MUSIC PARTICIPATION AND ACHIEVEMENT SCORES AMONG MIDDLE SCHOOL STUDENTS WITH DISABILITIES: A CAUSAL-COMPARATIVE STUDY

by

Ashley Anne Gonzalez

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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ABSTRACT

This quantitative, causal-comparative study examined the differences in reading and math achievement between students with disabilities who participated in music for two or more years and those who did not. This study's purpose was to show if participating in music can impact the academic achievement of middle school students as measured by the State of Texas Assessment of Academic Readiness (STAAR). The covariate in the study was the reading and math STAAR scores from fifth-grade students in the 2015–2016 school year before they participated in middle school music. These students' eighth-grade 2018–2019 math and reading scores were used to show if a difference exists between the academic achievement of students that took part in music and those who did not. A convenience sample of 155 students from an urban district was analyzed using ANCOVA statistical analysis to discover if there is a difference in the achievement of middle school students with disabilities when participating in music classes for two or more years as measured by their STAAR scores. The research found no statistically significant difference between the two groups. Future recommendations for research include duplication of the study with a larger sample or different population.

Keywords: developmental disabilities, music participation, special education

Dedication

I want to dedicate this work to my family, without whom this work could not have been completed. To my husband, who made an infinite number of dinners and put the kids to bed while I was working hard writing. You are my love, my best friend, and I would not have come this far without you. Also, to my Anna, who works hard no matter what: Your mom is finally done with her homework. To my April, whose boundless energy kept me on my toes while trying to finish these pages. Also, to my previous, current, and future students: Never give up and keep pursuing your dreams. There is nothing you cannot do when you put your mind and effort into it. Lastly, this dissertation would not have been possible without God, who is my strength and Savior.

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List of Abbreviations

Analysis of covariance (ANCOVA)

Attention deficit hyperactivity disorder (ADHD)

English language learners (ELL)

Every Student Succeeds Act (ESSA)

Individuals with Disabilities Education Act (IDEA)

MAP (Measure of Academic Progress)

National Center for Education Statistics (NCES)

No Child Left Behind Act (NCLB)

Socioeconomic status (SES)

State of Texas Assessment of Academic Readiness (STAAR)

Statistical Program for the Social Sciences (SPSS)

Texas Education Agency (TEA)

CHAPTER ONE: INTRODUCTION

Overview

Today, throughout the United States, there are seven million students from ages three to 21 in special education; teachers see all disabilities represented in every classroom and strive to bring each child up to the academic standards required by law (National Center for Education Statistics [NCES], 2017). Due to laws protecting students with disabilities, more students than ever receive special education services and participate in standardized assessments. Students with various disabilities have shown great promise with music therapy and music-related activities, such as social-emotional, motor, sensory-perceptual, behavior, and other skills (Matney, 2017; Robb, 2014; Shakarashvili & Arabuli, 2016; Srinivasan & Bhat, 2013). Also, participation in musical activities has shown to be correlated with an increase in math and reading achievement scores with the general population (Cox & Stephens, 2006; Gouzouasis et al., 2007; Miksza, 2010; Slater et al. 2010). Alternatively, music has been used as an intervention to increase literacy skills such as reading comprehension, fluency, and vocabulary (Bhide et al., 2013; Biggs et al., 2008; Long, 2014; Paquette & Rieg, 2008). The educational theorists Howard Gardner and John Dewey believed music is one of the seven multiple intelligences that work in tandem with the other intelligences (Helding, 2010). The impact of music participation has on students with disabilities should be studied to assist today's teachers in closing the achievement gap with this population. However, little research on music participation has included this specific student group.

Chapter One will briefly describe the historical background of special education and summarize the different uses and benefits of music. This chapter will also show the lack of studies that specifically use middle school students with disabilities enrolled in music. The

problem and purpose statements are discussed, detailing the need to understand the difference in achievement among students with disabilities enrolled and not enrolled in music classes. Lastly, presented are the research questions and definitions of terms used in this research.

Background

Historical

According to the NCES (2018), 95% of the seven million students receiving special education services are in regular schools. Due to federal and state laws explicitly protecting these students' education, the number of students receiving services has almost doubled from 1975 to now (NCES, 2018). These alarming statistics solidify teachers' and schools' need to find programs that help increase achievement for students with disabilities. Even though laws such as the Individuals with Disabilities Education Act (IDEA) protects students with disabilities and indicate assessment accommodations, students with disabilities continue to struggle on national mandated assessments (Texas Education Agency [TEA], 2017).

If laws dictate that students with disabilities must take these assessments, schools and educators need to develop ways to increase achievement scores specifically for this demographic. As new laws concerning students with special needs have evolved—with the enactment of the Every Student Succeeds Act (ESSA) and IDEA—teachers must find new ways to address these students' needs. Furthermore, the government mandates that schools provide accommodations and modifications for students with disabilities, including for curriculum, services, and assessment.

Social

Laws have dictated that students with disabilities must be given services for educational success. These special education services include related services, supplementary aids, and

services that enable the child to advance appropriately toward their goals, make progress in the general curriculum, and participate with children without disabilities. Music therapy is one service that can be provided to students and falls under the "related services" portion of the law. Music therapy services have assisted students in social-emotional, motor, sensory-perceptual, behavioral, and multi-system developmental skills (Matney, 2017; Robb, 2014; Shakarashvili & Arabuli, 2016; Srinivasan & Bhat, 2013). Music therapists employed by public schools use various activities to support students with an assortment of disabilities.

Furthermore, research has shown that music integration can positively impact student engagement, reading accuracy, comprehension, word knowledge, and decoding (Colwell & Murlless, 2002; Register et al., 2007). For students in general education, music has positively affected reading abilities (Darrow et al., 2009). Music has also been used in several interventions for struggling readers with positive effects (Bhide et al., 2013; Biggs et al., 2008). Specifically, the implementation of a rhythmic-based intervention program to enhance literacy achievement has also shown positive benefits (Bhide et al., 2013; Long, 2014). Incorporating soft music when students are completing academic tasks has positively impacted memorization (Moradi & Zamania, 2014). The specific demographic of English language learners (ELLs) have benefited from music intervention (Moradi & Zamania, 2014; Paquette & Rieg, 2008; Slater et al., 2014). Other research has focused on the effect music has on early literacy development and early literacy skills (Anvari et al., 2002; Bhide et al., 2013; Runfola et al., 2012; Salmon, 2010; Wiggins, 2007). Furthermore, there have been confirmed results of music instruction impacting social and academic behavior (Jellison & Draper, 2015).

Research has shown that music can contribute to higher achievement scores for students in musical groups (Cox & Stephens, 2006; Gouzouasis et al., 2007; Miksza, 2010). Participation

in music groups can affect literacy (Babo, 2004; Gordon et al., 2015; Helmrich, 2010; Horton et al., 2010; Slater et al., 2014). Specific literacy skills that have been impacted by music participation include reading comprehension and vocabulary. Music participation has improved math achievement scores in various studies (Babo, 2004; Horton et al., 2010; Jones-Lewis, 2013; Miendlarzewska & Trost, 2014). Although socioeconomic status (SES) is a significant factor impacting academics, music participation has shown positive results to counteract this negative impact (Catterallet al.,, 2012; Foster & Marcus Jenkins 2017; Kells, 2008). Even with positive research on the impact of music on achievement, there is little exploration of this impact on students with disabilities (Cogo-Moreira et al., 2012).

Theoretical

With the positive results music has had on various behaviors and academics, it is no wonder Howard Gardner suggests music as one of the multiple intelligences that can exist in an individual. Gardner emphasizes that each intelligence works together with the others, and music engages all seven intelligences: visual-spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, linguistic, and logical-mathematical (Gardner, 1993; Helding, 2010; Leshkovska & Speseva, 2016). Musical intelligence relates to linguistic and mathematical intelligences in many ways.

Many elements of music are strongly related to linguistic intelligence. For example, reading and music can contain similar concepts such as symbols that show meaning, combinations of letters or notes to create words or chords, and specific placement of reading left to right (Curtis, 2012). Music also plays a significant part in logical intelligence. This logical or mathematical intelligence is the capacity to analyze patterns and logic associated with mathematical thinking (Blue, 2015; Brualdi, 1996; Wu & McMahon, 2014). Mathematical

intelligence connects to musical intelligence by aiding in decoding musical notation and patterns (Mallonee, 1998).

Howard Gardner and John Dewey both supported the idea of music impacting achievement and believed in the correlation between music and other intelligences in a child's life (Dewey, 1916; Helding, 2010; Leshkovska & Speseva, 2016). John Dewey (1916) stated, "Music and literature are theoretically justified on the ground of their cultural values and are then taught with chief emphasis upon forming technical modes of skill" (p. 162). Also, Dewey (1938) conducted several studies that emphasized the integration of several extracurricular subjects, such as music, to educate the whole child. With evidence to support the positive impact that music and music participation has had historically and socially, it is not far-reaching to conclude that music participation can also impact students with disabilities.

Problem Statement

The problem in current research on music participation is that most studies include all students and do not distinguish between the scores of students in special education and students not in special education. Additionally, several studies exclude this demographic from their results when analyzing the effect of music participation on achievement (Babo, 2004; dos Santos-luiz et al., 2015; Gordon et al., 2015; Slater et al., 2014). Another study excluded those with severe disabilities, although these students could still participate in state assessments (Miksza, 2007). Several studies show a positive correlation between music participation and achievement for students without disabilities but do not provide any evidence for students in special education, although they make up a sizable percentage of the school population (Babo, 2004, dos Santos-luiz et al., 2015; Gordon et al., 2015; Slater et al., 2014). With 13% of the population of students in public schools having diagnosed disabilities, according to the NCES

(2018), educators need to be aware of the effect music participation can have on achievement scores for these students.

With the inclusion of students with disabilities in standardized testing, researchers must study music participation in these students. Educators must identify alternative factors that can contribute to higher achievement in students with disabilities, such as music participation. The problem is that most research conducted on the effect of music on academics either excludes students with disabilities or does not label them explicitly. However, the traditional classroom consists of all students, including those with disabilities.

Purpose Statement

The purpose of this study was to determine if participation in music for two to three years has any difference on math or reading State of Texas Assessment of Academic Readiness (STAAR) scores for eighth-grade students who are in special education. A comparison of the STAAR scores of students in special education who participated in music to the scores of students in special education who did not participate determined if a statistically significant difference in achievement existed based on of formal music participation (band or choir). The students' fifth-grade scores were used as a covariate in order to compare their eighth-grade scores. Both math and reading scores were analyzed for both groups. Achievement was examined for both groups to determine if a correlation existed between music participation and academic scores. If music involvement shows a difference in scores, educators can use this knowledge to help close the educational gap for students with disabilities.

Significance of the Study

The significance of this study is that it analyzed the effects of music participation on reading and mathematics achievement with students with disabilities and can add to the body of

research that suggests the positive impact music participation has on reading and math skills (dos Santos-Luiz et al., 2015; Miksza, 2007). Additional studies have been based on band or choir enrollment, but not combined music participation for middle school students (Jones-Lewis, 2013). The major weakness of many studies is the lack of statistical analysis of students with a range of disabilities (Babo, 2004; dos Santos-luiz et al., 2015; Gordon et al., 2015; Slater et al., 2014). Furthermore, this study investigated only the demographics of students in special education at a middle school. IDEA and the push toward the least restrictive environment encourages inclusion, so many classrooms are not separated by disabilities and include disabled and non-disabled peers. Replication of this study is possible because the number of participants and the variety of disabilities within the groups. With the passing of laws such as IDEA, inclusion has integrated most students with disabilities into the general classroom, no longer separating them from their non-disabled peers. If a statistically significant difference is shown to exist between groups in achievement scores, educators can begin accepting that music participation can impact the achievement gap for students with disabilities. Students with disabilities account for 13% percent of the student population (NCES, 2018). Hopefully, through this study, educators can encourage participation in music programs for students' enjoyment and the impact this participation may have on achievement scores. This study may provide evidence of the importance music programs have on math and reading. Also, this research may encourage schools to develop music programs to target students with disabilities.

Research Questions

RQ1: Is there a significant difference in eighth-grade *reading achievement scores* between middle school students with disabilities who participated in school-based music

performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores?

RQ2: Is there a significant difference in eighth-grade *math achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores?

Definitions

1. *Achievement* –knowledge and skills students have shown that correspond with the of the state-mandated curriculum and expectations
2. *Gardner's theory of multiple intelligence* – The theory that individuals have eight or more independent intelligences (Gardner, 1999).
3. *"Mozart effect"* – A term coined after an article published by Rauscher et al. in 1993, who stated that listening to Mozart may positively affect intelligence.
4. *Middle school* – Public school consisting of sixth through eighth grade and includes core subjects and extracurricular programs.
5. *Music participation* – Active student enrollment in any band or choir classes.
6. *Music therapy* – The skillful use of music and musical elements by a music therapist to promote, maintain, and restore mental, physical, emotional, and spiritual health (Canadian Association of Music Therapists, 2016).
7. *Special education* – Specially designed instruction that meets the needs of a child with a disability (IDEA, 2004).

8. *STAAR (State of Texas Assessments of Academic Readiness)* – A state testing program designed to measure the knowledge and skills defined in the Texas Essential Knowledge and Skills (TEA Student Assessment Division, 2018)
9. *Students with disabilities* – A studentwith mental retardation, hearing impairments (including deafness), speech or language impairments, visual impairments (including blindness), serious emotional disturbance, orthopedic impairments, autism, traumatic brain injury, other health impairments, or specific learning disabilities; and who, by reason thereof, needs special education and related services. (IDEA, 2004)

Summary

With the enactment of laws precisely identifying the equal education and assessment of students with disabilities, teachers must identify ways to increase test scores with this demographic. Music participation has shown great promise in increasing achievement scores with non-disabled students. This study may show that music can play a vital role in education for students with disabilities. For instance, music as an intervention has been used to increase a multitude of literacy skills, including reading fluency and comprehension (Darrow et al., 2009). Participation in musical activities has been shown to increase math and reading achievement scores (Cox & Stephens, 2006; Gouzouasis et al., 2007; Miksza, 2007; Slater et al., 2014). Howard Gardner believed that music is one of a person's multiple intelligences and works together with the other intelligences (Helding, 2010). The problem in current research is that most studies include all students and do not distinguish between the scores of special education and non-special education students. This purpose of this study was to determine if a difference existed in eighth-grade achievement scores between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as

measured by the STAAR when controlling for fifth-grade achievement scores. This study is significant because it can show the potential impact music can have on standardized achievement in students with disabilities. Additionally, this study can help educators identify music as a means to increasing achievement and add to the body of research that suggests the positive impact music participation has on reading and math skills (dos Santos-Luiz et al., 2015; Miksza, 2007).

After the foundation of information developed in this chapter, next is an examination of literature showing the impact of music on students with various disabilities. The theoretical framework will be discussed, which involves the correlation between Howard Gardner's multiple intelligence theory and the theories of John Dewey in conjunction with the current study. Also briefly discussed is special education law and assessment. The bulk of the present review highlights literature that supports music's positive effect on achievement in math and literacy within many populations and different age groups.

CHAPTER TWO: LITERATURE REVIEW

Overview

Over the years, special education law has changed, becoming more focused on the needs of children with disabilities. Music has shown positive effects on math and literacy achievement with non-disabled students. With complementary research on the impact of music on literacy achievement, more research is needed on music's ability to enhance the reading and math skills of students with disabilities (Cogo-Moreira et al., 2012).

Chapter Two first identifies the theoretical philosophies that support the correlation of music participation with literacy and math. Subsequently, discussed is special education law as it pertains to this current study. Following special education law is a discussion on assessment and how it relates to students with disabilities. Then, stated is music's impact on students with a variety of disabilities. Next is music's academic influence on students in the general population, including the "Mozart effect" and music as an intervention. Finally, previous literature shows the effect music participation has on math and literacy achievement with non-disabled students.

Theoretical Framework

Gardner

Howard Gardner was a pioneer that revolutionized the idea of the intelligence that a person may possess. As defined by Gardner (2011), intelligence is within each human, differs for each human, and is based on how one carries out a task to complete a goal. Garner's intelligences include seven categories: linguistical, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal (Gardner, 1993). According to Gardner (1993), intelligence is the knowledge gained and how a person acquires and uses it. Additionally,

Gardner (2011) emphasized that intelligences work in tandem, and individuals do not solely use one intelligence but many when learning, solving problems, and creating.

The intelligence most related to participating in school music programs is Gardner's music intelligence. Music intelligence is the ability to identify and create musical pitches, rhythms, and tones (Brualdi, 1996; Tamilselvi & Geetha, 2015). By participating in music, students use music intelligence to create songs. Music stimulates the brain, promotes positive parent-child relationships, and benefits children's behavior, communication, and social development (Nicholson et al., 2008). Music intelligence is an essential skill that should be cultivated in all children due to the learning that can stem from it (Stollery & McPhee, 2002).

Helding (2010) stated that music is connected to all other intelligences and shows uniqueness and independence. Moreover, Gardner (2011) paralleled this idea by noting that music activates intelligence beyond music. Music is linguistic, mathematical, spatial, kinesthetic, intrapersonal, and interpersonal. William P. Bintz (2010) suggested other parallels between musical intelligence and other areas of intelligence. Singing, he asserted, has an amplifying effect on creativity and can give individuals the ability to express themselves and create interpersonal or communal relationships (Bintz, 2010). Playing the piano is another example of combining intelligences; playing the piano uses musical, corporeal, and personal intelligence to communicate notes and feelings to the listener (Almeida et al., 2010). Thus, music intelligence directly correlates to other intelligences that are beyond the basic idea of creating music.

In an interview, Tammy McGregor stated that music and literacy share many of the same concepts or "parallel skills" (Frasier, 2014). For example, music intelligence can directly correlate to many reading skills, such as fluency. Fluency is the speed, accuracy, and expression with which a person reads a text aloud. Reading teachers in the classroom use repeated reading

to increase fluency, while music teachers use repeated reading as choral rehearsals. Another way music relates to literacy is in the concepts of print. Music and reading contain similar devices. Music uses symbols to convey sounds and chords that express meaning, just as letters represent sounds to create words and sentences. Further, music and reading require exact placement, reading from left to right (in English languages), and punctuation (Curtis, 2012). Also, both music and language use oral and auditory systems, according to Gardner (2011).

In addition to the connection between music and literacy, musical intelligence is related to logical-mathematical intelligences in many ways. Logical-mathematical intelligence is used when developing equations, making calculations, and solving abstract problems (Gardner, 1999). For years, music and mathematics have had a link exemplified by the logic of composing to the organizational structure of music itself. In non-Western cultures, the study of music shared many correlations with the practice of mathematics, such as proportions, ratios, and patterns (Gardner, 2011). From the time of Palestrina to the 20th century, music remained connected to mathematics, including through the 12-tone music scale and rhythms within musical work. With this correlation between music and mathematics, it seems prudent to investigate the effect music may have on mathematical achievement.

Dewey

John Dewey was one of the pioneers of education. His ideas of learning through experience were instrumental in the development of progressive education. Dewey believed that experience is an interaction between the environment and human beings (Reichling, 1991). Also, there is an organic link between knowledge and personal experience (Dewey, 1938). Dewey's definition of "art" relates to music, visual arts, and literature (Zinar, 1984).

Music and elements of achievement, such as literacy, are related to many aspects of experiential education. Literature and music encompass and convey human emotion, imagination, and other skills (Zinar, 1984). Dewey suggested that knowing and doing relates to feeling, and music can be its expression (Tan, 2016). Meaning sometimes cannot be expressed linguistically, only musically. Music can prevail and show logic when the language does not have the symbols or words to explain.

Dewey believed that experience is the art of making and observing, which relates to music through composing and performing (Reichling, 1991). Musicians interact with the instrument to provide sound, and singers use their vocal cords to create sound and convey meaning. A child's involvement in music could be considered a productive type of experience that is necessary, according to Dewey (1938). He believed that education should live creatively within experience (Dewey, 1938). That experience can provide a continuum of learning. Dewey's concepts address the many ways students can bring artistic experiences into the act of creation (Blom, 2017). Also, Dewey (1938) stated, "We have a problem of discovering the connection which exists within experience between the achievements of the past and issues of the present" (p. 23). A child's experience in music may impact their present or future understanding and how they experience the world around them.

The connection between music and language is evident. Language conveys thoughts, information, and feelings with words, while music uses different sounds to show these principles. Dewey (1934) noted that art is a kind of language that can communicate the artist's thoughts and feelings. Music breaks through human barriers, unlike other forms of communication (Dewey 1934). According to Dewey (1934), art or music is more of a universal language than speech. Music communicates because it expresses (Dewey, 1934). Music, through experience and

expression, can lead to multiple forms of language. The link between art and language is not the only association Dewey made; he also connected art through experience associated with mathematics or logic.

Inquiry allows students to guide their thinking through a logical process of problem-solving (Vannatta, 2014). Dewey understood that through investigations, mathematical concepts could be employed. This idea means that deduction, induction, and abduction originate in inquiry procedures (Ratner, 1992). Without this, mathematical concepts and logic would remain a mystery. This human inquiry is the vessel of experience that can guide understanding in all subjects, including mathematics.

The relationship between language, communication, logic, and art is integral in education, according to Dewey (1934). Music programs in schools embody Dewey's idea. Environments are created to encourage play, work, and facilitate mental growth (Dewey, 1916). Learning is accomplished through creating and lifts art above traditional education (Dewey, 1934). Dewey (1938) suggested that collateral learning between music and other subjects cannot be obtained using classical lessons. Art, such as music, is an experience that teaches students beyond conventional teachings.

Dewey discussed the connection of experience and music as a universal language of understanding and logic. Gardner emphasized the importance of music intelligence and how it works in tandem with logical and linguistic intelligence. Music is an experience that promotes a variety of intelligences. It is prudent to investigate if experience in a music program affects a child's reading and mathematical achievement.

Related Literature

Special Education Law

Education has changed and developed tremendously over time. Case laws and federal legislation have impacted the education of students with disabilities. The catalyst that shed light on teaching students who were considered different was the equal rights and desegregation laws of the 1950s and 1960s (Hurwitz, 2008). The civil rights movement ignited the idea of equality for all. Numerous state case laws supported this idea in education, such as *Brown v. the Board of Education* in 1954. This landmark case ignited the idea of fair and equal education for all, beginning with race. One can argue that this was the foundation of educational equality. The *Brown* decision eventually led to a case for special education, *Mills v. Board of Education,* in 1972 (Hurwitz, 2008). After *Mills*, many more examples supported the concept of equal and free education for students with special needs, including *N.Y. Board of Education v. Rowley* in 1982 (Hurwitz, 2008).

Not only did case law support this demographic of students, but federal legislation began assisting them as well. One of the first laws to explicitly indicate the fair treatment of students with disabilities was the Handicapped Children's Early Education Assistance Act of 1968 that provided early intervention programs and projects. Also, the Vocational Rehabilitation Act of 1973 and Section 504 provided services to students who may not meet special education guidelines (Hurwitz, 2008). The next law to support students with disabilities was the Education of All Handicapped Children Act of 1975 that mandated inclusion, parental consent, due process, and zero rejection (Hurwitz, 2008). The Education of All Handicapped Children Act was renamed and expanded to the Disabilities Education Act. Simultaneously, the Americans with Disabilities Act was passed, mandating the elimination of discrimination within schools, employment, and private entities for those with disabilities (Hurwitz, 2008). Through these

authorizations came the IDEA. Currently, the IDEA is one of the primary laws protecting students with disabilities. The IDEA's critical sections consist of a mandate for free and appropriate education for students with disabilities in the least restrictive environment. Other components of the IDEA include child find, individual education plans, related services, transition programs, and confidentiality (Hurwitz, 2008). Additionally, another significant law regarding students with disabilities is the No Child Left Behind Act (NCLB). This decree required a shift in interventions and curriculums for students in special education. NCLB described assessment and performance, where children with disabilities must participate in the evaluations (Hurwitz, 2008).

Currently, NCLB has been replaced by the ESSA, which is a reauthorization of the Elementary and Secondary Education Act of 1996. ESSA focuses on every child's success. Provisions include equity for disadvantaged individuals, and college and career academic standards for all. Also, it provides actions and accountability for lower-performing schools and dictates explicitly the percentage of students with severe disabilities who can take an alternative assessment. This current percentage is one percent of all students. The law also decrees specific subgrants for programs and activities that increase teachers' ability to effectively instruct children with disabilities, including the development or enhancement of instruction that ensures high-quality education and effective reading and writing strategies for these children (ESSA, 2015). ESSA provides specific funding and awards to enrich students' academic experience by promoting arts education for disadvantaged students and students with disabilities. It offers teachers more knowledge about instruction and support services regarding these individuals (ESSA 2015). With these significant mandates and case law advancements, schools must

accommodate students with disabilities, including the curriculum, supports, and assessments they receive.

Special Education and Assessment

The identification and qualification of students with disabilities are explained explicitly in the IDEA. First, a two-part test is used to determine whether a child is eligible for special education and related services. First, the child must have a disability. Second, because of this disability, the child must need special education services to succeed (IDEA, 2004). Thirteen categories of disabilities are used by IDEA (2004): auditory impartment (from birth), autism, deaf-blindness (from birth), emotional disturbance, intellectual disability, multiple disabilities, noncategorical early childhood, orthopedic impairment, other health impairment, specific learning disability, speech or language impairment, and traumatic brain injury or visual impairment (including blindness from birth). A child must meet the circumstances for eligibility with one or more of these disabilities. Once this criterion is met, a committee must then decide if the child needs special education and related services to succeed in public school. This second criterion is essential for qualification. Once a child meets these qualifications, an Individualized Education Program is developed for the child with parental and committee consent. Only then can services be rendered. Although these students may have a disability that significantly affects their education, the law mandates they take the grade-level content appropriate state assessment.

Beginning with NCLB's enactment in 2002, students with disabilities must take standardized assessments, and these scores are included in the desegregated assessment data for accountability. NCLB required that all students be 100% proficient on the assessments by 2014 (Egalite et al., 2017). There is no longer a proficiency quota with ESSA's enactment, but all students must participate in accountability testing. However, ESSA has established a mandated

cap of students that can partake in an alternative assessment. This cap is limited to one percent of the student body. According to Darrow (2014), this alternative assessment is meant for students with severe cognitive disabilities, which applies to approximately 10% of students with disabilities.

Furthermore, ESSA indicates that students with disabilities can have access to supports and allowable accommodations on assessments and in class; these accommodations are congruent with IDEA and a child's Individualized Education Program (Parsi & Casey, 2016). Accommodations usually include changes within the classroom, such as preferential seating, a slower pace of instruction, or extra time (Crockett, 2017). Accommodations are a means of leveling the playing field for both learning and assessment for students with disabilities (Bouck, 2013).

Students with significant intellectual disabilities, learning disabilities, and other disabilities are assessed using the same standards as their general education peers, although their disability can significantly affect academics. According to the National Assessment of Educational Progress, a measure of academic achievement of U.S. elementary and secondary students in various subjects that assesses what students know and can do, indicated the total number of students with a disability was 12% in 2017 (U.S. Department of Education, 2017a). Nine percent of these students took the test with accommodations and three percent without (U.S. Department of Education, 2017a). Unfortunately, academic performance for this demographic is incredibly low; this may be due to their disability. For instance, in reading for eighth-grade students, 19% of students overall scored below basic, while 61% of students with a disability scored below basic (U.S. Department of Education, 2017a). The eighth-grade math

scores mirrored this data, with 69% of students with disabilities scoring below basic, and students as a whole scoring only 25% below basic (U.S. Department of Education, 2017b).

Specifically, in Texas, the statistics are similar to the national data, with over 11% of students taking the STAAR categorized as having a disability in eighth grade. Performance differences between this demographic and students as a whole were even more staggering than nationally. According to Texas Assessment Management System (2017), 41% of students with a disability met the standards in reading on the STAAR assessment, compared to 90% of those without a disability. In Texas, the math performance for students with disabilities was slightly better than in eighth-grade grade reading. For example, 48% of special education students met the math standard compared to 91% of students not in special education. For students with disabilities taking the standardized assessment, school districts may need to find alternative resources, such as music performance, to close this achievement gap.

Music in Special Education

Music Therapy

Music is used in a variety of ways to assist students. Currently, one of the only means of using music explicitly with students with disabilities is music therapy. Music therapy is a related service in special education (Sze, 2006). This related service is guaranteed by IDEA and ESSA, requiring students with disabilities to be granted services that support their education and educational goals (Hurwitz, 2008). Specific services are not outlined in the laws but can include transportation; counseling; recreation and enrichment programs; school nurse services; and physical, occupational, speech therapy, and music therapy.

Music therapy has increased in both the private and public settings. According to a survey by the American Music Therapy Association (2018) with over 1,400 respondents, 13% of

music therapists work in the school setting and serve over 2.4 million people overall. This therapy is used mostly with individuals with behavioral, physical, and emotional disabilities but has gained popularity for use with other disabilities. It provides the integration of music to assist students with disabilities. According to a recent study, music therapy elements are listening, signing, music making, and rhythmic movement (Srinivasan & Bhat, 2013). Music therapy directly or indirectly impacts communication, social-emotional skills, motor skills, sensory-perceptual skills, and behavior that connects music to multi-system development (Srinivasan & Bhat, 2013). Music therapists use various interventions, including instrument play, sensory stimulation, early intervention, technological, social interaction, and adult therapy (Farnan, 2007).

As one of the first music therapists in public schools, Alice-Ann Darrow stated that musical therapy aims to assist non-musical elements such as physical, social, emotional, and cognitive skills (Tsiris, 2013). She also emphasized that music for students with disabilities can have impacts beyond school and into their future lives. Additionally, music therapy is "a sophisticated cognitive, linguistic, social and psychological vitamin pill" (Sze, 2006, p. 115) that can facilitate learning. Music, Sze (2006) asserted, boosts children's ability to examine and analyze situations beyond the music, encouraging reason and creativity. Music can have influence beyond the definition of music therapy for students with disabilities. It can aid in all areas, including education.

Music therapy usually targets specific behaviors but can be used to enable a child's learning (Gallegos, 2006). Judith Jellison has expressed that music can impact student learning, including inclusion, on-task behavior, and social behavior competency. She believes music has strong ties with special education and can assist memory, behavior, psychology, and relaxation

for students with disabilities (Gallegos, 2006). Jellison stated that in the future, integrating music in the education of students with disabilities can go beyond behavior and into the learning process. Music and music therapy can assist students with various disabilities, autism, attention deficit hyperactivity disorder (ADHD), emotional, behavior disorders (Sze, 2006), and dyslexia (Rolka & Silverman, 2015).

Music's Effect on Various Disabilities

Therapists and educators have used music and music therapy with autism. Music can improve social and behavior skills that students with autism may lack. Several studies with students with autism have shown positive results when incorporating music to teach social and behavioral skills (Jellison & Draper, 2015). Susan Sze, a professor from Niagara University, stated music therapy could "encourage cognitive, learning, perceptual motor, social and emotional development of disabled students" (2006, p. 113). A review of literature from 22 experimental studies that contained both students with and without disabilities showed either positive or partially positive results of music on variables of social behavior and academic outcomes (Jellison & Draper, 2015). An additional review of the literature by Simpson and Keen (2011) showed numerous positive impacts on students with autism concerning socialization skills. Simpson and Keen (2011) varied the type of music incorporated and types of music therapy. Results revealed music's impact on task behavior, academic engagement, classroom routines, and the teaching of social stories (Simpson & Keen, 2011). Studies also showed a positive effect when using music for social behavior and social responses in students with autism (Finnigan & Starr, 2010; LaGasse, 2014; Simpson & Keen, 2011). A recent study of a pilot music program showed a remarkable increase in self-esteem, reduced anxiety, and increased positive attitudes toward peers among students with autism (Hillier et al., 2012). Not only is

music and music therapy assisting with the deficits that students with autism may experience, but music can help with other disabilities.

ADHD is another disability that has benefited from music and music therapy. The federal special education guidelines categorize this disability under Other Health Impairments. Students with ADHD may lose focus, have self-esteem issues, and have a distorted reality that can negatively impact their development and academics (Ouellet & Poliquin, 2012). Moreover, such children are curious and interested in the world around them; they learn best when they use all their senses and are active learners within subjects that interest them (Ouellet & Poliquin, 2012). Music and music therapy have been able to "improve attention, concentration, impulse control, social functioning, self-esteem, motivation, and memory" (Sze, 2006, p. 116). Several studies have explored music therapy's effects on students with ADHD (Jackson, 2003; Ouellet & Poliquin, 2012; Rickson, 2006). Music therapy has decreased several symptoms of ADHD and encourages creativity and self-determination (Rickson, 2006). Rickson's (2006) study showed an overall improvement in attention and decreased oppositional behavior after music therapy sessions. In conclusion, music therapy has shown positive effects for students with ADHD regarding their behavior and related social goals, but more research should continue to expand this body of knowledge and positive claims (Jackson, 2003; Ouellet & Poliquin, 2012; Rickson 2006).

Another disability that music and music therapy has helped is known as an emotional disturbance. According to IDEA (2004), an emotional disturbance is a condition that includes the inability to learn which is not due to intellectual or health factors, failure to have satisfying relationships, inappropriate behavior or feelings under normal circumstances, a general mood of unhappiness, or physical symptoms of fear. A music therapist can use music to enable

socialization, assist in interpersonal interactions, and create emotional reactions (Sze, 2006). One study showed a significant positive effect on communication and interaction skills with students over age 13 who struggled with behavioral, developmental, and emotional disturbances (Porter et al., 2017). Likewise, some students had a significant improvement in self-esteem and decreasing depression after a series of music therapy sessions (Porter et al., 2017). An additional literature review concerning music therapy with children with severe emotional disturbances showed enhancement with communication, socialization, and tolerance (Hong et al., 1998). Additionally, improvements in decreasing anxiety, recognizing moods, enhancing self-expression, and increasing social awareness, cooperation, and relating to others were evident (Hong et al., 1998). Music and music therapy continues to help students with emotional disturbances and improve social and emotional skills.

Students with dyslexia have also benefited from music and music therapy. Although not defined by the federal government as a qualifying disability for special education services, dyslexia still affects many individuals. Dyslexia is "a heterogenetic term indicating a fundamental deficit in phonological processing (the manipulation of sounds)" (Rolka & Silverman, 2015, p. 24). A recent review of the literature by Rolka and Silverman (2015) revealed a connection between dyslexia and music. For instance, students with dyslexia tend to struggle with rhythmic patterns in music.

Additionally, music can be used as an early detection method for dyslexia and can identify language deficits at an early age (Rolka & Silverman, 2015). A study verified the connection between dyslexia and music and revealed that the students receiving music training scored better on various reading-related skills (Forgeard et al., 2008). Another study showed that after music training, students with dyslexia performed better on rhythmic abilities, phonological

awareness, and reading skills (Flaugnacco et al., 2015). Students with dyslexia may have difficulty with timing skills, and music lessons can decrease this deficit while increasing reading fluency, phonological awareness, and spelling skills (Overy, 2000, 2003; Overy et al., 2003). With many studies revealing the correlation between dyslexia and music, researchers can assume that music participation can assist with deficits like dyslexia, but more research is needed.

Music Within the General Population

The Mozart Effect

The idea of music's effect on achievement and cognition is not new. This understanding began with an article published by Rauscher and colleagues (1993). This article triggered a bandwagon of studies involving listening to music. The term "Mozart effect" was eventually coined after this study due to music's so-called impact on cognition. Rauscher and associates (1993) showed only a slight increase in spatial reasoning and beyond 15 minutes showed no long-term effect on the limited population when participants listened to Mozart. The study showed non-statistically significant data, but it encouraged an epidemic of research connecting the idea that listening to Mozart can make a person smarter. Also, news reports exaggerated the effect, which led to music CDs and other products claiming that listening to Mozart made children smarter. Due to the results not being replicable and a limited research population, Rauscher et al.'s (1993) study is flawed. However, the idea that music can assist in cognition is still worthy of research.

Many studies have tried to prove or disprove the Mozart effect. For instance, Chabris (1999) conducted a meta-analysis on 16 different studies that showed the effect of listening to Mozart on cognitive tasks. Overall, Chabris (1999) concluded that listening to Mozart can have a small positive impact on difficult spatial tasks due to enjoyment or arousal. Using over 30

experiments in a meta-analysis, Hetland (2000) concluded that listening to some type of music can enhance performance on spatial-temporal tasks more than on non-spatial-temporal tasks.

Other researchers sought to determine if the types of classical music participants listened to may have different outcomes. Nantais and Schellenberg (1999) showed that participants who listened to Mozart or Schubert, over silence, increased their performance on spatial-temporal tasks. One study showed that listening to music made participants happy; thus, they performed tasks slightly better (Helding, 2014; Schellenberg & Hallam, 2005). Also, the enjoyment and recognition factor of the background music can impact creativity. For instance, after listening to music, cognitive enhancement was evident, especially in creativity, but improvement depended on the match between the music and the listener (Schellenberg et al., 2007). This research solidifies the idea that listening to pleasant music can positively affect performance based on the listeners' pleasure. Furthermore, a recent study demonstrated that musical arousal, both positive and negative, impacted creative thinking (He et al., 2017). Alternatively, one study suggested that music can increase memory but rejected the idea that mood and arousal were the sole reasons for the improvement (Bottiroli et al., 2014). Küssner (2017) suggested that listening to music before a cognitive task might be a more efficient way of increasing performance than listening to background music during the same task. The evidence suggests that listening to music during or before a task can affect a person's performance on cognitive and creative tasks. Still, more studies need to be conducted to understand if arousal or other factors cause this change.

Other studies have been conducted on the effect of listening to music on older adults with mental disorders due to the Mozart effect's popularity. Studies on adults with Alzheimer's disease have shown that listening to music can enhance subjective memory function and

objective cognitive performance (Innes et al., 2016). Additionally, when a group of adults listened to music for six and eight weeks, they reported reduced anxiety and depression scores compared to adults that did not listen to music (Chan et al., 2012; Sung et al., 2010)

Although the Mozart effect's initial impact was exaggerated, the idea that music affects learning is still evident in some previous research (Bottiroli et al., 2014; Innes et al., 2016). Currently, not enough data support this theory conclusively. Furthermore, research is still needed to determine if listening to music can result in higher cognition in both participants with and without disabilities to support the Mozart effect's claims.

Music in the Classroom

Music in the classroom is not a new concept. It is common in many preschools and early elementary classrooms. Elementary teacher preparation programs usually require music fundamentals or music methods courses (Colwell, 2008). This combination of teaching and music strengthens connections in the brain and uses multiple modalities of learning (Weinberger, 2004). Functional literacy taught in elementary connects music and other general curriculum disciplines in ways unknown to both the regular teacher and music teacher. Usually, these disciplines are separated, and each teacher teaches a separate curriculum, never considering how alike and connected they are. Both the general education teacher and the music teacher design a curriculum and pedagogy driven by critical and transformative purposes (Benedict, 2012). The teaching of music and functional literacy are linked. For instance, notation in music is a way of communication. There is a similarity between note reading and writing (Benedict, 2012). Besides, both music and general education teachers must teach to national and state and standards. Teachers need to understand that music and core subjects are related.

One way that educators can incorporate music is to study the teachings of William P. Blintz, a college education professor. Blintz (2010), who supported singing across the curriculum, discussed that singing is a personal expression that connects reading and writing within a community. Blintz (2010) encouraged his college education students to create songs to popular tunes that promote content learning. This strategy can assist in teaching content area material.

Teachers have found other ways to combine music and literacy within the classroom, and this can provide differentiated instruction for different learning types through active engagement opportunities for students. One example of incorporating music in teaching is accompanying written text with music (Curtis, 2012). In the Curtis study (2012), the kindergarten classrooms used music in phonemic awareness and concentrated on alliteration when children sang songs with words with the same phonetic sound.

Another example of incorporating music and literature is a technique by Tanny McGregor of combining songs with the reading strategies from her book Comprehension Connection. She used six songs per concept for different grade levels, creating activities that included flip charts for each song. The literacy skills that are depicted by Comprehension Connection are schema, inferring, questioning, determining importance, visualizing, and synthesizing (Frasier, 2014). Reading specialists, classroom teachers, and music teachers can work together to create lessons that can grow students' knowledge in literacy and music.

Teacher preparation programs, education professors, and many others support the combination of music with literacy. Integrating music in the classroom can benefit students beyond traditional musical skills; additionally, music can enhance other literacy skills through integration.

Music as an Intervention

Music also has assisted in education it is correlated with the core content area. The integration of music in the literacy curriculum may help diverse types of readers. Combining music with learning has helped several readers include early readers, struggling readers, and ELLs. The data supporting this integration can hopefully assist in closing the achievement gap with these types of readers.

Music is typical in many early learning activities. It assists with the levels of engagement, diversity, and creativity in young people (Wiggins, 2007). Extensive research confirms music's impact on early literacy development skills (Anvari et al., 2002; Paquette & Rieg, 2008; Runfola et al., 2012; Salmon, 2010; Wiggins, 2007). Teachers can use music to promote social and cognitive development and visual imagery and activate prior knowledge (Salmon, 2010). Also, music can connect listeners with culture and encourage imagination (Salmon, 2010). Music can support early literacy skills in a variety of ways. For example, using songs can increase fluency improve writing (Parquette & Reig, 2008). Furthermore, children with music skills have shown higher emergent literacy skills (Anvari et al., 2002; Runfola et al., 2012).

Music was used as an intervention in several studies (Darrow et al., 2009). Darrow conducted five separate studies on the integration of a music/reading curriculum. These studies proved that short-term music instruction could affect different literacy skills, including decoding, comprehension, and vocabulary (Darrow et al., 2009). A total of five studies were conducted with 458 second-grade children; the studies used the same music/reading curriculum but used various sites and teachers. In Case 1, students in the experimental group participated in an original reading curriculum and the music/reading program for 30 minutes three times per week, for a total of 18 sessions (Darrow et al., 2009). The experimental group in this case showed gains

in word decoding and comprehension, but overall growth was not statistically significant (Darrow et al., 2009). Case 2 involved three separate schools with different degrees of implementation of a weekly music/reading curriculum but did not show any increase in scores when combining reading and music in class (Darrow et al., 2009). Darrow and associates' third case study did not provide significant evidence that the music/reading instruction had increased students' reading skills. Still, it may have had other positive effects on the students, including engagement (Darrow et al., 2009). Case 4 consisted of seven groups, three that only participated in a regular music class, and four classes that participated in the assigned music/reading curriculum (Darrow et al., 2009). Although this study did not show gains, the participants in both groups had a positive response, and the music/reading curriculum could add to traditional music instruction (Darrow et al., 2009). The last study, Case 5, consisted of four groups in two different schools containing significantly different student ethnicities. Results did show a slight gain in reading skills for the music/reading curriculum, although the gain was not statistically significant (Darrow et al., 2009). Through this extensive research of five different cases, Darrow et al. (2009) concluded that students receiving the music/reading curriculum did have slightly increased scores over those who did not participate in the music/reading curriculum. However, overall teacher and pupil reactions were high even though the curriculum had little effect on reading scores (Darrow et al., 2009).

Additionally, poor readers have used rhythm-based music interventions to increase performance (Bhide et al., 2013; Long, 2014). One study compared a traditional reading intervention to a musical rhythmic reading intervention. It showed that a rhythmic intervention was effective for struggling readers, even though individual literacy skills were not directly taught through the music program (Bhide et al., 2013). An additional study integrating

movement and rhythm showed a moderate increase in reading comprehension, accuracy, and reading rate (Long, 2014). In both Long's (2014) and Bhide et al.s's (2013) studies, the participant sizes were small, but they did show evidence that music can increase reading skills. In a study using an interactive singing program, students showed gains in reading comprehension and achievement (Biggs et al., 2008). Although each intervention was different and focused on different literacy skills, the cited evidence shows that music can help struggling readers (Bhide et al., 2013; Biggs et al., 2008; Long, 2014).

Not only have struggling readers used music as an intervention, but music has also revealed positive results with ELLs. According to NCES (2019, para.1), "ELL students are individuals who have sufficient difficulty speaking, reading, writing, or understanding the English language to be unable to learn successfully in classrooms or to participate fully in the larger U.S. society." Researchers have studied the effects of music on ELLs (Moradi & Zamania, 2014; Paquette & Rieg, 2008; Slater et al., 2014). Slater et al. (2014) showed an increase in rapid naming skills with ELLs when incorporating music. Research has shown that literacy development can increase when integrating musical experiences into daily instruction with ELLs (Paquette & Rieg, 2008). In parallel with the Mozart effect, one study showed that soft music also revealed a positive effect on ELLs' reading vocabulary (Moradi & Zamania, 2014). The overall integration of music when teaching ELLs have shown positive results.

In conclusion, prereaders, struggling readers, and ELLs have shown growth when Music is integrated in teaching literacy. Research has been conducted incorporating music with various readers, but more research is needed to include students with disabilities. Furthermore, while integrating music into the curriculum shows promise for education, participating in music has also shown to be correlated with academic gains.

Music Participation

Impact on Reading Achievement

Literacy achievement includes reading, phonological skills, fluency, and comprehension. Due to the correlation between music and language, as explained by theorists such as Dewey and Gardner, it is no wonder that many researchers have studied the result of music on reading achievement scores. Studies have researched students' participation in music related to achievement beginning as early as four years old to high school age (Anvari et al., 2002; Cox & Stephens, 2006; Miksza, 2007, 2010; Southgate & Roscigno, 2009). The research was primarily conducted on elementary and high school students, with few studies concentrating on middle school students. Many studies do not identify any students with disabilities or explicitly exclude them (Babo, 2004; Cogo-Moreira et al., 2013; dos Santos-luiz et al., 2015;).

Gordon et al. (2015) completed a meta-analysis of 13 studies with specific criteria containing a music training or intervention, a control group, and a change in reading outcomes. Several studies included in the meta-analysis revealed small increases in phonological awareness skills associated with music training (Gordon et al., 2015). Also, when increasing the number of hours in music training, rhyming skills improved (Gordon et al., 2015). Other phonological outcomes, such as fluency, were tested but only showed a small effect size. The studies investigated musical intervention, musical training, controlled or non-reported SES, controlled or non-reported IQ, multiple languages, and other variables that produce even more questions about the impact music may have on reading skill (Gordon et al., 2015). Through this analysis, a relationship is recognized between music training and literacy skills.

One idea researched by Anvari et al. (2002) is the extensive relationship between developmental reading skills and musical skills, specifically music's impact on phonological

awareness in four- and five-year-old children. This study was conducted because of the fast rate at which reading and musical skills can be acquired at this age (Anvari et al., 2002). Researchers concluded that the ability to understand music is directly connected to reading skills and phonological awareness. Additionally, these same researchers showed that music could serve as a predictor for reading comprehension and phonological knowledge (Anvari et al., 2002). When a child is just beginning to read, phonological processing and musical skills are connected. This connection may be due to the similarity in auditory mechanisms in both early reading skills and early music skills.

Many studies discussed music's effect on lower elementary–age students' reading achievement scores (Moreno et al., 2009; Slater et al., 2014). Slater et al. (2014) studied the longitudinal effect of group music instruction on literacy skills when controlling for language and SES. These researchers compared a group receiving group music instruction to a control group receiving non-music education. Participants were identified as low-income, Spanish-English bilingual children ages six to nine. Slater et al. (2014) determined that the students receiving the music instruction retained their age-normed reading performance level while the control group deteriorated. The students that did not take music training declined in their overall reading ability. Students who received music instruction increased their rapid naming ability, a fluency-related skill (Slater et al., 2014).

Alternatively, Moreno et al. (2009) discussed music's impact on reading ability and pitch processing. Moreno et al. (2009) conducted a study on musical and non-musical eight-year-old children that revealed a transfer of music to improve speech, reading, and other neural processes. Surprisingly, the musical participation in this study only continued for 24 weeks, a significantly shorter period than the study conducted by Slater et al. (2014; Moreno et al., 2009). Expressly,

Moreno et al.'s (2009) study indicated a reduction of simple and consistent word errors, and the study showed an increase in full-scale IQ in the music group. This study also indicated that students with musical training improved in their discrimination of small pitch variations in speech, specific event related potential components, and complex phoneme-to-grapheme correspondence (Moreno et al., 2009). Even though the time involved in music participation and the specific skills tested were different, the findings showed a positive impact on reading. Although both studies used a small population, they do provide evidence that music participation can influence reading and other auditory skills (Moreno et al., 2009; Slater et al., 2014). The growing body of literature on the influence music participation has on reading skills is evident. Research still needs to be conducted using larger samples and other age groups to determine if the increase in reading skills is due to the participants' developmental age.

Research has shown a positive correlation between auditory skill, music participation, and reading skills with upper elementary students, ages eight to ten (Banai & Ahissar, 2013; Cogo-Moreira et al., 2013). Students with poor auditory discrimination and no music experience had low verbal memory scores (Banai & Ahissar, 2013). Cogo-Moreira et al. (2013) showed a statistically significant increase in reading and other secondary achievement factors when children complied with music activities compared to only a marginally significant increase when students did not comply. Overall, word accuracy, in-text accuracy, phonological awareness, and math were positively affected by music participation in this study, in which over 500 middle elementary students participated (Cogo-Moreira et al., 2013). However, it is unclear if prior music experience contributed to the reading skills or if the auditory function resulted in the difference in reading scores (Banai & Ahissar, 2013).

Very few studies specifically investigated the outcomes of middle school students' achievement in correlation with music participation (Corrigall et al., 2013; Kinney, 2008; Metsäpelto & Pulkkinen, 2012; Rickard et al., 2012; Thornton, 2013). Kinney (2008) specifically researched two different cohorts, sixth and eighth graders, to determine if music had a significant effect on achievement. This study showed that in sixth grade, music participation showed a significant main impact on success before and after the students enrolled in middle school music; the difference in proficiency were significant for all subtests (reading, math, science, and citizenship; Kinney, 2008). Additionally, students in the band showed the most significant increase in achievement over those who did not participate and participated in choir. The eighth grade cohort showed a significant main effect of music participation on achievement in most subtests, including reading, language arts, math, and science (Kinney, 2008). The band cohort again had a more significant difference than the other groups, and all those who participated in music showed a substantial difference in reading and math (Kinney, 2008). Rickard et al. (2012) also researched the effect of numerous factors on reading. Although the difference between pre- and post-treatment scores in the experimental group was not significant, the students did have a definite increase in reading and other academic measures (Rickard et al., 2012). Finally, Thornton (2013) researched fifth-, eighth-, and 11th-grade individuals who were considered music students. Results indicated that all grades had a higher mean score in reading for students who participated in music than those who did not, with nearly 7,000 students in the study. Overall, the data show that participation in music does impact academic reading scores in middle school students.

Studies have been conducted with high school students on the association between music participation and achievement have been conducted (Cox & Stephens, 2006; Eason & Johnson,

2013; Elpus, 2013; Gouzouasis et al., 2007; Miksza, 2007, 2010; Southgate & Roscigno, 2009). There is a greater extent of research done on high school students compared to other grade levels. One of the reasons may be the average number of music classes offered in high school nationally (5.47) compared to middle school (3.68) and elementary school (2.57) in the 2015–2016 school year (Elpus, 2017). Two studies indicate the relationship between music participation and academic achievement (Miksza, 2007; Southgate & Roscigno, 2009). Both studies suggest a positive association between music and achievement, although higher success may have existed before participation. The influence of SES was not indicated (Miksza, 2007; Southgate & Roscigno, 2009). Alternatively, Southgate and Roscigno (2009) believed that music impacts achievement in early and later adolescents, while SES only impacts later adolescence. When assessing measures of performance, researchers used many different analyses. For instance, high school students' grade point averages when participating in music and not participating in music were examined, showing higher grade point averages for students that participated in music (Cox & Stephens, 2006; Eason & Johnson, 2013). Additionally, other researchers measured music's effect on standardized test scores (Eason & Johnson, 2013; Gouzouasis et al., 2007). One study showed a positive relationship between music and achievement using American College Testing and British Columbia examination scores (Gouzouasis et al., 2007). On the other hand, one study did not show that music students outperformed non-music students when using the Scholastic Aptitude Test for academic progress (Elpus, 2013). Many reasons could account for the difference in results, such as the different achievement measures, length of participation, and the number of participants. Although many studies confirm a correlation between higher achievement when participating in music, further

studies should be conducted to verify why music participation impacts achievement (Cox & Stephens, 2006; Eason & Johnson, 2013; Gouzouasis et al., 2007).

Impact on Math Achievement

The connection between math and music is not as widely known as the connection between literacy and music. Vaughn (2000) described the relationship this way: "Musical rhythm is based upon mathematical relations (and) an understanding of music requires some understanding of ratios (e.g., 3/4 time vs. 4/4 time) and repeating patterns" (p. 149). In a meta-analysis of studies, a small causal relationship existed between the study of music and mathematics achievement (Vaughn, 2000). This connection may be due to several factors, including the similarities between music and math or how the brain processes both subjects. More research is needed to discover any other explanations for the correlation between music and math (Vaughn, 2000).

Research has been conducted connecting music participation to mathematical achievement among children four years old to beyond high school age (Boyd, 2013; Catterall et al., 2012; Hash, 2011; Helmrich, 2010; Holmes & Hallam, 2017; Jones-Lewis, 2013; Southgate & Roscigno, 2009; Thornton, 2013; Vaughn & Winner, 2000). In small children, music in school positively influences math achievement (Southgate & Roscigno, 2009). Additionally, research has shown that music participation can have a minor impact on mathematics achievement in children ages four to seven (Holmes & Hallam, 2017). With no considerable evidence confirming the effect music participation has on young children's mathematical performance, more research needs to be conducted.

The most extensive research concerning the impact music participation has on mathematics has been completed in middle school– and high school–age children. Several

studies researched the outcome of music participation in multiple middle school grades (Boyd, 2013; Hash, 2011; Jones-Lewis, 2015; Thornton, 2013). For instance, Boyd (2013) investigated the effects music participation had on middle schoolers' achievement scores as measured by a standardized assessment. Boyd (2013) also determined that a positive correlation exists between the number of years in music and math achievement. Expressly, Boyd (2013) indicated that vocal participation was correlated with achievement more than instrumental involvement. Moreover, there was a more significant impact when students participated for three or more years than those who participated for zero to two years (Boyd, 2013). When exclusively researching fifth- and eighth-grade students using a large sample of participants, researchers found remarkable results concerning standardized math achievement for students who were partaking in music (Thornton, 2013). The analysis included the scores of over 6,000 students in Grades 5, 8, and 11 who did and did not participate in music. Thornton (2013) indicated that students voluntarily involved in music had significantly higher scores than students who were not in music in all grade levels. Jones-Lewis (2013) identified that students' mean ranks on the Northwest Evaluation Association Mathematics MAP (Measure of Academic Progress) were higher for students, both male and female, who participated in music compared to students who did not participate. This participation was only one or two times during the year and showed an effect on achievement, particularly in male sixth graders, as opposed to students who did not participate (Jones-Lewis, 2013). Also, Hash (2011) identified that eighth-grade band students achieved higher scores on the ACT Explore test than students who never participated or dropped band before the eighth grade. Also, research suggests that students in either lower-quality or higher-quality music program outperformed students that were not in a music program at all when tested in middle school (Johnson & Memmott, 2006). Although these studies may show contradicting data

regarding how many years of music participation truly impacts math skills, research does indicate a positive relationship between music and math in middle school (Boyd, 2013). There is ample evidence to support the impact music participation has on mathematical achievement with middle school students (Hash, 2011; Jones-Lewis, 2013; Thornton, 2013).

Research also suggests a significant impact on math achievement with students in high school (Catterall et al., 2012; Helmrich, 2010; Horton et al., 2010; Vaughn, 2000; Vaughn & Winner, 2000). One research study stated students in out-of-school band or choral programs and students that played instruments such as piano and violin outperformed students with no musical experience when given the ninth grade algebra standardized assessment (Helmrich, 2010). Additionally, another study that includes students in 11th grade showed a significant positive impact on standardized math achievement scores when the students participated in music (Thornton, 2013). When using the Texas achievement tests, students in tenth and 11th grade showed significantly higher scores when they participated in a music program (Horton et al., 2010). When Vaughn & Winner (2000) analyzed math and verbal SAT scores, they found an increase in scores linked to the number of years students spent studying music. Not only did comparative research indicate a significant impact on achievement with music participation, but other research such as longitudinal studies and meta-analyses also showed comparable results (Catterall et al., 2012; Vaughn, 2000). Catterall et al. (2012, p.13) did a longitudinal study on the math achievement of high school students participating in music; this study indicated that teenagers and young adults identified as “at-risk” who have “intensive arts experiences” showed no deficit in achievement when they participated in music. Additionally, a meta-analysis showed a modest association between voluntary music study and math achievement (Vaughn, 2000).

Previous research shows a strong correlation between music or arts participation and math achievement. Results have indicated students from age four to high school who participated in music showed an increase in scores compared to students that did not participate in music (Boyd, 2013; Catterall et al., 2012; Hash, 2011; Helmrich, 2010; Holmes & Hallam, 2017; Jones-Lewis, 2013; Southgate & Roscigno, 2009; Thornton, 2013; Vaughn & Winner, 2000). Although studies contradict each other on how many years of participation is necessary and what types of participation, such as choir or band, is the most effective, there is general agreement that music studies make a positive difference in academic math performance. With the wide variety of research conducted on music participation, students with disabilities were never explicitly identified. The above literature review provides conclusive evidence of the connection music has on math scores, despite studies utilizing various age groups and music class types. The overall correlation between music and math is evident, but no research has shown that this correlation translates to students with disabilities.

Summary

With the positive results of music therapy, music intervention, and music participation, it is no wonder Gardner suggested music as one of the multiple intelligences that can exist in an individual. Musical intelligence does not work alone; it exemplifies many other intelligences. Not only did Gardner suggest the importance of music, but Dewey also showed an understanding of the importance of the arts, such as music through experiential learning.

Federal laws and case studies mandate that students with disabilities must have their educational needs met. Music and music therapy can be used to help with a variety of disabilities, including autism, ADHD, dyslexia, or emotional disturbances. Also, music has shown great promise for students academically. Music participation for non-disabled students

has increased achievement on multiple assessments across multiple age groups. With these positive results, it is only prudent to hypothesize that music participation could help impact achievement scores for students with disabilities.

Chapter Three is the methods section of this study and includes a brief overview of the research design. Stated are the research questions and hypotheses. Next is a full description of the setting, participants, and instrumentation. Lastly, the researcher describes the specific procedures and data analysis used to implement the research design, providing full disclosure to the reader.

CHAPTER THREE: METHODS

Overview

The purpose of this quantitative causal-comparative study was to determine if there is a statistically significant difference in reading and math achievement scores of students with disabilities who participate in school-based music performance classes as opposed to those who do not participate. The nonparticipant group included students with a disability who have not taken music classes throughout middle school. The participant group included students with a disability who have received at least two years of music classes. The researcher utilized an analysis of covariance (ANCOVA) between the two groups' scores on the STAAR in reading and math. Through this analysis, the researcher determined whether there was a statistically significant difference in scores between students with disabilities who participate in music classes in middle school and those who do not.

Design

This quantitative study is based on a causal-comparative design because its purpose was to determine if a causation can be made between music participation and achievement scores in reading and math with students who have disabilities. A causal-comparative design is the correct design to determine the possible cause of the relationship between music participation and achievement (Gall et al., 2007). The independent variable is in the form of two categories: those who participated in a school music program and those who did not. The dependent variable is math and reading scores within the two groups (Gall et al., 2007). The study also used ex post facto research due to the actual participation or nonparticipation that had already occurred, and no direct experimentation took place. The researcher determined if there was a statistically significant difference between reading and math achievement scores of students with disabilities

participating in school-based music programs for at least two years and students with disabilities who were not involved in music.

Pre- and posttests were utilized to obtain the students' achievement scores in math and reading. The students had already participated in a pretest by taking the fifth-grade STAAR assessment. The fifth-grade STAAR assessment scores were collected from the April 2016 testing period and were used as the pretest since, at that point, no fifth-grade student had participated in middle school music instruction. The posttest scores were taken from the same students but on the eighth-grade STAAR assessment. The STAAR is a state-mandated assessment given to all third- through eighth-grade students at the end of each year and is designed to measure the knowledge and skills contained in the Texas standards. All STAAR assessment scores were obtained at the end of the fifth grade and then at the end of the eighth-grade year. Only the first examination period scores were used for all tests. Students were enrolled in either band or choir. This study attempted to determine if there was a difference in reading and math achievement between the two groups: the group that participated in music for two or more years and the group that did not.

Research Questions

The research questions for the study are as follows:

RQ1: Is there a significant difference in eighth-grade *reading achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores?

RQ2: Is there a significant difference in eighth-grade *math achievement scores* between middle school students with disabilities who participated in school-based music performance for

two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores?

Hypotheses

The null hypotheses for the study are as follows:

$H_0$1: There is no significant difference in eighth-grade *reading achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade reading achievement scores.

$H_0$2: There is no significant difference in eighth-grade *math achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores.

Participants

This study's archival data were from a convenience sample of students located in a Texas suburban school district. Fifth-grade scale scores were retrieved from 2015–2016 data sets and included only the test's first administration. The eighth-grade scores were obtained from the 2018–2019 school year data sets and included only the first administration. All students were coded as special education according to the school district before the 2015–2016 test. Students in special education are qualified and identified by IDEA. This district identifies students using the Child Find system required by state and federal law and identifies, locates, and evaluates individuals with suspected disabilities from birth to age 21 within the district's authority. The process is as follows: anyone can make a referral for a suspected disability, then the campus follows the Student Support Team procedures, and as determined by these procedures, a full and

individual evaluation is performed to examine the child's eligibility and educational needs per federal law.

Gall et al. (2007) stated that there should be a minimum of 15 participants in each group when conducting causal-comparative research. After enrollment data was utilized to determine eligible participants, 51 students were in the participant group and 104 students in the nonparticipant group, with 155 participants total in the study. Therefore, according to Gall et al. (2007), with 155 participants, the study exceeded the minimum required when assuming a medium effect size with a statistical power of .7 at an alpha level of .05.

The participants in this study included 155 participants from seven schools in a suburban population. The study used students from all seven middle schools within the district. School-based music programs are considered the same in all schools, and participation is determined by participation in band or choir for all schools. The study participants must have remained in the district from the end of fifth grade to the end of eighth grade to be eligible for the study. The participants are all in special education, and their disabilities include all 13 categories of eligibility, as indicated by IDEA. Overall, participants' demographics of ethnicity, ELL, and gender are as follows. Of the 155 participants, the sample consisted of 47 females and 108 males. Of this sample, 4.5% were reported Asian, 20% Black, 55.5% Hispanic, 1.3% American Indian, 1.3% two or more races, and 17.4% White. Also, 38.7% were reported ELLs, and 66.5% of the participants were categorized as economically disadvantaged.

Both groups were taught using the district-wide curriculum and abided by the pacing guide outlined by the district. Students attended resource math and reading classes and general education math and reading classes. The ANCOVA accounted for any group difference in core content enrollment.

Setting

The school used for this study is a major suburban district. This district contains over 55,000 students and 73 campuses. This district is a choice district where all residents of the area can send their child to any school within the district no matter proximity; for this study's purposes, however, all middle schools from this district were included in this analysis. According to Public Education Information Management System 2015–2016, the population of middle school students is 12,700. The demographics of the district are approximate due to ananomity with over 55,000 students. As of 2018-2019, the demographics approximately are half Hispanic/Latino. With the next two largest groups, which are about equal size, are White and African American, followed by Asian and those classified as Other.

Instrumentation

The instrument used for both pre- and posttest was the STAAR. Texas public schools began utilizing this assessment in 2011 to assess the state standards (Davis & Willson, 2015). This assessment aims to measure learning and application of the Texas Essential Knowledge and Skills, which are the state-mandated curriculum standards in all core subjects (TEA 2017). The STAAR is given to Grades 3 through 8 and 11 and provides state and federal accountability. Students' scores for this study were taken from both online and paper-based assessments. The sections that measure reading achievement consist of three categories: understanding across genres, understanding literary texts, and understanding informational texts (TEA, 2017). The parts that measure math achievement consist of four categories: numerical representation and relationships, computations and algebraic relationships, geometry and measurements, and data analysis and personal financial literacy (TEA, 2017).

Pretest scores were obtained from the 2015–2016 school year for fifth graders in all seven schools. Participation in music programs took place during the students' sixth- through eighth-grade years and included all band and choir sections. The 2018–2019 school year scores from the same students were obtained on the eighth-grade assessment. Groups were then determined based on their enrollment in band or choir for four or more semesters. Any student who did not participate in the 2015–2016 STAAR assessment was exempt from the data. This study did not include students taking an alternative assessment.

According to a recent validity and reliability study, the eighth-grade reading assessment has a validity of 95%, 88.2%, and 85.3% for understanding genres, literary text, and informational texts, respectively, as indicated by the Human Resources Research Organization (HumRRO, 2016). The eighth-grade reading assessment validity scores were 100%, 96.6%, and 95% for categories understanding genres, literary text, and informational texts, respectively (HumRRO, 2016). This same study found the fifth-grade reading's projected reliability to be 90.8% and the eighth-grade reading to be 94% (HumRRO, 2016). The fifth-grade math assessment has the validity of 100.00%, 96.9%, 100.00%, 100.00% for categories numerical representation and relationships, computations and algebraic relationships, geometry and measurements, and data analysis and personal financial literacy separately (HumRRO, 2016). The eighth-grade math assessment validity scores were as follows: 100.00%, 97.7 %, 96.3%, and 100.00% for reporting categories numerical representation and relationships, computations and algebraic relationships, geometry and measurements, and data analysis and personal financial literacy separately (HumRRO, 2016). This same study found the fifth-grade math's projected reliability to be .93 and the eighth-grade math to be .907 (HumRRO, 2016).

The data confirm that the instrument used for this study is an accurate assessment of the state standards and provides reliable data. Within this assessment, scoring for each grade level is converted from raw scores to scale scores by STAAR. The scale scores were the only scores evaluated for this study. The fifth-grade math test consisted of 36 questions, and the eighth-grade math test consisted of 42 questions (both multiple choice and gradable). The fifth-grade reading tests consisted of 38 multiple-choice questions, and the eighth-grade reading tests consisted of 44 questions of the same type (TEA, 2017).

Procedures

First, the researcher gained Institutional Review Board approval due to the use of human subjects under the condition of the district's approval. The researcher had to obtain permission by completing the district-supplied application. The application was reviewed and accepted by the Research Administration Accountability Department within the school district (see Appendix A). Then, full Institutional Review Board approval was granted (see Appendix B). The researcher then contacted the Research Administration Accountability Department to obtain all data. The district uses a program for all enrollment and student data and class schedules known as the Skyward Student Information System. Data were obtained by the district using this system and given to the researcher in an encrypted file. All students enrolled in the participating district from Spring 2016 to Spring 2019 who were classified as students in special education were anonymously identified using the Skyward Student Information System. Data from this group included demographic indicators such as race, sex, ELL, and SES. Subsequently, the researcher further separated the pool into students that completed four or more semesters of a music program (choir or band) and students who had participated in no music program. The participant group consisted of the students who had participated in two or more years. The nonparticipant

group contained students who did not participate in music at all during middle school. Any students that participated in music but for less than two years were not included in this study. After each group was established, the students' initial or first fifth-grade (2015–2016) STAAR assessment scores in math and reading were analyzed using descriptive statistics. Obtaining scores from the initial evaluation period was crucial because some students can retake this same assessment three times. The analysis was only done on scale scores. According to the TEA,

> A scale score is a conversion of the raw score onto a scale that is common to all test forms for that assessment. Scale scores allow direct comparisons of student performance between specific sets of test questions from different test. (2017)

All student records were kept confidential by the assignment of random numbers for identification purposes and stored on a password-protected computer. The researcher organized all scores and groups for this study.

Data Analysis

The purpose of this study was to investigate if a difference exists in reading and math achievement scores between students with disabilities who participated in music classes and those who did not. The 2015–2016 STAAR math and reading achievement scores were used as a pretest in this quantitative casual-comparative design. The posttest achievement scores were the 2018–2019 STAAR scores in both math and reading. Due to the groups being from a convenience sample with unequal groups, differences may exist among groups. If any discrepancy exists before participation in the music program for two or more years, an ANCOVA is necessary. An ANCOVA can correct for any preexisting group differences between the non-music participation and music participation group (Warner, 2013). First, the data were screened for normality and outliers by using a box and whisker plot. Once the researcher

screened the data, assumption tests for ANCOVA were conducted on the screened data. A histogram was used to test normality. The researcher used the Levene's test of equality of error variance to test the assumption of homogeneity of variance (Warner 2013). Next, an assessment of homogeneity of slopes was performed by Statistical Program for the Social Sciences (SPSS) to examine the interaction assumption. Lastly, the researchers used scatterplots to identify if the data were linear and free of extreme bivariate outliers.

Once assumptions were verified, an ANCOVA was calculated using the reading achievement and math achievement scores in SPSS. After considering the pretest or covariant scores, an ANCOVA determined if a causal correlation existed between music participation and achievement with students with disabilities. The effect size was determined by computing a partial η^2. SPSS reported the proportion of variance in Y with predictors removed (Warner, 2013). As suggested by Warren (2013), an alpha level of .05 was used in conjunction with the statistical power table for factorial analysis of variance; this table is the same for ANCOVA. According to Gall et al. (2007), 60 students exceed the minimum required when assuming a medium effect size with a statistical power of .7 at the .05 alpha level.

Summary

In conclusion, the researcher utilized an ANCOVA between the two middle school groups' scores on the STAAR in reading and math while controlling for previous achievement scores. Through this analysis, the researcher determined if there was a statistically significant difference in scores when students with disabilities participate in music classes in middle school. Chapter Four analyzes the data, provides detailed information regarding the null hypotheses, and describes the findings.

CHAPTER FOUR: FINDINGS

Overview

The purpose of this quantitative casual-comparative study was to examine the effect of music participation on achievement scores of middle school students with a disability as measured by the STAAR. Archival data for a total of 155 participants were used by the researcher. First, the researcher used descriptive statistics to show and describe summary data. Then the researcher screened the data for normalcy and any outliers. Next, all assumption tests were conducted before an ANCOVA. Finally, an ANCOVA was used to test the hypotheses and to control for any differences among groups.

Research Questions

RQ1: Is there a significant difference in eighth-grade *reading achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores?

RQ2: Is there a significant difference in eighth-grade *math achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores?

Hypotheses

$H_0$1: There is no significant difference in eighth-grade *reading achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade reading achievement scores.

H_02: There is no significant difference in eighth-grade *math achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores.

Descriptive Statistics

The 155 participants' demographics are detailed in Figures 1 and 2 to highlight the participants' overall diversity.

Figure 1

Participants' Ethnicity

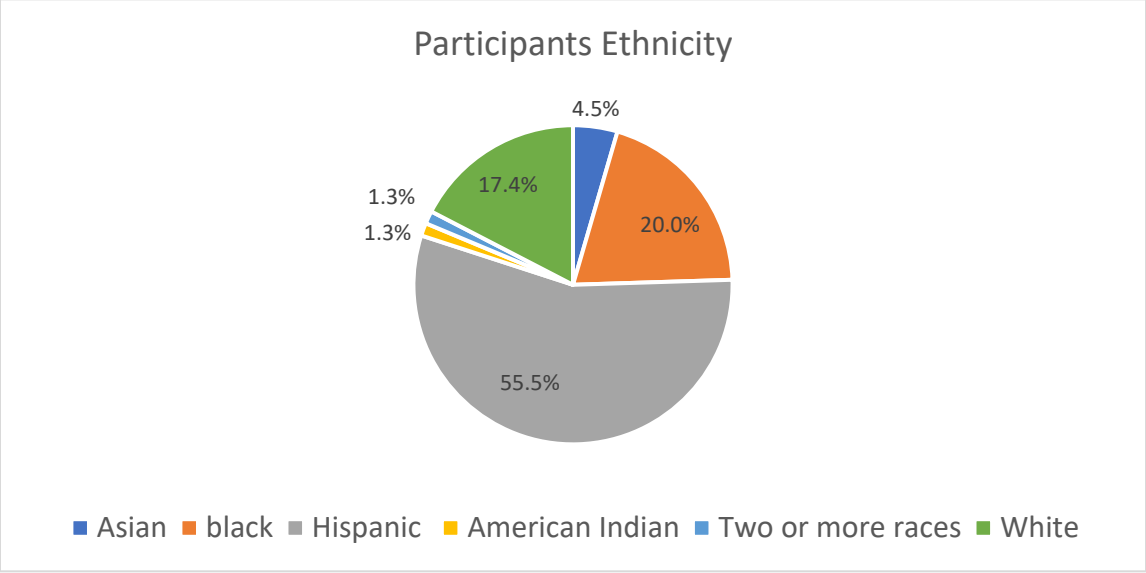
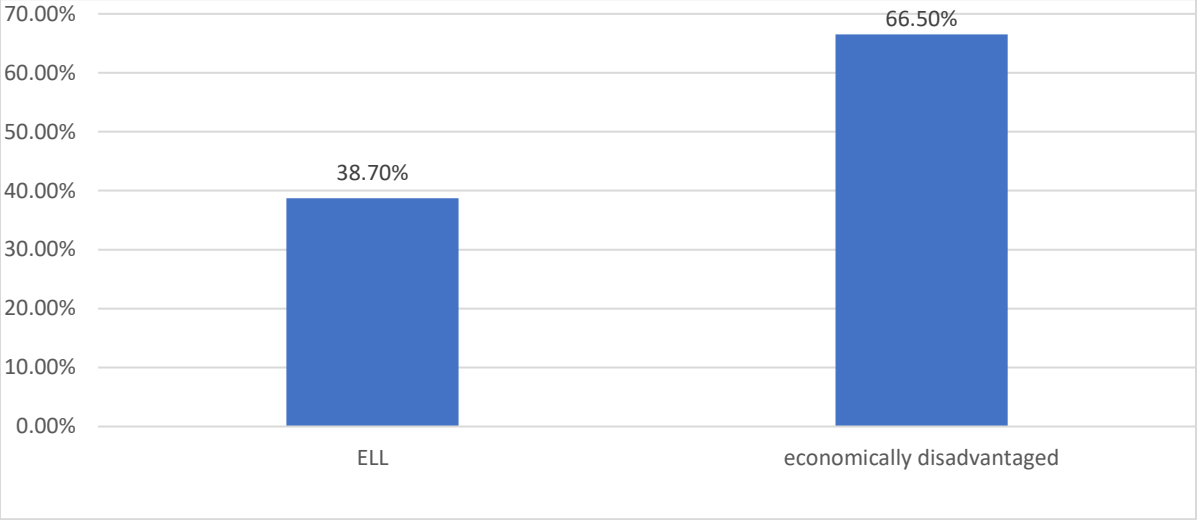


Figure 2

Participants' Additional Demographics



Descriptive statistics can be found in Table 1 for the nonparticipant and participant scores in reading and in Table 2 for both groups' pretest and posttest scores for mathematics. Students that took the algebra STAAR were not included in the statistics for math.

Table 1

Student Scores on the Reading STAAR

Group	*N*	Mean	Median	Mode	*SD*
Music nonparticipant pretest	104	1383.08	1356	1359	114.91
Music nonparticipant posttest	104	1519.60	1493	1421	114.25
Music participant pretest	51	1382.16	1356	1463	115.22
Music participant posttest	51	1525.35	1487	1475	105.65

Table 2

Student Scores on the Math STAAR

Group	*N*	Mean	Median	Mode	*SD*
Music nonparticipant pretest	101	1442.65	1408.0	1372	104.45
Music nonparticipant posttest	101	1573.60	1540.0	1467	123.08
Music participant pretest	48	1455.67	1436.0	1431	98.79
Music participant posttest	48	1573.29	1572.5	1657	100.27

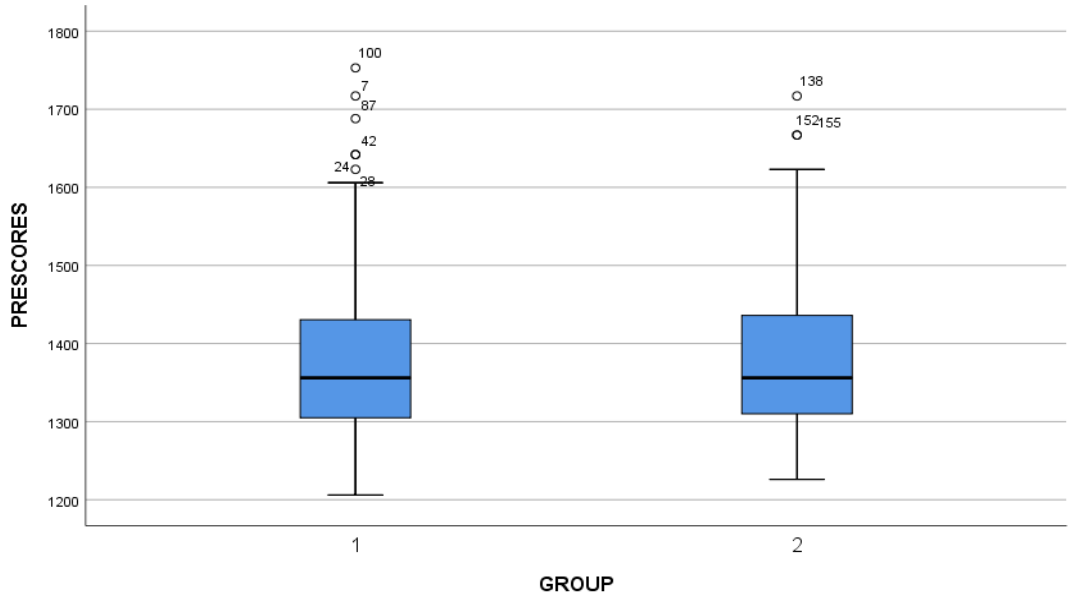
Results

Data Screening

Data screening was conducted on each group's pretest scores. The researchers sorted the data on each variable and scanned them for inconsistencies. No data errors or inconsistencies were identified. Box and whisker plots were used to detect outliers on each independent variable (see Figure 3). Outliers were identified in both groups. The research used the number 1 to designate the nonparticipant group and number 2 to identify the participant group.

Figure 3

Box Plot Pretest Scores for Nonparticipant and Participant Groups in Reading

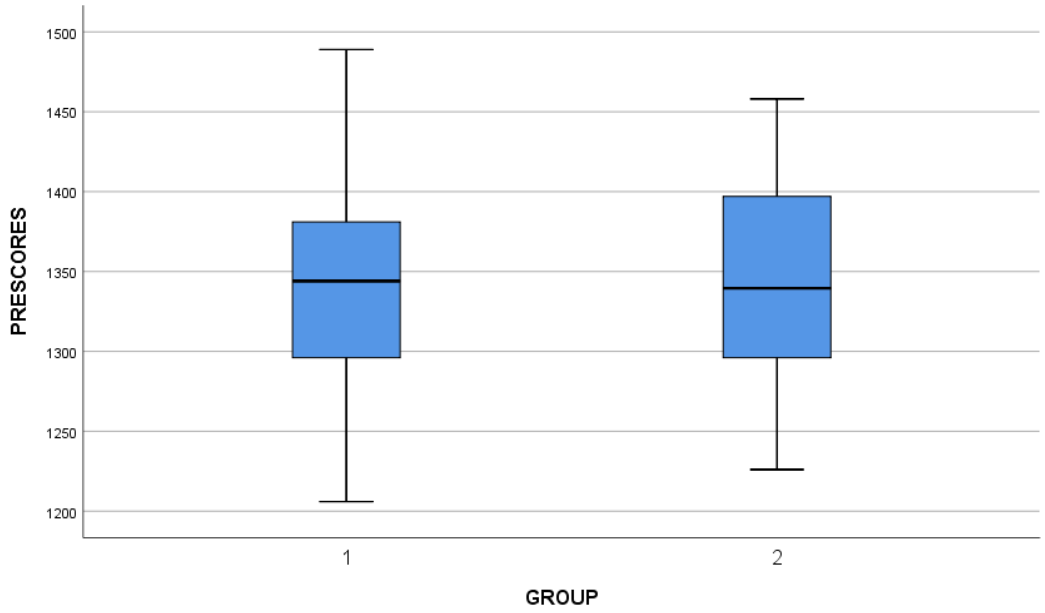


After analyzing the box whisker plot, the researcher decided to remove the outliers from the data set; this way, no outliers would skew the data. The maximum score cut off was 1500 in reading and includedmost of the data points with no identified outliers. Removing the outliers in the reading scores reduced the number of participants to 87 in the nonparticipant group and 44 in the participant group. The number of participants still met the minimum for assuming a medium

effect size with the statistical power of .7 at the .05 alpha level (Gall et al., 2007). With the new data set, the quartiles for all the box plots appeared to have no significant outliers (see Figure 4).

Figure 4

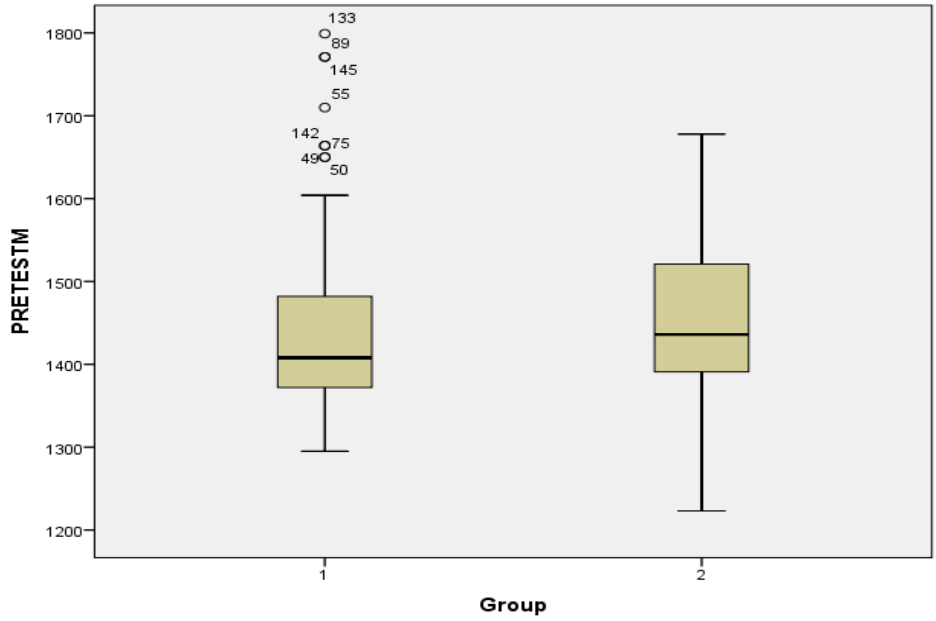
Box Plot of Pretest Scores for Both Groups After Outlier Removed



The same screening was used for the math pretest scores of both groups. The researcher examined box and whisker plots (see Figure 5) for the pretest scores of both the non-participation group (Group 1) and the participation group (Group 2) in math.

Figure 5

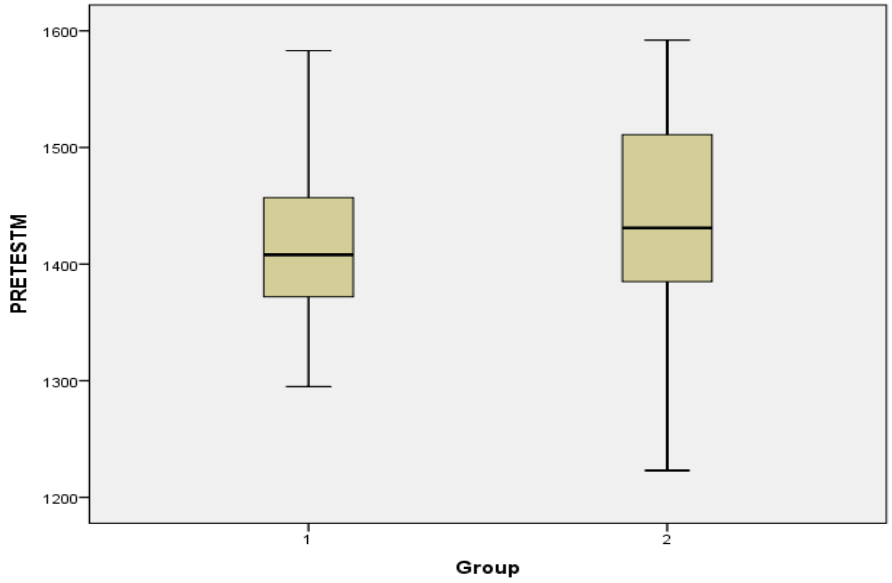
Box Plot of Pretest Scored for Nonparticipant and Participant Groups in Math



After analyzing the box and whisker plot, the researcher again decided to remove the outliers from the data set so as not to skew the data. The cutoff score was 1600 for math and included most of the data points with no identified outliers. Removing the outliers reduced the participants in each group to 92 in the nonparticipant group and 44 in the participant group. After removing the outliers, the sample size still exceeds the minimum required for a one-way ANCOVA when assuming a medium effect size, statistical power of .7, and alpha set at .05. (Gall et al., 2007). The quartiles for all the box plots appeared to have no significant outliers (see Figure 6).

Figure 6

Box Plot of Pretest Scored for Both Groups in Math After Outlier Remove



Assumptions

Reading Assumption Tests: Null Hypothesis One

An ANCOVA was used to test the null hypothesis for reading. The ANCOVA required that the assumptions of normality, assumptions of linearity and bivariate normal distribution, and assumptions of homogeneity of slopes and the homogeneity of variance are met. The researcher entered the data into SPSS using the screened numbers that showed no outliers within the box and whisker plots for the reading scores. The assumption of normality was tested using histograms (see Figures 7 and 8). The nonparticipant group showed a nearly normal distribution, while the participants' histograms showed data that were not normally distributed. The researcher continued with testing as ANCOVA is robust to a slight violation of normality when the sample size is sufficiently large. The assumptions of linearity and bivariate normal distribution were tested using scatterplots for each group. Linearity was met, and bivariate

normal distributions were tenable, as the distributions' shapes were not extreme (see Figures 9 and 10).

Figure 7

Histogram Pretest Reading Scores for Nonparticipant Group After Data Screening

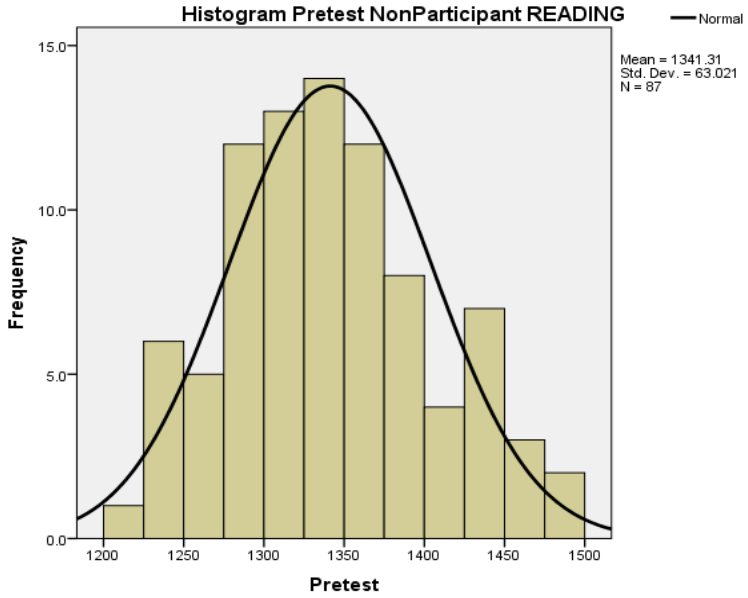


Figure 8

Histogram Pretest Reading Scores for Participant Group

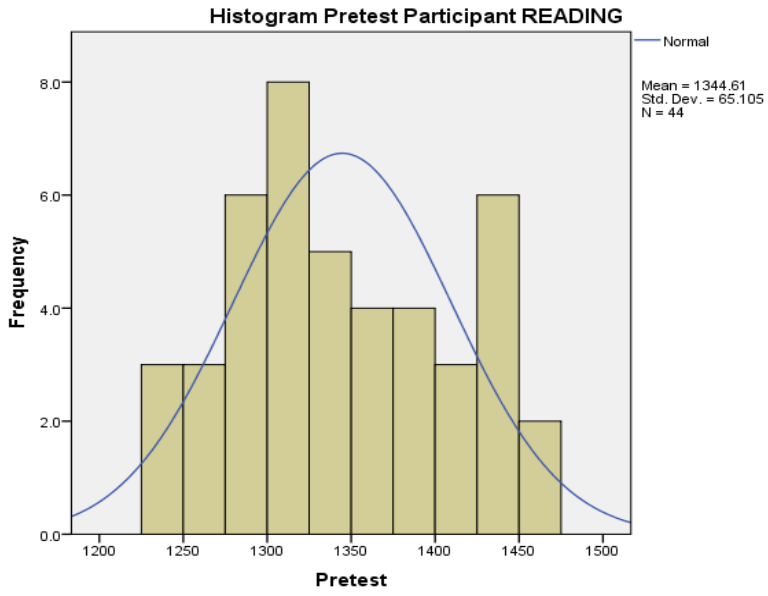


Figure 9

Scatterplot Reading Scores for Nonparticipant Group

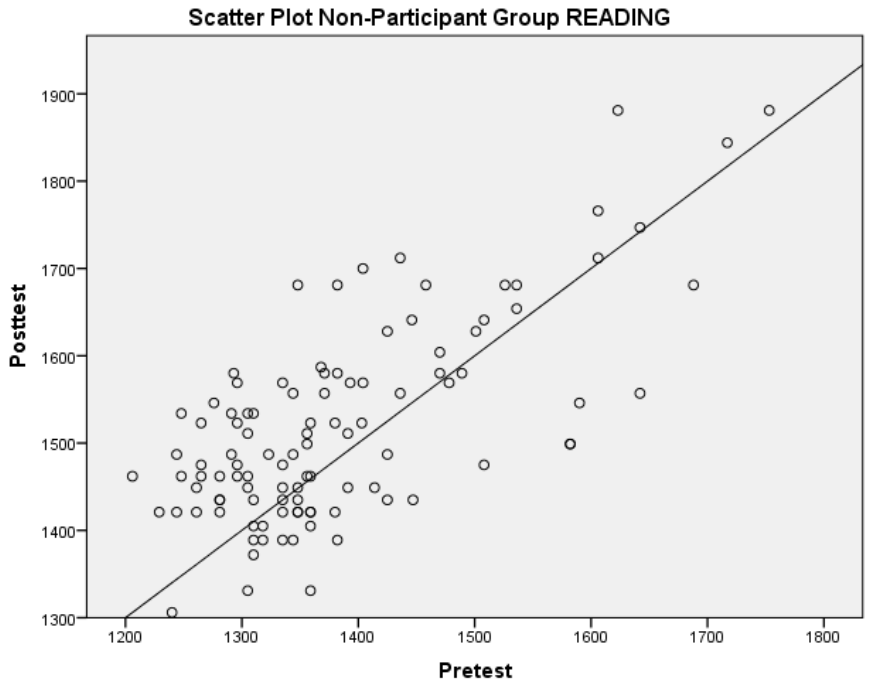
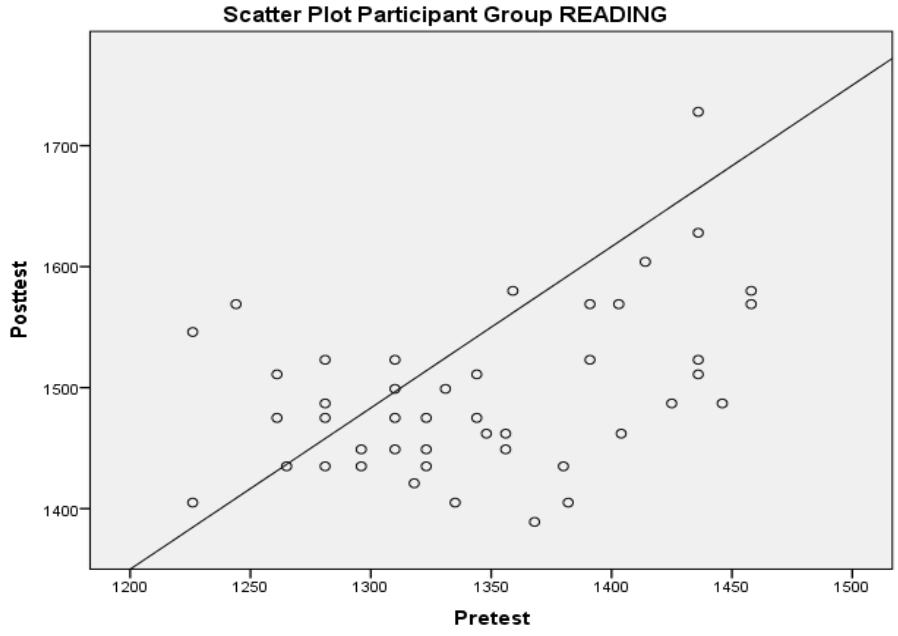


Figure 10

Scatterplot Reading Scores for Participant Group



The next assumption test required for ANCOVA is the test of the assumption of homogeneity of variance. The assumption of homogeneity of variance was examined using the Levene's test of equality of error variance. No violation was found where $p = .143$. The assumption of homogeneity of variance was met. The assumption of homogeneity of slopes was tested, and no interaction was found where $p = .394$. Therefore, the assumption of homogeneity of the slope was met. The data did not violate any of the assumption tests that are required by Warner (2013); thus, the researcher could successfully run an ANCOVA to examine the research questions.

Math Assumption Tests: Null Hypothesis Two

An ANCOVA was used to test the null hypothesis for math. The ANCOVA required that the assumptions of normality, assumptions of linearity and bivariate normal distribution, and assumptions of homogeneity of slopes and the homogeneity of varianc, are met. The researcher entered the data into SPSS using the screened numbers that showed no outliers within the box and whisker plots for the math scores. The assumption of normality was tested using histograms (see Figures 11 and 12). The nonparticipant group showed a nearly normal distribution, while the participants' histograms showed data were not normally distributed. The researcher continued with testing, as ANCOVA is robust to slight violations of normality when the sample size is sufficiently large. The assumptions of linearity and bivariate normal distribution were tested using scatterplots for each group. Linearity was met, and bivariate normal distributions were tenable, as the distributions' shapes were not extreme (see Figures 13 and 14).

Figure 11

Histogram Pretest Math Scores for Nonparticipant Group

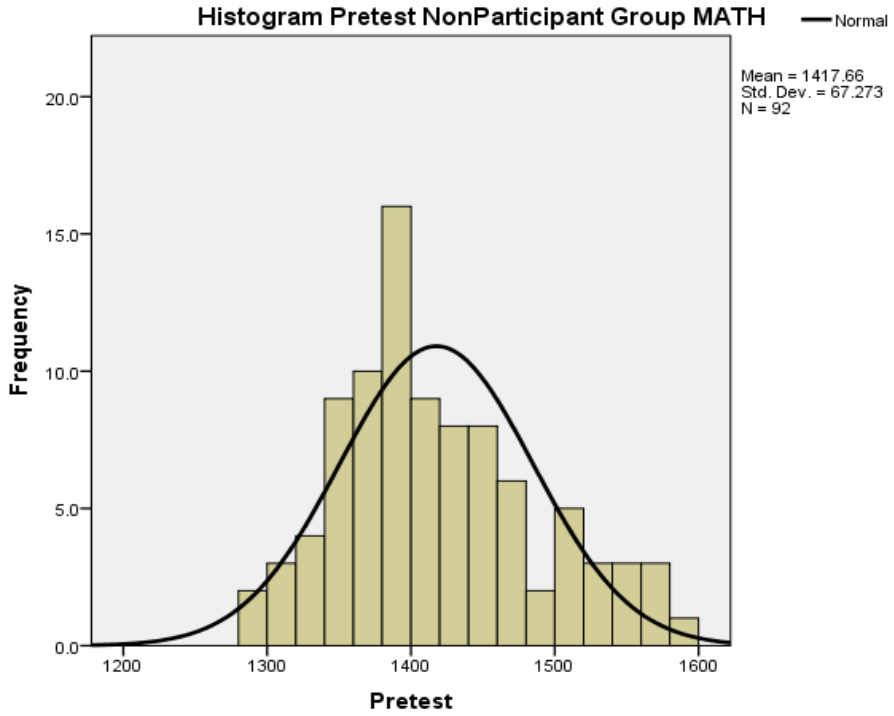


Figure 12

Histogram Pretest Math Scores for Participant Group

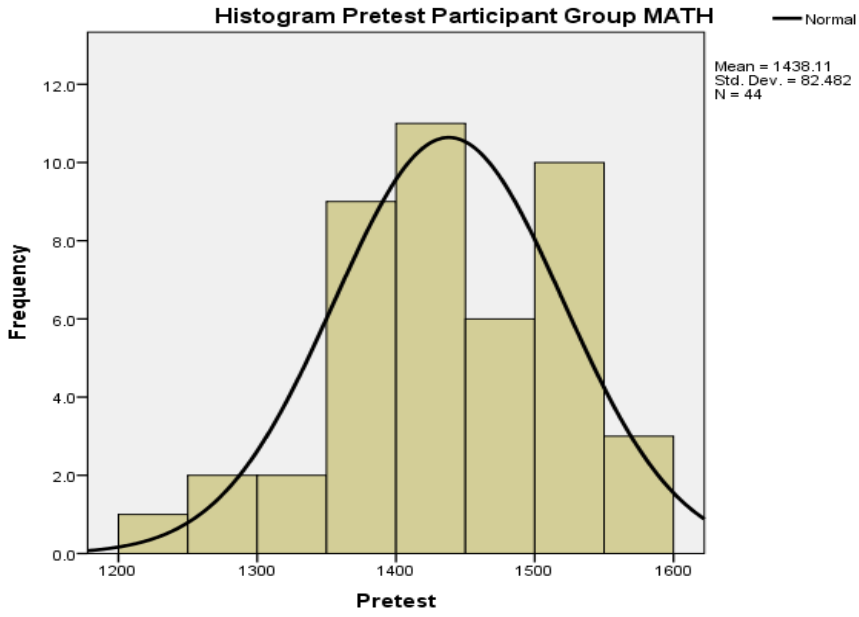


Figure 13

Scatterplot Math Scores for Nonparticipant Group

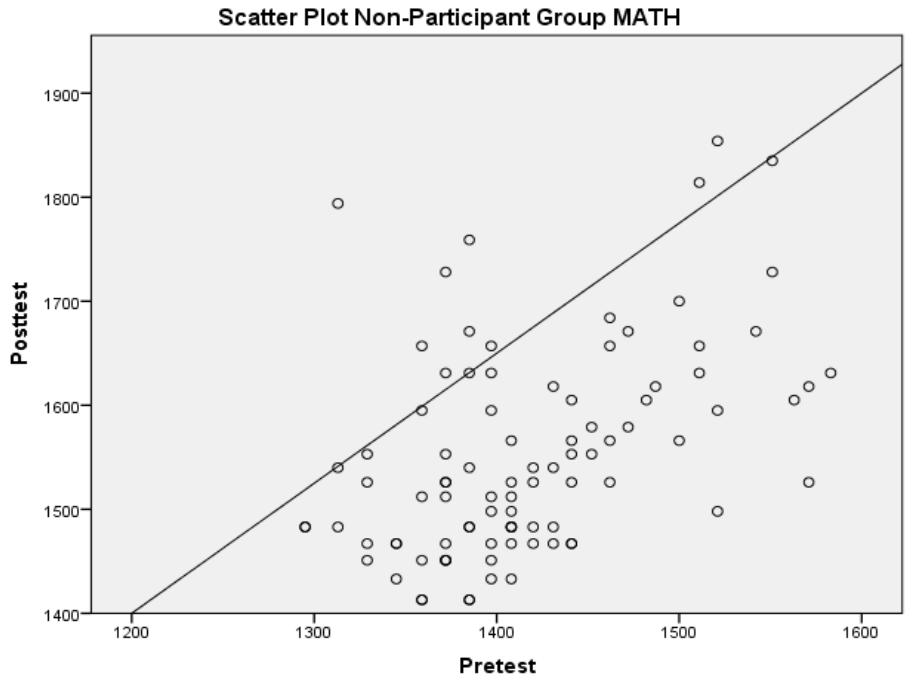
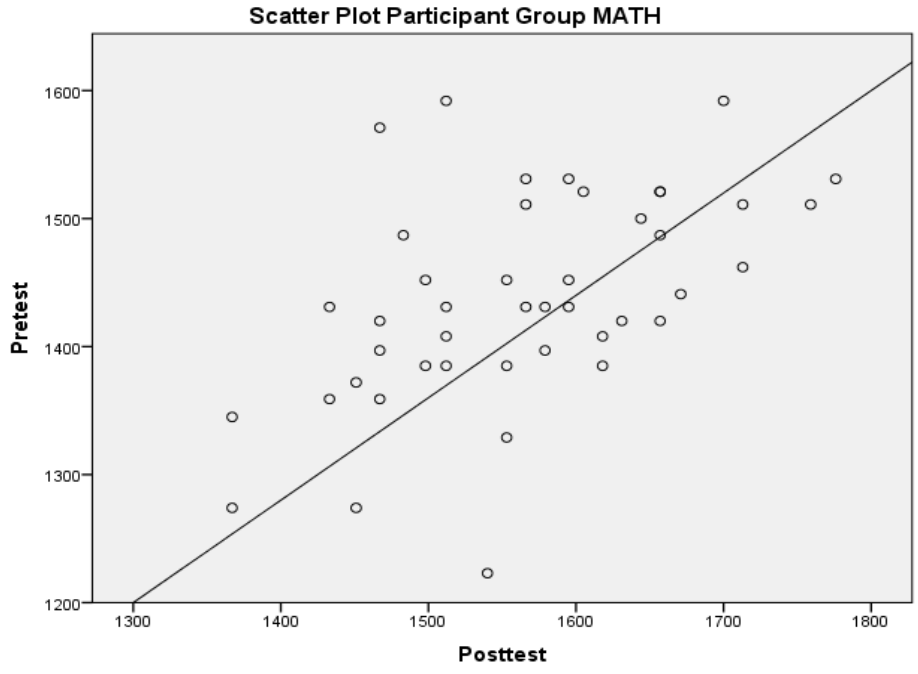


Figure 14

Scatterplot Math Scores for Participant Group



The next assumption test required for ANCOVA is the assumption of homogeneity of variance. The assumption of homogeneity of variance was examined using the Levene's test of equality of error variants. No violation was found where $p = .858$. The assumption of homogeneity of variance was met. The assumption of homogeneity of slopes was tested, and no interaction was found where $p = .762$. Therefore, the assumption of homogeneity of slope was met. Although the data did violate the assumption of normality, the researcher continued with testing as ANCOVA is robust to slight violations of normality when the sample size is sufficiently large.

Null Hypothesis One

The researcher used a one-way ANCOVA to determine if there was a significant difference in eighth-grade *reading achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores. The null hypothesis was not rejected at a 95% confidence level were $F(1, 128) = .045$, $p = .832$, $\eta_p^2 = .000$ (Tables 3 and 4). The effect size was small. This analysis shows no statistical difference in math performance between the students who participated in music and those who did not. There was no significant difference between groups.

Table 1

One-Way ANCOVA Results for Reading Scores

Source	Type III Sum of Squares	*df*	Mean square	*F* ratio	Sig.	Partial eta squared
Corrected model	158998.125[a]	2	79499.063	15.229	.000	.192
Intercept	164854.691	1	164854.691	31.581	.000	.198
Pretest	158361.963	1	158361.963	30.337	.000	.192
Group	237.143	1	237.143	0.045	.832	.000
Error	668171.752	128	5220.092			
Total	292429618.000	131				
Corrected total	827169.878	130				

Note. Dependent variable = posttest.
[a] R squared = .192 (Adjusted R squared = .180)

Table 4

Multiple Comparison of Groups Reading

(I) Group	(J) Group	Mean Difference (I-J)	*SE*	Sig.[a]	95% CI[a] *LL*	95% CI[a] *UL*
1	2	-2.850	13.370	.832	-29.304	23.605
2	1	2.850	13.370	.832	-23.605	29.304

Note. Dependent variable = posttest. Based on estimated marginal means.
[a] Adjustment for multiple comparisons: least significant difference (equivalent to no adjustments).

Null Hypothesis Two

The researcher used a one-way ANCOVA to determine if there was a significant difference in eighth-grade math achievement scores between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores. The null hypothesis was not rejected at a 95% confidence level $F(1, 133) = .022$, $p = .884$, $\eta_p^2 = .000$ (Tables 5 and 6). The effect size was small. This analysis shows no statistical

difference in math performance between the students who participated in music and those who did not. There was no significant difference between groups.

Table 2

Tests of Between-Subjects Effects Math

Source	Type III Sum of Squares	*df*	Mean Square	*F* ratio	Sig.[a]	Partial eta squared
Corrected model	316084.087[a]	2	158042.044	20.707	.000	.237
Intercept	131485.230	1	131485.230	17.227	.000	.115
Pretest	312318.977	1	312318.977	40.920	.000	.235
Group	164.371	1	164.371	0.022	.884	.000
Error	1015109.678	133	7632.404			
Total	330742632.000	136				
Corrected total	1331193.765	135				

Note. Dependent variable = posttest.
[a] R squared = .237 (Adjusted R squared = .226)

Table 3

Multiple Comparison of Groups Reading

					95% CI[a]	
(I) Group	(J) Group	Mean Difference (I-J)	*SE*	Sig.[a]	*LL*	*UL*
1	2	2.371	16.154	.884	-29.582	34.323
2	1	-2.371	16.154	.884	-34.323	29.582

Note. Dependent variable = posttest. Based on estimated marginal means
[a] Adjustment for multiple comparisons: least significant difference (equivalent to no adjustments).

CHAPTER FIVE: CONCLUSIONS

Overview

Chapter Five will discuss the statistical analysis results, including the descriptive statistics and one-way ANCOVA, and their relation to other research. After the discussion section, the researcher explains the implications and limitations of the study, including reasons the analysis did not show a significant difference between groups. Finally, the last section of this chapter provides future recommendations for further research.

Discussion

The purpose of this study was to determine if participation in music for two to three years had any difference on math or reading STAAR scores for eighth-grade students who are in special education. An ANCOVA analysis determined if a difference existed between the participant and nonparticipant groups. The idea that music can affect reading scores corresponds with Gardner's concept of musical intelligence working in tandem with other intelligences (2011). In addition to Gardner, Dewey believed that education is based on experience (1938). Experience in music can provide knowledge that can transfer to other disciplines.

The first research question was as follows: Is there a significant difference in eighth-grade *reading achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores? This research question was addressed using an ANCOVA. Through the ANCOVA, no statistical difference was found between the scores of students that participated in music and those that did not. The result of this study mirrors other studies that showed the effect was not statistically large enough to be significant, although these studies only included student in general educatin (Elpus,

2013; Gordon et al., 2015; Rickard et al., 2012; Slater et al., 2014). The Rickard et al. (2012) study showed that students who participated in music showed less improvement in reading scores than the nonparticipant group. In this instance, the nonparticipant group did better on the measured achievement than students in a music group. Gordon and associates (2015) conducted a meta-analysis, which showed a small gain in phonological skills when students participated in musical training. The results of this gain were not statistically significant, as seen in the current study. These studies support the idea that although the increase in reading achievement was not significant, music somewhat influenced achievement in students without disabilities. Also, Elpus (2013) indicated when comparing SAT scores of students in music and student not in music that no significant difference existed. Furthermore, one study showed no increase in achievement for students in music but noted that they retained their age-normed reading performance level when participating in music while the control group decreased their performance over time (Slater et al., 2014). Depending on the length of student participation, the types of participants, and the assessment, results vary.

Unlike this current study, other research has shown a significant effect of music on reading achievement (Cogo-Moreira et al., 2013; Kinney, 2008; Thornton, 2013). Cogo-Moreira et al.'s (2013) study showed a significant increase in reading when children participated in music activities; increases were seen specifically in word accuracy, in-text accuracy, and phonological awareness. In both cohorts researched by Kinney (2008), middle school students in music showed a significant positive difference in reading achievement not seen in those not in music. Finally, Thornton (2013) researched fifth-, eighth-, and 11th-grade music students, and all grades showed a higher mean score in reading for students that participated in music compared to those that did not. These studies do not identify if any student have disabilities. Researchers need to

continue studying and identifying why some studies show a difference in achievement while others do not.

The second research question answered by this study is “Is there a significant difference in eighth-grade *math achievement scores* between middle school students with disabilities who participated in school-based music performance for two or more years and those who did not as measured by the STAAR when controlling for fifth-grade math achievement scores?” The ANCOVA determined that there was no significant difference in math scores between students who participated in music and students who did not.

Very few studies mirrored the research and results that students in music did not increase in mathematical achievement. Boyd (2013) had a similar determination when comparing students who participated in music and those who did not participate in middle school. His study also used ANCOVA to test the means between the nonparticipant and participant groups, as did the current study. Boyd’s (2013) results yielded no correlation between math achievement and student participation in musical activities for two or fewer years. The only positive effect of music participation was seen when students participated for three or more years (Boyd, 2013). The current research did not specify the impact on achievement for different lengths of participation. It only included students who participated in music for two to three years. Additionally, Boyd’s (2013) study showed that the type of musical participation affects the correlation, which included brass, percussion, choir, and string instruments. However, Boyd (2013) only used students without disabilities in his study. In additional research, the difference between the nonparticipation group and the music participation group in mathematics was not substantial enough to be significant (Holmes & Hallam, 2017). Furthermore, other research

indicated that the relationship between musical participation and mathematical achievement is less clear, and additional research is needed (Holmes & Hallam, 2017).

Alternatively, most of the research is in opposition to the current results when using participant without disabilities. With a variety of age groups, achievement measures, and length of participation, much research indicates that participation in music does somewhat impact students' mathematical achievement (Hash, 2011; Helmrich, 2010; Horton et al., 2010; Jones-Lewis, 2013; Thornton, 2013; Vaughn & Winner, 2000). Additionally, Thornton (2013) indicated that students in the fifth, eighth and 11th grades who were voluntarily involved in music had significantly higher math scores than students who were not in music. When using Northwest Evaluation Association Mathematic MAP scores, Jones-Lewis (2013) identified that students' mean ranks were higher for when they participated in music only one or two times during the year compared to students who did not participate. Also, Hash (2011) identified that eighth-grade band students achieved higher scores on the ACT Explore math achievement test than students who never participated or dropped band before the eighth grade. Another research study stated students in out-of-school band or choral programs outperformed students with no musical experience when given the ninth grade algebra standardized assessment (Helmrich, 2010). Specifically, using Texas achievement tests in math, students in 10th and 11th grade showed significantly higher scores when participating in a music program (Horton et al., 2010). Vaughn and Winner (2000) analyzed SAT scores in math, and there was an increase in scores linked to the number of years students spent studying music. Overall, previous research shows evidence that music affects mathematical achievement scores for student in general education, but no research excists with students who are in special education. Research should continue in this subject due to the recent research showing opposite music participation results on

mathematic achievement and if these results are due to the students being in special education or another factor.

Implications

With over seven million students receiving special education services in public schools, the need for research on this population is paramount (NCES, 2019). Additionally, due to IDEA and ESSA, most of these students continue to participate in general education assessments and are included in the school and state accountability standards. This study contributes to the current knowledge base of music's effect on students' academics. However, most of the past research was with the general education population. This research fulfills a current deficit in research on students with disabilities and the impact music participation can have on their academics. This study also provides more ideas for research to be conducted explicitly including students with special needs.

This study proves that more research should be conducted using middle school students in special education to address the gap in literature that exists with students in special education that participate in music and general standardized assessments. Current research identifies only one or two disabilities that music can affect through music therapy or music intervention (Matney, 2017; Robb, 2014; Shakarashvili & Arabuli, 2016; Srinivasan & Bhat, 2013). On the contrary, other studies exclude this demographic from the research (Babo, 2004; dos Santos-luiz et al., 2015). Due to inclusion practices and the requirement for students to learn in the least restrictive environment, students are no longer grouped per disability and participate in general education and assessment. According to ESSA, only one percent of the student body can participate in alternative assessments, although students with disabilities encompass approximately 13% of students (NCES, 2019). There is a considerable deficit of research

targeting students with disabilities and the impact music can have on these students. This study hopes to shed light on the fact that this topic should continue to be studied to determine if music participation does affect the academics of students in special education.

Limitations

As with all research, this study was limited by several factors. Limitations are due to the type of sample, the nature of the causal-comparative design, the uniqueness of the instrumentation, the amount and types of participants, and the time of participation. Each limitation may have impacted the ultimate results of this study. Finally, the degree to which the results can be generalized to different populations and settings must be respected.

Due to this study using a convenience sample of the middle school students identified in special education, the study was limited to only this sample, not the entire population. Only students in the district during the three years of middle school were participants, and only one school district was used. Due to the variance in demographics, these results cannot be replicated in all places. Furthermore, using convenience sampling only uses the available participants, not the actual population (Gall et al., 2007).

Next, the use of a casual-comparative design does not allow the researcher to make definitive statements regarding the independent variable's effect on the dependent variable. This design cannot give the researchers definite conclusions about cause-and-effect relationships (Gall et al., 2007). Also, since the instrument used was the STAAR, this research cannot be duplicated in other states due to this assessment only being given at schools in Texas. Another limitation to this study was the number of participants used. The researcher predicted there would be 300 students in the initial research as determined by the total number of students in the district and the percentage of special education students but was only provided with 155 acceptable

participants. Also, the dependent group was exceedingly smaller than the independent group. Although ANCOVA can account for this difference, the best practice for research is equal groups. During data analysis, the assumption of normality did not show a normal curve in both participant groups. However, ANCOVA is robust enough for this not to make a difference but should still be considered a limitation. The last limitation in this study was the limited time the participants were enrolled in music. Other research states that music's impact on academics is concurrent with participation (Boyd, 2013). The participants in this study participated for only two years and were not assessed beyond eighth grade.

Recommendations for Future Research

The following are recommendations for future research:

1. Conduct research on a larger population. Future studies can include multiple districts and schools. Due to the small percentage of students in special education and the even lower percentage who participated in music, expanding the research to several schools can lead to more conclusive results.
2. Conduct research using a national assessment instrument such as the PSAT (Preliminary Scholastic Aptitude Test) or MAP. This study included the STAAR, and this assessment can only be administered to Texas schools; using a different instrument may produce different results.
3. Conduct a different type of study, such as a qualitative study or case study on the students' or teachers' perception of the impact participation in music has on academics. Further, this study only uses one assessment to measure achievement, and future research may use multiple data points to measure performance.

4. Conduct a similar study but individually separate the results for each disability. Research can show how participation can affect different disabilities. Disabilities could not be separated due to this study's small population because it would compromise participants' anonymity.

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Appendix A

[redacted]

Ashley Gonzalez
Doctoral Student, Liberty University
167 Hampton Drive
Fate, TX 75087
May 6, 2020

Dear Ms. Gonzalez:

Thank you for the recent submission of your independent research project application for your study, *Music Participation and Achievement Scores Among Middle School Students with Disabilities: A Causal-Comparative Study*. This letter is to inform you that your application documents have been reviewed. The review committee is pleased to inform you that research application to conduct research in the [redacted] has been **conditionally approved as submitted**.

In order to proceed with your work on this project within [redacted] the following conditions **must** be met:

- Access to data and/or information not specifically outlined in the research application, including other student demographics and/or student performance outcomes, is prohibited beyond that which is publically available. In addition, the project may not deviate from the processes outlined in the research application submitted March 2020 or authorized through this conditional approval.
- District, campus, and teacher anonymity should be preserved throughout your study. This requirement applies to district, campus, and/or teacher references in the study title, abstract, participation invitations, consent forms, or any other location in the research documents describing the location of the participants.
- Researcher is prohibited from engaging with any [redacted] staff for any purposes related to this study beyond requests for clarification that may be submitted to researcher by the district's research department.
- All researcher activities related to this project must be conducted **outside his/her [redacted] contractual time** and without use of district resources (e.g., email, other electronic resources, etc.).

Within the next three weeks, [redacted] research department will provide you with a masked data file (see file specifications attached). It is important that you carefully read and understand the file parameters, as there is more specificity in what will be provided compared to the data fields included in the research application. If data need assumption errors were made, you should contact the research department ASAP to request a revision to the data file specification. Only one data file transfer will be available from the research department to you.

It is evident that this is a research topic that you are very dedicated to and we wish you well with your continued work on this project.

[redacted]
Director | Research, Assessment & Accountability

Appendix B

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

June 2, 2020

Ashley Gonzalez
IRB Application 4167: Music Participation and Achievement Scores Among Middle School Students with Disabilities: A Causal-Comparative Study

Dear Ashley Gonzalez,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because it will not involve the collection of identifiable, private information.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

[redacted]

G. Michele Baker, MA, CIP
Administrative Chair of Institutional Research
Research Ethics Office

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