graduate, ACT score, 8th-grade End-of-Grade scores, 2020-2021 End-of-Course scores significant predictors of academic success for the 2021-2022 End-of-Course scores?

The hypotheses that correlate to the above research questions are as follows: The hypothesis for the primary research question is that there is a significant difference between the disruption of in-person learning and lower End-of-Course test scores for student-athletes. The hypothesis for the second research question is that there will be a significant difference in End-of-Course test scores across students with differing at-risk levels. The hypothesis for the third research question is that there will not be a significant difference between student grade level and End-of-Course test scores. The hypothesis for the fourth research question is that there will not be a significant difference between End-of-Course test scores and sport type. The hypothesis for the final research question is that at-risk to graduate, ACT scores, 8th grade End-of-Grade scores, and 2020-2021 End-of-Course scores will be significant predictors of academic success on the 2021-2022 End-of-Course exam scores.

**Subsection 1: Setting and Participants**

This study evaluates data from the 2020-2021 academic year of online learning at a Charlotte-Mecklenburg high school. The online learning platform consisted of synchronous and asynchronous lessons every school day, which took place over the teacher's preferred video technological platform i.e Zoom. For each class, synchronous sessions were to last 40 minutes and the remaining time, 50 minutes, was to be spent asynchronous. Synchronous learning is conducted live with students and teacher participating from different locations. Asynchronous learning is when students access certain assignments on their own time from different locations. Hopewell High School is located on the outskirts of Charlotte and is described as being in a suburban location. Hopewell High School consists of roughly 1,800 students with a wide range

of ethnicities. This high school is made up of approximately 44.7% African American, 30.6% Caucasian, 17.4% Hispanic, 4% with two or more races, 2.7% Asian, and 0.6% American Indian students.

For this particular research proposal, data comprised of 11th and 12th grade student athletes from Hopewell High School is to be collected. Information on roughly 160 participants will be collected and analyzed. The participants represent a diverse array of race, socioeconomic status, and GPA. The participants will be either male or female, either 16, 17, 18, or 19 years of age, and either in the 11th or 12th grade. The participants will all have completed an eighth grade End-of-Grade exam to use as the control as well as an End-of-Course exam during the 2020-2021 and 2021-2022 school years.

The sample will also consist of all student athletes from Hopewell High School. Since the data is only collected from one high school, the population for which the researcher will generalize will be similar high schools. Since this study is only using multiple regression techniques and not mixed methods the researcher cannot generalize to the whole population in the study. By using G*Power with alpha level 0.05, with the population effect size moderate, and power of 0.8, the desired sample size is 159 participants.

**Subsection 2: Instrumentation**

The instruments utilized in this study will be North Carolina End-of-Grade and Course standardized exams. These tests are developed by the state. Research indicates that Kristen Maxey-Moore specialized in the test development for the state of North Carolina. Beth Nash is a test measurement specialist for grades 6-8 Math, NC Math 1, NC Math 3, and Biology. In 1984

the North Carolina General Assembly voted to incorporate End-of-Course test in high schools. During the 1992-93 school year the first End-of-Grade/Course tests were taken (*North Carolina Test timeline,* 2014).

> One of the North Carolina Department of Public Instruction members said, "The mission of the Accountability Services Division is to promote the academic achievement of all North Carolina public school students and to assist stakeholders in understanding and gauging this achievement against state and national standards. The major thrust of this mission is three-fold: the design and development of reliable and valid assessment instruments, the uniform implementation of and access to suitable assessment instruments for all students; and the provision of accurate and statistically appropriate reports" (*Testing and School Accountability*, 2021, para.1).

**Subsection 3: Procedure**

The data used in this study will collected from Hopewell High School. One of the administrators at Hopewell High School will supply the data with all personal identifying information removed.

This data will incorporate information from a group of roughly 160 student athletes at Hopewell High School. Members of this study will be students that play a sport at Hopewell High School such as football, basketball, baseball, softball, soccer, track and field, swimming, golf, tennis, wrestling, cheerleading, volleyball, and lacrosse. These students will either be seniors or juniors.

Data is stored online in a database at Hopewell High School and will be provided by an administrator from the school. The data will be cleansed of any identifying information prior to being provided to the researcher. The researcher will receive this data in late April after the first semester ends and students have completed the End-of-Course test. There is little to no risk of a confidentiality breach due to the personal identifiers being removed from the data prior to coming into contact with the researcher. This research proposal has been submitted and approved by the Institutional Review Board (IRB).

**Subsection 4: Data Processing and Analysis**

The categories of data being collected from these student athletes are both quantitative and categorical. The types of quantitative data being collected from the student athletes are ACT score, 8th grade End-of-Grade scores, 2020-2021 End-of-Course scores, 2021-2022 End-of-Course scores, and age. The categorical data consists of gender, sport type, race, grade level, and at-risk level. Upon the conclusion of this study, the researcher will provide descriptive statistics for all quantitative data and will present findings based on categorical analysis.

Upon data collection, the data will be opened in R, a statistical software program, to compute responses to the following statistical questions. Is there a statistically significant difference in the End-of-Course test scores for student-athletes during and after the Covid-19 pandemic? Research question two seeks to answer is there a statistically significant difference in mean scores across students' at-risk level (red, yellow, green) and End-of-Course test result? Research question three seeks to answer is there a statistically significant difference in mean scores across students' grade level (junior and senior) and End-of-Course test scores? The fourth

research question asks, is there a statistically significant difference in mean End-of-Course test scores across sport type (individual or team)? The last research question is, are individual or team sport played, at-risk level to graduate, ACT score, 8th-grade End-of-Grade scores, 2020-2021 state's End-of-Course scores significant predictors of academic success on the 2021-2022 state's End-of-Course scores?

In order to answer the first research question, the researcher will use a dependent samples t-test. For the next three research questions, the researcher will use ANOVA techniques or a two-tailed sample independent t-test for the statistical technique. The researcher will need to test the following assumptions: the sample is random and comes from a normal distribution, equal variance, and independence. These assumptions are well known and are standard practice for this type of research study. The researcher will use scatterplots, boxplots, Welch's t-test, and Levene's test for homogeneity of variance.

In order to answer the final research question, multiple regression techniques will be used. The researcher will need to test the following assumptions: linearity, homogeneity of variance, normality, and independence. Multiple regression analysis using backward elimination will be utilized to find the best model to predict the 2021-2022 End-of-Course exam scores. Many previous studies that are similar to this study have used these same techniques as well as the same variables listed above. The book titled "Applied Linear Statistical Models Edition 5" lays the groundwork for the procedures and tests addressed in the methodology section (Kutner et al., 2013).

**Summary**

The purpose of this study is to investigate the effects of online learning in high school for student athletes by evaluating many different attributes of the participants. By conducting this study, the researcher anticipates determining if online learning was as effective as it could have been or if improvements could be made in the future.

In summary, the data being collected is from a suburban high school located on the outskirts of Charlotte, North Carolina and will have all identifying factors removed prior to being provided to the researcher in order to ensure that information remains confidential. The researcher will then use statistical techniques in R, such as ANOVA and multiple regressions, in order to answer the five research questions. In the next chapter the five research questions will be addressed.

# CHAPTER IV: RESULTS

In chapter four, the results of the data analysis will be displayed and presented to the reader. The purpose of the study was to determine if there were statistically significant differences in End-of-Course test scores for student athletes by evaluating the student athletes' at-risk level, End-of-Grade test scores, sport type, and gender. This study will also determine the extent of the academic impact from the Covid-19 pandemic on student athletes. Data was collected from junior and senior student athletes in order to obtain test scores as well as demographics such as age, gender, sport type, at-risk level, ACT score, 2021-2022 EOC raw score, 2020-2021 EOC raw score, eighth grade state EOG test raw score, and grade level.

There are five main research questions that will be answered at the conclusion of this chapter. The research questions are as follows:

1. Is there a statistically significant difference in the End-of-Course test scores for student-athletes during and after the Covid-19 pandemic?

2. Is there a statistically significant difference in mean scores across students' at-risk level (high, moderate, low) and End-of-Course test result?

3. Is there a statistically significant difference in mean scores across students' grade level (junior and senior) and End-of-Grade test scores?

4. Is there a statistically significant difference in mean End-of-Grade test scores across sport type (individual or team)?

5. Are gender, ACT score, 8th-grade End-of-Grade scores, 2020-2021 state's End-of-Course scores significant predictors of academic success on the 2021-2022 state's End-of-Course scores?

**Data Cleaning**

Data cleaning took place after the researcher received the data from one of their administrators. The researcher then analyzed the data for missing and incomplete data. Once all the incomplete data was found the researcher then highlighted the row that corresponded to the missing data. Participants that had missing data were then removed from the data set. After having to exclude 12 participants from this study because of missing data, a total of 163 student athletes were able to be anazlyzed. Then the data was then entered into R version 4.0.4 where the analysis took place.

**Description of the Sample**

The analysis of the participants of the study based on sport type, at-risk level, grade level, age, and gender are as follows: sport type, which indicates if the participants played an individual (*n=49, 30.06%*) or team sport (*n=114, 69.94%*). At-risk level was comprised of either low (*n=157, 96.32%*) or high (*n=6, 3.68%*). The break down of grade level was juniors (*n=78, 47.85%*) and seniors (*n=85, 52.15%*). The age of the participants ranged from 16-19, with age 16 (*n=17, 10.43%*), age 17 (*n=92, 56.44%*), age 18 (*n=52, 31.90%*), and age 19 (*n=2, 1.23%*). Lastly, gender is comprised of female (*n=60, 36.81%*) and male (*n=103, 63.19%*). Table 1 displays the means and standard deviation of the participants' standardized test scores across different years.

Table 1

*Means and Standard Deviation for Participants by Test*

| Test Type | *M* | *SD* |
|---|---|---|
| 8th Grade EOG | 459.14 | 12.31 |
| 20-21 EOC | 555.34 | 12.13 |
| 21-22 EOC | 560.63 | 13.09 |
| ACT | 18.07 | 5.52 |

**Hypothesis and Descriptive Analysis**

**Hypothesis 1.** Research question 1 stated the following: Is there a statistically significant difference in the End-of-Course test scores for student-athletes during and after the Covid-19 pandemic? Hypothesis 1 stated the following: There is a significant difference between the 2020-2021 EOC test scores and the 2021-2022 EOC test scores for student athletes. Hypothesis 1 was addressed by performing a dependent samples t-test to examine the mean differences in the student athletes' 2020-2021 and 2021-2022 standardized state test scores.

For hypothesis 1, a dependent samples t-test needs to be used. Using R, the researcher found the test statistic and p-value and attained these results: $t(162) = 7.86, p < .01$. This indicates that there was more support from the sample and that the mean difference is not equal to zero. Lastly, a 95% confidence interval was found (3.96, 6.63). With the p-value being less than .01 these results indicate that there appears to be a statistically significant difference of means between the 2020-2021 and 2021-2022 school year state EOC scores.

**Hypothesis 2.** Research question two seeks to answer: Is there a statistically significant difference in mean scores across students' at-risk level (low, moderate, high) and the 2020-2021 End-of-Course test results? Hypothesis 2 stated the following: There will be a significant

difference in End-of-Course test scores across students with differing at-risk levels. It is important to note that there were no participants with a moderate at-risk level. Low at-risk level had a sample size of *n=157, 96.32%*, while high at-risk level had a sample size of *n=6, 3.68%*. If all three at-risk levels were present in the sample, ANOVA techniques would be used. Since only low and high at-risk levels were in the data, an unpooled independent samples t-test was conducted.

There are three assumptions that need to be verified in order to conduct an unpooled independent samples t-test. The first assumption was met since the independent variables for at-risk levels were categorical, either low or high, and the dependent variable, 2020-2021 EOC scores were continuous and quantitative. The second assumption for an unpooled independent samples t-test is that the dependent variable comes from a population that is of a normal distribution. When plotting a histogram, it appears that the data results in a normal distribution. A more formal test to show this would be the Shapiro-Wilks test. Performing this test yielded results of (W = 0.99, p = .29). With those results it is within reason to assume that the sample of 2020-2021 EOC scores came from a population that was normally distributed. Lastly, the third assumption was tested. The third assumption is the homogeneity assumption which is tested from Levene's Test of Equal Variances. The results from this test are F(1, 161) = 3.80, p = .053. Therefore, the homogeneity assumption is assumed.

The unpooled independent samples t-test specified that the true difference in means of the 2020-2021 EOC scores on the at-risk levels were not equal to zero. The at-risk low category had a (*M = 556.09, SD = 11.69*) whereas the at-risk high category had a (*M = 535.67, SD = 4.80*). With the following results, $t(7.51) = -9.41, p < .01$, meaning the difference in mean 2020-2021 EOC scores across at-risk level, was statistically significant. Using G*Power, a post hoc

power analysis was conducted. This indicated a high power of 0.61 when a high effect size was used (d = 0.80).

**Hypothesis 3.** Research question three was: Is there a statistically significant difference in mean scores across students' grade level (junior and senior) and 2020-2021 End-of-Course test scores? The hypothesis for the third research question is that there will not be a significant difference between student grade level and 2020-2021 End-of-Course test scores. Juniors had a sample size of $n=78, 47.85\%$, while seniors had a sample size of $n=85, 52.15\%$. For research hypothesis 3, an unpooled independent samples t-test was conducted.

There are three assumptions that need to be verified in order to carry out an unpooled independent samples t-test. The first and second assumptions were met. The third assumption is the homogeneity assumption, which is tested from Levene's Test of Equal Variances. The results from Levene's test are $F(1, 161) = 5.02$, $p < .05$, thus the homogeneity assumption is not assumed and we cannot assume equal variances.

The unpooled independent samples t-test specified that the true difference in means of the 2020-2021 EOC scores on the grade levels were equal to zero. The grade level of juniors had a ($M = 555.79$, $SD = 10.68$) whereas the grade level of seniors had a ($M=554.92$, $SD = 13.38$). With the following results, $t(158.02) = 0.46, p = .643$, meaning the difference in mean 2020-2021 EOC scores across juniors and seniors was not significant. Using G*Power a post hoc power analysis was conducted. This indicated a moderate power of 0.61 when a small effect size was used (d = 0.20).

**Hypothesis 4.** The fourth research question is as follows: Was there a statistically significant difference in mean 2020-2021 End-of-Course test scores across sport type (individual or team)? The fourth hypothesis was that there would not be a significant difference between

End-of-Course test scores and sport type. Individuals had a sample size of *n=49, 30.06%*, while team had a sample size of *n=114, 69.64%*. For research hypothesis 4, an unpooled independent samples t-test was conducted.

There are three assumptions that need to be verified in order to carry out an unpooled independent samples t-test. All three assumptions are met.

The unpooled independent samples t-test specified that the true difference in means of the 2020-2021 EOC scores on sport type were not equal to zero. The sport type of individuals had a (*M = 558.49, SD = 11.58*) whereas the sport type of team had a (*M = 553.98, SD = 12.16*). With the following results, $t(95.25) = 2.24, p < .05$, meaning the difference in mean 2020-2021 EOC scores across individual and team sports was statistically significant. Using G*Power, a post hoc power analysis was conducted. This indicated a small power of 0.32 when a small effect size was used (d = 0.20).

**Hypothesis 5.** The last research question was: Are gender, ACT scores, 8th-grade End-of-Grade scores, 2020-2021 state's End-of-Course scores significant predictors of academic success on the 2021-2022 state's End-of-Course scores? The hypothesis for the final research question is that gender, ACT scores, 8th grade End-of-Grade scores, and 2020-2021 End-of-Course scores will be significant predictors of academic success on the 2021-2022 state's End-of-Course exam. To conduct this final hypothesis, multiple regression techniques were utilized. Using R, the researcher found the following summary of the model displayed in Table 2 below.

Table 2

*Summary of Multiple Regression Model*

| Coefficients | *Estimate* | *Std. Error* | *t-value* | *p-value* |
|---|---|---|---|---|
| Intercept | 151.31 | 41.57 | 3.64 | < .001 |
| ACT Score | 0.26 | 0.18 | 1.42 | .16 |
| 8th Grade EOG Score | 0.29 | 0.09 | 3.13 | < .01 |
| 20-21 EOC Score | 0.49 | 0.09 | 5.19 | < .001 |
| Gender | -2.42 | 1.31 | -1.86 | .07 |

The overall model had an adjusted R-square of 0.6333, with $F(4,158) = 70.94, p < .001$. The AIC for this model is 1144.45. An interpretation of Gender is as follows, controlling for ACT Scores, 8th Grade EOG Scores, and 20-21 EOC Scores, the predicted 21-22 EOC Scores for males is 2.42 units more than for females. While evaluating the hat matrix, the researcher observed that participant 60 has an influence of 0.097, which is slightly higher than the max of 0.092. Therefore, this participant is exerting more of its influence on the model. All of the residual standard errors are within reason of one another. In reviewing Figure 1 below, the plot of Residuals vs Leverage, it is evident that none of Cook's distances exceeds one. Therefore, there is no concern that one specific case has a significant impact on the overall influence of the model. By using R the researcher was able to verify that no values of Cook's distance are greater than one.
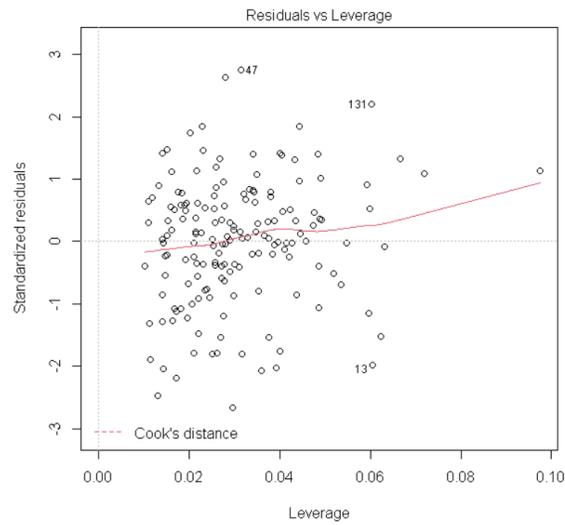
Figure 1



Figure 2 reveals the plot of the residuals verses the fitted values. There are no patterns observed within the graph and it appears to be random, which indicates linearity has not been violated. It is to be noted that cases 47, 77, and 157 appear to be outliers.
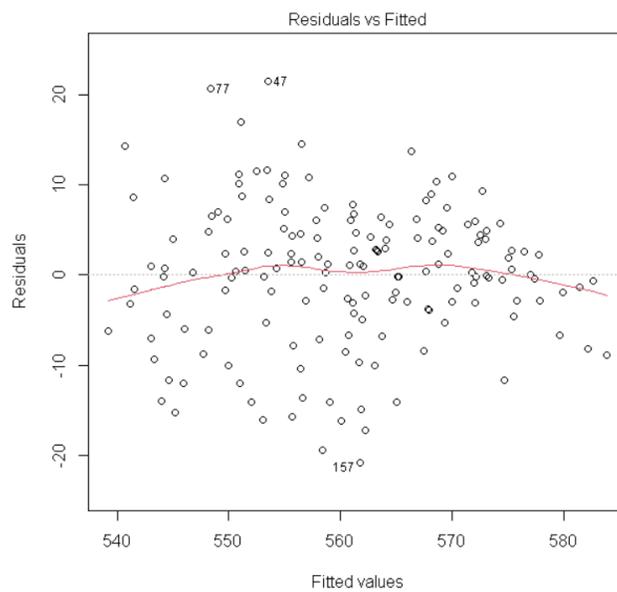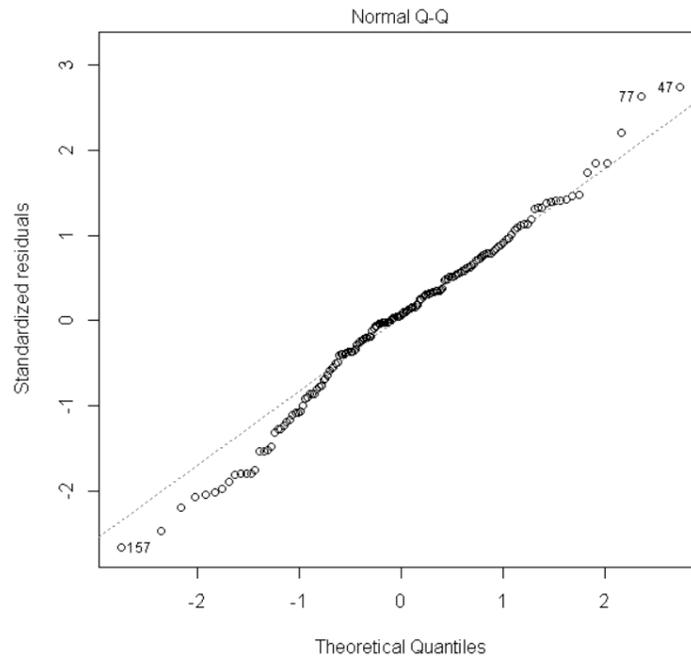
Figure 2



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Figure 3 shows the Normal Q-Q plot. There does seem to be a large variation from the line around the bottom and top. Running a Shapiro-Wilks normality test of the residuals yields the following results: $W = 0.99$, $p = .12$. With a p-value greater than .05 we can assume the residuals follow a population with a normal distribution.

Figure 3



The Variance Inflation Factor (VIF) for each variable is as follows, ACT scores = 2.57, 8th Grade scores = 3.48, 2020-2021 Scores = 3.36, and Gender = 1.03. All variables have a low VIF, thus no predictors are highly correlated.

Using backward elimination, R can find the best model for the data. Based on the stopping criteria that R uses it found the best model. In doing so, R found the original model where gender, ACT Scores, 8th grade End-of-Grade scores and 2020-2021 End-of-Course scores to be the best model to predict 2021-2022 End-of-Course scores.

**Chapter Summary**

This study was created to examine the differences in the 2020-2021 EOC Scores and 2021-2022 EOC Scores across gender, at-risk level, sport type, ACT scores, and 8th grade EOG scores of student athletes. There was a total of 163 student athletes from one high school that participated in this study. Research question one used a dependent samples t-test to report that there is a statistically significant difference in the End-of-Course test scores for student athletes during the year of online learning (2020-2021 EOC test scores) and the return of in-person learning (2021-2022 EOC test scores). These results coincide with the literate review of how the pandemic had a negative effect on students' grades. Research question 2,3, and 4 all use an unpooled independent samples t-test to evaluate the hypothesis. Hypothesis 2 as well mirrors the literature that the more at-risk a student is, the lower scores they will receive. Research question 3 found that the difference in mean 2020-2021 EOC scores across grades for juniors and seniors was not statistically significant. Hypothesis 4 concluded that the true findings were that the difference in mean 2020-2021 EOC scores across individual and team sports was statistically significant. Lastly, hypothesis 5 found that four predictors of ACT scores, 8th Grade End-of-Grade scores, 2020-2021 End-of-Course scores, and Gender provided the best model for predicting 2021-2022 End-of-Course scores. By using the knowledge that the pandemic has had a clearly negative effect on students' EOC scores, leaders within the school system can seek a better course of action for future disruptions in in-person learning.

# CHAPTER V: SUMMARY

The main purpose of this qualitative study was to compare high school student athletes' standardized test scores during the remote learning year brought on by the Covid-19 pandemic to the year after the pandemic when the students were back in the classroom. In addition to this, the study seeks to answer four other research questions. The results from the study found that there was a significant difference in test scores between the two years being evaluated. With these findings it is imperative that educators and the community are well prepared for future online learning circumstances. It is highly likely that school closures will happen again at some point in the future due to a number of unforeseeable events. With the impending future of school closures, education will not be put on hold and will continue online.

The impact of Covid-19 has been difficult on everyone. Most people have never experience anything like this in their lives and hopefully they never will encounter something like this ever again. The researcher, knowing how many people have been affected by the pandemic, felt compelled to investigate the topic of education during Covid-19. The researcher seeks to better the world of education and thought the findings would impact the most amount of people. The scope of the motivation for this study was based on the researcher's admiration of athletics and curiosity of findings for that particular school.

Disruption theory was one of the backbones of this study. Disruption theory considers and observes the negative consequences in a student's education when any type of disruption in classroom learning occurs.  Unfortunately, disruption doesn't just hinder grades. It also effects students' mental health. Shima Islam from UNICEF said "School closures have serious effects on the education, development and well-being of children and adolescents. In addition to

depriving them of the necessary social interactions that support and promote their mental well-being, school closures led to remote learning arrangements that did not offer the same educational outcomes. In addition, even in the best settings, socially disadvantaged children and those in greater need of educational support have fallen behind, increasing social inequity between and within countries." (Islam, 2021, para.9).

The Covid-19 pandemic is most likely the greatest, and hopefully the only disruption the students of the twenty-first century will have to endure. Research question one, which asks "Is there a significant difference in the End-of-Course test scores for student-athletes during and after the Covid-19 pandemic?" focuses on disruption theory. The findings for this research question were far from shocking and were to be expected. The research did find that there was a statistically significant difference in the test results from the two years being questioned. This accompanies the overall essence of the disruption theory.

The primary research question findings correlate with what the literature reveals. A study conducted about a massive bushfire in Australia concluded that students affected by the bushfire did have lower grades compared to those who were not affected. The study also indicates that the more the student was affected by the bushfire, the lower their grades were. For example, a student whose education was only disrupted for a week would typically have a higher grade than someone whose learning was disrupted for more than a week. An additional study evaluated the effects on education as a result of the hurricanes and earthquakes of Puerto Rico. The results respectfully coincide with the findings of Australia's bushfires.

The researcher also reported on similar types of disruptions due to pandemic-like situations. The first incident was the polio epidemic of 1916 which indicated that there was a negative impact due to a disruption in students' education. The 1918 influenza pandemic was

also studied, and the findings were there was little to no effect of this pandemic on student

education. The researcher would like to note that for the 1918 pandemic, data from that time

period is not available in the same capacity that it is today. The main purpose of the research

conducted on the 1918 influenza pandemic evaluates students' absenteeism rates and compares

this with their future census records to determine if there is a correlation between their education

and their livelihood, which is highly subjective. Nevertheless, the majority of the findings

solidify the need for students to be present and distraction free in the classroom for the most

optimal learning to take place.

Research question two asks "Is there a statistically significant difference in mean scores

across students' at-risk level (low, moderate, high) and the 2020-2021 End-of-Course test

results?" For this question the researcher's data was only comprised of "low" and "high"

categories. The results of this research question found that there was a statistically significant

difference between the means of low and high at-risk levels. This finding was not unexpected,

much like the results of the first research question. There is plenty of supporting research on the

correlation between at-risk level and test scores.

Lu Li and Mary Jane Uzzi from Grinnell College conducted a study into the graduation

rate and SAT scores and these are their findings, "Third, we looked at the relationship between

the average SAT score of students at the institution and graduation rate of the institution by

testing whether there was a correlation between them. We got a Pearson's correlation coefficient

of 0.811 and a 95% confidence interval of (0.791, 0.829). This strong correlation allows us to

conclude that higher SAT scores are very likely to be associated with high graduation rates (Li &

Uzzi, 2020)."

The results of answering research question three implied there was not a statistically significant difference of mean scores across grade level, specifically with reference to juniors and seniors. Jed Applerouth investigated juniors and seniors taking the SAT and ACT and sought to determine whether or not there was any reason for students to wait to take these tests in their senior years. The results found that there was no benefit to waiting until senior year to take either of these tests (Applerouth, 2019).  This coincides with the results of the current study.

Data analyzed for the purpose of answering research question four revealed that there was a statistically significant difference across means in sports type either being a team sport or an individual sport. Earlier in this study, the researcher shared their findings that student athletes in general do tend to score better than non-student athletes. Exploring this more in detail across team and individual sports suggests that students involved in individual sports tend to score better than those involved in team sports. This could be because when students participate in an individual sport, they are the only one in charge and the only one that can be responsible for their win or loss. This might be more motivation for success as opposed to a team sport where you have other players to rely on. Comparisons can be drawn between those playing individual sports and students required to self-motivate while learning remotely on their own.  A study at an all-boys Irish high school found that engaging in any sport will lead you to a higher assessment score by 4.2 percent. This study delved into the individual sport and found if you participated in such a sport than you would have a 12.2 percent increase in assessment scores (Bradley, Keane, and Crawford, 2013).

The answer to the last research question found that the best model to predict the 2021-2022 EOC scores was by utilizing the following variables: gender, ACT scores, 8$^{th}$ grade EOG scores and 2020-2021 EOC scores. Throughout the course of the research, a study has not been

found that utilizes the same predictors as this study. However, the literature is very consistent in stating that SAT/ACT are good predictors of future academic success. The University of California Standardized Testing Task Force spent a year reviewing testing scores, as this is one aspect that college admissions regularly review. They found that the best way to predict graduation rate, retention rate, and a students' success in their first year in college is using standardized test scores (Camara, Croft, 2020).

This study has potential limitations. The first limitation of this study is the fact that all the researchers' data came from one high school. Another issue is the fact that there aren't any other studies that evaluate the effects of Covid-19 on student athlete test scores. The fact that the data was only gathered from one high school is a threat to the generalizability. This study can only be compared with similar schools.

Recommendations for future studies would include gathering data from other high schools and districts that include more diversity. It would be interesting to evaluate results from other states in order to compare data. Recommendations would also include investigating middle school students and collecting data throughout their high school years to determine the changes in their state EOC scores. Would the students' grades improve, stay the same or worsen? It's going to be highly important to evaluate the long-term effects of the pandemic on education. An additional recommendation would include adding more variables. It would be interesting to evaluate the impact on those with differing socioeconomic statuses along with comparing students who do and do not have an IEP/504/ELL plan. Knowing that student athletes are very motivated, it would be interesting to add a motivational survey to the study and compare to determine if a students' motivation level impacts their grades in any way.

In conclusion, the Covid-19 pandemic has caused some serious waves around the world not only with people's personal lives but education as well. With other studies suggesting that there will be long term effects of the Covid-19 pandemic on students' education it is very evident that change needs to occur. While standardized tests aren't the "end all be all" for students, there were obvious gaps that have been created from only a year of online learning. In order to combat these gaps, educators need access to resources to help students get back on grade level. The hope is that the results of this study will start a conversation to initiate movement in the right direction to address these gaps. This is necessary for the future of education to succeed.

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