

## **ABSTRACT**

TRAFICANTE, AMANDA LYNN. Predicting Middle and High School Students with Disabilities' Change in Grades and State Test Performance Associated with Their Accommodations. (Under the direction of Dr. Scott Stage).

Despite educational policies aimed at increasing equality for children in special education, students in special education tend to earn lower grades than students who are not in special education (Deshler et al., 2002). The current research literature lacks sufficient information on the effects of accommodations on grades and state tests for students with disabilities and mental health diagnoses. Using data obtained from typical students' and students with disabilities' cumulative files who attended a public charter school, the current study investigated the effects of students' disabilities, mental health diagnoses, and accommodations on their change in grades over several academic years and their performance on state-mandated test outcomes. Data was analyzed using hierarchical linear modeling growth curve analysis, principle component analysis, and multiple regression. Results showed that students who received accommodations tended to earn lower initial math and reading grades but showed increased grade performance over time. However, for state-mandated tests, students who received accommodations showed lower scores. The discussion focuses on accommodations associated with lower state-mandated test scores and the implications of these results for special education practices.

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Predicting Middle and High School Students with Disabilities' Change in Grades and State Test  
Performance Associated with Their Accommodations

by  
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## **DEDICATION**

This dissertation is dedicated to my family and to the loving memory of my grandparents:

Robert Lowe, Sandra Lowe, John Traficante, and Assiride Traficante.

## **BIOGRAPHY**

Amanda Lynn Traficante was born on July 21, 1994. She graduated from Norwin High School in 2012, and she earned her B.S. in Psychology and Addiction Specialist Certificate from Saint Vincent College in 2015. During her time at Saint Vincent College and with the guidance of excellent mentors, Amanda became passionate about research in psychology and decided to pursue a doctoral degree in the field. She began her graduate training at North Carolina State University in the School Psychology Program. In 2018, Amanda earned her Master of Science in Psychology at North Carolina State University. Amanda is currently completing her APA-accredited pre-doctoral internship at Geisinger Medical Center in the Pediatric Psychology/Child Clinical Psychology track in Danville, PA.

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## INTRODUCTION

Students receiving special education services tend to earn lower grades than students who do not receive special education services (Deshler et al., 2002). In addition, students with disabilities tend to score below average on academic achievement tests (Wagner, Newman, Cameto, & Levine, 2006). Furthermore, students receiving special education services are more likely to drop out of school than their peers who do not receive special education services (Werblow, Urick, & Duesbery, 2013). However, the overarching goal of federal legislation and use of Individualized Education Plans (IEPs) is to promote ‘educational’ equality for individuals with disabilities (Individuals with Disabilities Education Act [IDEA], 2004).

### **The Individuals with Disabilities Education Act**

The IDEA (2004) aims to improve the educational performance of students with disabilities and promote equality for students with disabilities. The IDEA indicates that students with disabilities should receive a free and appropriate public education which includes specially designed instruction—this is documented in students with disabilities’ IEP—and other services to promote success for individuals with disabilities. According to the IDEA, students with disabilities should be served in the least restrictive environment (i.e., with general education peers as much as possible), schools should offer appropriate special education services including any helpful services that would be appropriate to support student learning, and special education providers should use evidence-based practices. In addition, students with disabilities should have an IEP which includes the student’s current level in academic achievement or other domains of functioning, effects of the disability on academic performance, measurable goals related to the disability, the services that the student will receive, the accommodations that the student will receive, and the frequency and duration of services.

To qualify for the aforementioned special education services, one must meet criteria for one of the thirteen disability categories (i.e., specific learning disability, other health impairment, autism spectrum disorder, emotional disturbance, speech or language impairment, visual impairment, deafness, hearing impairment, deaf-blindness, orthopedic impairment, intellectual disability, traumatic brain injury, and multiple disabilities). Taken together, federal legislation mandates the use of IEPs with special education settings and accommodations provided to students with disabilities. Special education services refer to the specially designed instruction and often include modifications made to instruction for students with disabilities. Special education services are often provided in settings which are documented in an IEP. Accommodations do not deal with the modification of instruction, but are modifications to the environment or requirements that are meant to increase equity for students with disabilities to perform at the level of students without disabilities. Many different special education services and accommodations are used for students with disabilities; see the Appendix for commonly used accommodations and special education services (Aron & Loprest, 2012).

#### **Section 504**

Section 504 of the Rehabilitation Act of 1973 protects individuals with disabilities—including mental and physical disabilities—from discrimination by promoting equity through the use of accommodations. In the school setting, students can qualify for a 504 Plan if their mental health diagnoses negatively impact their educational functioning. Students with disabilities can receive accommodations through this 504 Plan. Accommodations are modifications made to the environment or academic requirements such as extended time on tests, preferred seating near the point of instruction, copies of teacher notes, and other accommodations (e.g., see Appendix A-

D). Bryant and Strabavy (2012) recommend the use of 504 Plans for individuals with mental health diagnoses such as anxiety and depression (see Appendix E).

### **Academic Outcomes for Students**

The following section describes the results of studies of academic outcomes for students with disabilities and mental health diagnoses. These studies did not use experimental designs but describe the academic progress of students over time.

**Outcomes for state-mandated testing.** Previous research is fairly consistent regarding the results on state-mandated tests for students with disabilities compared to their general education peers. Landman (2014) studied state-mandated test scores in reading over time for students in special education and not in special education in third through sixth grade. They found evidence that students in special education had lower rates of reading growth on state-mandated tests than children who were not in special education; thus, finding students with disabilities fell further and further behind students without disabilities. Schulte, Stevens, Elliott, Tindal, and Nese (2016) investigated the change in state mandated reading tests over a five-year period for different special education categories of students between third and seventh grade. They found that students with disabilities tended to have lower initial reading scores with similar rates of growth over time, indicating that students with disabilities did not catch up to their peers without disabilities. Fleming, Cook, and Stone (2002) studied fifth through eighth grade students with learning disabilities' reading state-mandated test scores over time. Students with learning disabilities initially had lower achievement in reading with a stable gap remaining over time.

Longitudinal research on math performance tends to follow a similar trend. For example, one study revealed that students from third to seventh grade with disabilities had lower initial math state-mandated test scores and this gap remained stable over time (Stevens, Schulte, Elliott,

Nese, & Tindal, 2015). However, this was not the case for one category of students with disabilities; those with mild intellectual disabilities had higher rates of growth over time on the state-mandated tests (Stevens et al., 2015). Shin, Davison, Long, Chan, and Heistad (2013) investigated fourth through seventh grade students' mathematics achievement using state-mandated tests. Findings showed that students receiving special education had lower mathematics state testing scores than those not receiving special education.

**Outcomes for individual achievement tests.** Many previous studies used individual achievement tests to measure the academic outcomes for students with disabilities and mental health diagnoses. Morgan, Frisco, Farkas, and Hibel (2010) found that students in special education did not have statistically significant gains in reading or mathematics skills—as assessed by modified subtests from individual achievement tests—compared to their general education peers over a two-year period for elementary school students. In addition, Wei, Blackorby, and Schiller (2011) investigated the reading achievement of students ages 7 through 17 with disabilities using the *Woodcock-Johnson Test of Achievement, Third Edition* (Woodcock, McGrew, & Mather, 2001). However, this study did not include a comparison group without disabilities. Results showed similar rates of growth over time in reading for students across disability categories but differences in their starting points. Students identified as having a learning disability had significantly lower reading than other disability categories with the exception of students with an intellectual disability or with multiple disabilities. Furthermore, one study measuring the math achievement of students using the *Woodcock-Johnson Tests of Achievement, III* (Mather, Schrank, & Woodcock, 2007) showed that students with speech impairments or visual impairments had the highest math scores, and students with intellectual disabilities or multiple disabilities had the lowest math achievement of students with disabilities

(Wei, Lenz, & Blackorby, 2013). Morgan, Farkas, and Wu (2009) investigated the math achievement of students in first through fifth grade using modified subtests of individual achievement tests. The researchers found that students with lower initial math achievement had slower math growth over time.

St. Clair, Durkin, Conti-Ramsden, and Pickles (2010) investigated the reading accuracy and comprehension of students with and without a speech and language impairment from ages 7 to 16 using specific subtests from a range of individual achievement tests. They found that individuals with a speech and language impairment had lower reading skills but similar rates of growth over time in reading skills. Catts, Bridges, Little, and Tomblin (2008) studied the reading recognition and reading comprehension growth of students with and without language impairments in second through tenth grades assessed by the *Woodcock Reading Mastery Tests, Revised* (Woodcock, 1987) and the *Gray Oral Reading Test, Third Edition* (Wiederholt & Bryant, 1992). Similar to the previous study cited, they found that students with language impairments performed lower initially on reading tasks compared to students without language impairments, with a stable gap over time.

Francis, Shaywitz, Stuebing, Shaywitz, and Fletcher (1996) studied the reading growth of students with and without specific learning disabilities in reading for first through ninth grades assessed by the *Woodcock-Johnson Psychoeducational Test Battery* (Woodcock & Johnson, 1977). Findings showed that individuals with learning disabilities in reading had lower initial reading skills, with a gap remaining over time. Compton, Fuchs, Fuchs, Lambert, and Hamlett (2012) investigated the reading comprehension and word reading of students with learning disabilities compared to students in general education for third through fifth grade using the *Woodcock Reading Mastery Tests* (Woodcock, 1998) and the *Wide Range Achievement Test*,

*Third Edition* (Wilkinson, 1993). These researchers found similar results in that individuals with learning disabilities had lower initial intercepts and similar growth over time. Mattison, Hooper, and Glassberg (2002) used repeated measures ANOVAs to study the reading achievement of students with a learning disabilities classification over a three-year period using the *Woodcock-Johnson Psychoeducational Battery* (Woodcock & Johnson, 1978). Similar to previous studies described, the researchers showed that students with learning disabilities had stable reading outcomes (i.e., the students showed no change in achievement scores over time) which were below students with the emotional disturbance classification for reading scores. Furthermore, Swanson, Sáez, and Gerber (2006) investigated the reading growth of students ages 5 through 10 with learning disabilities and for whom English was not their first language using the *Woodcock-Johnson Tests of Achievement, III* (Woodcock, McGrew, & Mather, 2001). Findings showed that individuals with reading disabilities were below those without reading disabilities in reading. In addition, there were not significant differences in growth in reading over time. Wei, Yu, and Shaver (2014) studied the reading skills of students ages 6 through 12 with learning disabilities and comorbid attention-deficit/hyperactivity disorder (ADHD) using the *Woodcock-Johnson Tests of Achievement, III* (Woodcock et al., 2001). They found that children with both learning disabilities and ADHD had lower intercepts for reading skills but similar rates of growth over time compared to students with learning disabilities.

Wei and colleagues (2014) investigated math calculation growth over time using the *Woodcock-Johnson Tests of Achievement, III* (Woodcock et al., 2001). They found that individuals with a classification of emotional disturbance and a diagnosis of ADHD had slower rates of math calculation growth over time when compared to individuals classified in the emotional disturbance category without comorbid ADHD. In addition, longitudinal data over a

ten-year period indicated that students with ADHD tended to initially perform lower on reading and mathematics testing but had similar rates of growth over time (Bussing et al., 2012).

Siperstein, Wiley, and Forness (2011) investigated the educational outcomes of students receiving special education services with the emotional disturbance classification over a two-year period using the *Woodcock-Johnson Tests of Achievement, III* (Woodcock et al., 2001).

They found limited progress for the students with emotional disturbance in an academic year in both reading and mathematics achievement.

**Outcomes for grades.** Some researchers investigated the effects of ADHD on academic grade performance. Bussing and colleagues (2012) studied kindergarten through fifth grade students with ADHD, subclinical ADHD, and comparison students. Findings showed that half of the students in the ADHD group also received special education services. Cross-sectional data from this study indicated that an ADHD diagnosis predicted lower grades when compared to students without ADHD.

Other researchers investigated the impact of anxiety on academic grades. Mazzone and colleagues (2007) found that 71.4% of elementary, middle, and high school students who scored high for anxiety had “insufficient” or failing grades. Frojd and colleagues (2008) investigated the associations between depression and grade point average for individuals with a depression diagnosis from seventh to ninth grades. They found that lower grade point average was associated with greater depression scores. In addition, they found that a drop in grade point average was associated with depression. These findings related to depression and anxiety are limited as they do not investigate the grades for students with anxiety and depression over a period of time.

The above studies show an achievement gap for students based on special education status and mental health diagnoses; however, this research is limited in depth of content. The studies do not contain information on the types of accommodations that lead to more success for students with disabilities.

### **Accommodations for Students with Disabilities**

Some researchers investigated the use of accommodations within schools. Elliott, Kratochwill, McKeivitt, and Malecki (2009) found that the following accommodations were commonly used: extra time on standardized tests, reading directions to the student, special education teacher as the administrator of the test, rereading directions to the student, and verbal encouragement during the exam. Given the common use of accommodations by students with disabilities, other researchers investigated the effectiveness of specific accommodations. In a meta-analysis of research outcomes for the read-aloud accommodation, Buzick and Stone (2014) found that the read-aloud accommodation increased test scores for students with and without disabilities for reading. However, this was not the case for mathematics. In fact, some groups performed less well on mathematics testing with the read-aloud accommodation. The meta-analysis found some differences in effects for elementary schools compared to higher grades, suggesting better effectiveness of the read-aloud accommodation in elementary school (Buzick & Stone 2014).

In terms of mathematics and reading, evidence exists that resource guides (e.g., sheets with definitions, graphics, and other helpful information) were not a helpful accommodation for students with disabilities on Georgia state-mandated tests in elementary and middle school (Engelhard, Fincher, & Domaleski, 2011; Randall, & Engelhard Jr., 2010). Calculators were found to be helpful for students in late elementary school; however, calculators were not a

helpful accommodation for middle school students on Georgia state-mandated tests (Engelhard et al., 2011). This may be due to the changes in demands from basic calculations in elementary school to more advanced problem solving required in math word problems in middle school. The read-aloud accommodation is another common accommodation used during testing in schools. For this accommodation students are read directions and test questions by a teacher or staff member. Randall and Engelhard Jr. (2010) tested the read-aloud test modification and found that reading comprehension performance on state-mandated tests was improved for students with disabilities, except for those in seventh grade. Although the research conducted by Engelhard and colleagues (2011) and Randall and Engelhard (2010) included state testing scores as an outcome measure, students in these studies were given the same state test given in their previous year to test the effects of the specific accommodations in the studies (i.e., resource guides, calculators, and the read-aloud accommodation). Thus, practice effects and concerns related to the external validity of the study limit the conclusions of the studies. These researchers also did not assign the accommodations of interest to students based on their individual needs—the way that accommodations are typically assigned to students.

Elliott, Kratochwill, McKeivitt, and Malecki (2009) studied test accommodations for fourth grade students, some of whom were identified for special education services. Performance was measured using math and science classroom tasks; the accommodations were delivered in packages developed for each individual student—similar to how accommodations are chosen for students in schools. They were tested in an alternating treatment design that included verbal encouragement, directions read to the student, directions simplified or read with understandable vocabulary, rereading subtask directions, students paraphrasing the directions, read aloud, and extra time. Of the students with disabilities, 78% had higher test scores with the

accommodations. Of the students without disabilities, 54% had higher test scores with the accommodations. For 10 to 13% of students with and without disabilities, the accommodations related to lower test scores.

Lewandowski, Lovett, Parolin, Gordon, and Coddling (2007) used middle school students with and without attention-deficit/hyperactivity disorder (ADHD) to test the effects of extended time on a math calculation task developed by the researchers and a math fluency achievement task from the *Woodcock-Johnson Tests of Achievement, III* (Woodcock et al., 2001). Children with and without ADHD benefited from the extended time for the math tasks. Children with ADHD performed as well as children without ADHD when the children with ADHD received extended time and the control group received no extended time; indicating that some children with ADHD are able to compensate for their weaknesses when given extra time on tests (Lewandowski et al., 2007). Another study conducted with students in tenth through twelfth grades with learning disabilities compared to their peers without disabilities (Lewandowski, Lovett, & Rogers, 2008) found that the students with learning disabilities attempted more items and got more items correct when given extended time for a reading comprehension achievement subtest. However, their grades were not equivalent to their nondisabled peers as a result of the accommodation (Lewandowski et al., 2008).

The current research literature does not indicate which accommodations best promote student success for students over time on their grades. In the past, researchers have conducted either experimental studies on accommodations for classroom tasks, achievement subtests, or state testing scores with little external validity and a limited amount of services that are typically provided in special education (e.g., Engelhard, Fincher, & Domaleski, 2011; Lewandowski, Lovett, Parolin, Gordon, & Coddling, 2007; Randall, & Engelhard Jr., 2010), or descriptive

studies that show students with disabilities not catching up to their peers academically in achievement, state testing scores, and grades—without showing which interventions led to success for students with disabilities who did succeed (e.g., Compton, Fuchs, Fuchs, Lambert, & Hamlett, 2012; Fleming, Cook, and Stone, 2002; Morgan, Frisco, Farkas, & Hibel, 2010; Schulte, Stevens, Elliott, Tindal, & Nese, 2016). More research is necessary to understand the qualities of an IEP that result in more success and educational gains for students with disabilities.

### **Purpose of Study**

The purpose of this study was to test the effects of middle and high school students' special education category, mental health diagnoses, and accommodations on their course grades and performance on their state mandated achievement tests. Results from this study have important implications for educators and educational policy as the results will provide information related to ways educators might provide accommodations to secondary students with disabilities.

### **Research Questions and Hypotheses**

This study answered the following research questions.

**Research question 1.** How would students with disabilities compare to students without disabilities on their grades over time?

**Hypothesis 1.** Consistent with previous research (Deshler et al., 2002) about students with disabilities it was expected that they would earn lower grades than students without disabilities. In addition, it was expected that students with disabilities would have similar rates of growth over time based on previous research related to achievement growth over time for students with disabilities (Catts et al., 2008; Compton et al., 2012; Francis et al., 1996; Mattison et al., 2002; Morgan et al., 2010; St. Clair et al., 2010; Wei et al., 2014).

**Research question 2.** Would students' mental health diagnoses such as attention deficit/hyperactivity disorder (ADHD), anxiety, or autism result in differences in grades over time?

**Hypothesis 2.** A mental health diagnosis was expected to be associated with lower grades when compared to students without a mental health diagnosis based on previous research (Bussing et al., 2012; Frojd et al., 2008; Mazzone et al., 2007).

**Research question 3.** Would the accommodations that students received relate to differences in grades and change in grades for students with disabilities?

**Hypothesis 3.** Consistent with research by Elliott and colleagues (2009), it was expected that students receiving accommodations would show higher grades.

**Research question 4.** How would students with disabilities compare to students without disabilities on their performance on state-mandated tests?

**Hypothesis 4.** Consistent with previous research (e.g., Fleming et al., 2002; Schulte et al., 2016; Stevens et al., 2015), it was expected that students with disabilities would have lower state-mandated test scores than their general education peers.

**Research question 5.** Would students' mental health diagnoses result in differences on their state-mandated test scores?

**Hypothesis 5.** It was expected that students' mental health diagnoses would be associated with lower state-mandated test scores based on previous research related to academic achievement for individuals with mental health diagnoses (Bussing et al., 2012; Siperstein et al., 2011; Wei et al., 2014).

**Research question 6.** Would the accommodations that students received relate to differences in their state-mandated test scores?

**Hypothesis 6.** Consistent with research by Elliott and colleagues (2009), it was expected that students who received accommodations would show higher state-mandated test scores.

**Research question 7.** Which student accommodations would significantly predict differences on state-mandated test scores?

**Hypothesis 7.** This aspect of the study was exploratory and sought to discover what student accommodations were related to differences on the outcome variables. Thus, there is no explicit hypothesis regarding this question.

## METHOD

### Participants

Participants were 320 students in a suburban public-charter school in North Carolina for grades 6 through 12 who were enrolled in the school during the 2017-2018 school year. Students met inclusion criteria if the student's school record included grades and state-mandated test scores. If a student was included in the dataset for this study, their historical academic information from the previous years of their enrollment were collected from sixth grade to their present grade in school. Thus, if a student was in ninth grade during the 2017-2018 school year, the four years of academic information from sixth to ninth grade was collected. If a student was in eighth grade during the 2017-2018 school year, the three years of academic information from sixth to eighth grade was collected, and so on. Students were selected for enrollment by a lottery system. The average age of the student participants was 14.58 ( $SD = 1.80$ ) years of age with a minimum age of 12 and a maximum age of 20. Of the sample, 150 participants (46.9%) were female students and 170 participants (53.1%) were male students. Two hundred and fifty students (78.1%) were identified as White, 28 students (8.8%) were identified as Black, 17 students (5.3%) were identified as Multiracial, 16 students (5%) were identified as Latinx, and 9

students (2.8%) were identified as Asian. One hundred and fifty students (32.8%) were eligible and receiving special education services.

Descriptive information related to mental health diagnoses, students' special education eligibility category, and services received are provided below. Fifty-six students (17.5%) were diagnosed with ADHD, 30 students (9.4%) were diagnosed with autism spectrum disorder, 27 students (8.4%) were diagnosed with an anxiety disorder (i.e., generalized anxiety disorder, social anxiety disorder, or adjustment disorder with anxious mood), 42 students (13.1%) were diagnosed with a specific learning disorder according to the DSM-5, and 3 students (0.9%) were diagnosed with a depressive disorder (i.e., major depressive disorder or adjustment disorder with depressed mood). In terms of special education eligibility categories, 45 students (14.1%) were identified as having an other health impairment, 28 students (8.8%) were identified as having a specific learning disability, 24 students (7.5%) were identified as having autism, 10 students (3.1%) were identified as having an intellectual disability, 1 student (0.3%) was identified as having a visual impairment category, and 1 student (0.3%) was identified as having a serious emotional disability.

## **Measures**

**Special education category.** Students' specific disability categories were collected from their cumulative file which was kept at the school. Specific IDEA (2004) categories included: autism, deaf-blindness, deafness, hearing impairment, intellectual disability, multiple disabilities, orthopedic impairment, other health impairment, serious emotional disability, specific learning disability, speech or language impairment, traumatic brain injury, or visual impairment.

**Mental health diagnoses.** Students' mental health diagnoses were identified through medical verification forms sent to the school by parents or guardians and located in their

cumulative files. Mental health diagnoses were taken from the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (American Psychiatric Association, 2013) and included major depressive disorder or adjustment disorder with depressed mood categorized as depression; generalized anxiety disorder, social anxiety disorder, or adjustment disorder with anxious mood categorized as anxiety; ADHD; conduct disorder; specific learning disorder; oppositional defiant disorder; or autism spectrum disorder diagnoses were also identified..

**Accommodations.** The accommodations that students received were collected from their cumulative files. Accommodations were listed for each student in special education or with a 504 Plan. Accommodations included extra time on tests, testing in a separate setting, mark in test booklets, copies of teacher notes, preferred seating, modified tests, modified classwork, modified homework, read-aloud tests, pen and paper assignments only, graphic organizers provided by the teacher, breaks in testing sessions, word banks for tests, study guides, teacher rubrics, dictate to scribe, red card (i.e., putting a red card on the desk and leaving if the student needs a break), test checklist, break down assignments, visual reminders for homework, use of a word processor, teacher check for understanding, proof reading checklist, teacher praise, allow typed assignments, pair visual and verbal directions, intentional grouping of the student with a nice peer, enlarge assignments, and allow portable devices. See Tables 1 and 2 for percentages of students who receive specific accommodations by special education category and mental health diagnosis.

**Grades.** Grades were collected from the students' cumulative files. Grades at the end of each grading period were collected for math, science, and reading courses. Grades were in the form of percentages that could range from 0% to 100%. In terms of predictive validity, Hodara and Lewis (2017) found that high school grade point average accounted for 9 to 18% of the

variance in college course grades for students in urban settings and 7 to 21% of the variance in college course grades for students in rural settings.

**State-mandated test scores.** School administrators and policy makers use standardized testing as an assessment of students' overall academic learning so that it is easily compared to other students within the state. Students in North Carolina are required to take the End-of-Grade (EOG) assessment in Grades 3-8 for reading and mathematics. The reading EOG measures reading skills in the following domains: reading for literature, reading for informational text, and language (North Carolina Department of Public Instruction [NC DPI], 2020). The mathematics EOG measures math skills in the following domains: ratios and proportional relationships, the number system, expressions and equations, the number system, expressions, and equations, functions, geometry, and statistics and probability. The following achievement level scores are possible: 1, limited knowledge and skills; 2, partial knowledge and skills; 3, sufficient knowledge and skills; 4, solid knowledge and skills; and 5, superior knowledge and skills (NC DPI, 2020). The Alamance-Burlington School System Accountability Department (2015) reported the scaled score ranges for Grade 6 reading, level 1 scaled scores were 441 or less (less than or equal to the 14<sup>th</sup> %tile), for level 2, the scaled scores ranged from 442-450 (the 16<sup>th</sup> %tile to the 39<sup>th</sup> %tile), for level 3, the scaled scores ranged from 451-453 (the 43<sup>rd</sup> %tile to the 49<sup>th</sup> %tile), for level 4, the scaled scores ranged from 454-464 (53<sup>rd</sup> %tile to the 86<sup>th</sup> %tile), and for level 5, the scaled scores were greater than or equal to 465 (greater than or equal to the 90<sup>th</sup> %tile). For Grade 7 reading, level 1 scaled scores were 444 or less (less than or equal to the 13<sup>th</sup> %tile), level 2 scaled scores ranged from 445-453 (15<sup>th</sup> %tile to the 37<sup>th</sup> %tile), level 3 scaled scores ranged from 454-456 (41<sup>st</sup> %tile to the 49<sup>th</sup> %tile), level 4 scaled scores ranged from 457-468 (52<sup>nd</sup> %tile to the 88<sup>th</sup> %tile), and level 5 included scaled scores greater than or equal to 469

(percentile greater than or equal to the 89<sup>th</sup> %tile). For Grade 8 reading, level 1 scaled scores were 448 or less (less than or equal to the 17<sup>th</sup> %tile), level 2 scaled scores ranged from 449-457 (19<sup>th</sup> %tile to the 43<sup>rd</sup> %tile), level 3 scaled scores ranged from 458-461 (47<sup>th</sup> %tile to the 55<sup>th</sup> %tile), level 4 scaled scores ranged from 462-472 (60<sup>th</sup> %tile to the 90<sup>th</sup> %tile), and level 5 included scaled scores greater than or equal to 473 (greater than or equal to the 92<sup>nd</sup> %tile). The sixth through eighth grade internal reliabilities of the EOG assessment in reading range from .88 to .91 (NC Public Schools, 2014).

For Grade 6 math, level 1 scaled scores were 443 or less (less than or equal to the 26<sup>th</sup> %tile), level 2 scaled scores ranged from 444-450 (29<sup>th</sup> %tile to the 50<sup>th</sup> %tile), level 3 scaled scores ranged from 451-452 (54<sup>th</sup> %tile to the 58<sup>th</sup> %tile), level 4 scaled scores ranged from 453-460 (62<sup>nd</sup> %tile to the 84<sup>th</sup> %tile), and level 5 included scaled scores greater than or equal to 461 (greater than or equal to the 86<sup>th</sup> %tile). For Grade 7 math, level 1 scaled scores were 443 or less (less than or equal to the 26<sup>th</sup> %tile), level 2 scaled scores ranged from 444-450 (29<sup>th</sup> %tile to the 51<sup>st</sup> %tile), level 3 scaled scores ranged from 451-452 (54<sup>th</sup> %tile to the 58<sup>th</sup> %tile), level 4 scaled scores ranged from 453-560 (61<sup>st</sup> %tile to the 84<sup>th</sup> %tile), and level 5 included scaled scores greater than or equal to 461 (greater than or equal to the 86<sup>th</sup> %tile). For Grade 8 math, level 1 scaled scores included 443 or less (less than or equal to the 25<sup>th</sup> %tile), level 2 scaled scores ranged from 444-451 (29<sup>th</sup> %tile to the 56<sup>th</sup> %tile), level 3 scaled scores ranged from 452-453 (59<sup>th</sup> %tile to the 62<sup>nd</sup> %tile), level 4 scaled scores ranged from 454-462 (66<sup>th</sup> %tile to the 89<sup>th</sup> %tile), and level 5 included scaled scores greater than or equal to 463 (greater than or equal to the 91<sup>st</sup> %tile). The sixth through eighth grade internal reliability of the EOG assessment in Mathematics range from .92 to .93 (NC Public Schools, 2014).

For Grade 8 science, level 1 scaled scores were 240 or less (less than or equal to the 16<sup>th</sup> %tile), level 2 scaled scores ranged from 241-244 (18<sup>th</sup> %tile to the 27<sup>th</sup> %tile), level 3 scaled scores ranged from 245-247 (30<sup>th</sup> %tile to the 37<sup>th</sup> %tile), level 4 scaled scores ranged from 248-259 (41<sup>st</sup> %tile to the 81<sup>st</sup> %tile), and level 5 included scaled scores greater than or equal to 260 (greater than or equal to the 84<sup>th</sup> %tile).

Paepflow (2008) studied the relationship between grades and EOG scores for middle school students between the years of 2006 through 2008. The author found that more than 80% of students who earned an A, B, or C for classes also scored at or above grade level on the EOG tests. Interestingly, students who earned a D or F in reading scored at or above grade level on the EOG tests between 50 to 81% of the time. Thus, grades and state testing scores show some differences for students, especially those who receive D's or F's. The current study utilized both state testing scores and grades as outcome measures for student outcome comparisons with regard to the effects of special education eligibility, mental health diagnoses, and accommodations.

## **Procedures**

The Institutional Review Board at the university where the researcher resided approved this study. The principal of the charter school also gave written approval for the study. Data was collected on-site at the school. No identification numbers, names, or dates of birth were collected from the school; each student was assigned a random identification number that only the researcher knew. Then, the student information listed in the measures section was recorded in SPSS Statistics Software 24 (International Business Machines [IBM], 2016).

## Data Analysis Plan

The research questions about students' special education disability and mental health diagnosis in relation to change in grades over time were answered using hierarchical linear growth curve modeling (HLM; Raudenbush, & Bryk, 2002). Empirical Bayes estimates were used to account for missing data in the Level 1 data file (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011). The null model statistical equation was  $Y = B_0 + B_1 (\text{Time [i.e., 0, 1, 2, 3, 4, 5, 6, 7, and 8]}) + R$ , for which  $B_0$  was the initial student's grade intercept,  $B_1$  was the slope, and  $R$  was the error term. In this equation, time was a linear constant with fixed data points, although a quadratic model was also tested to determine which explained the most variance. Student grades were obtained from the end of each quarter that they attended classes; thus, there were four time points per year for grades. The Level 1 model included reading grades, math grades, and science grades with the intercept centered at the first time point. The Level 2 data file included the independent variables and tested their effects on both the Level 1 y-intercept and on the slope over time. The independent variables were entered as dichotomous variables for the special education model and included whether the student was academically gifted, learning disabled, had an other health impairment, had an autistic disability, had an intellectual disability, received curriculum assistance with a special educator, and whether or not the student received any accommodations. The second model was named the mental health diagnoses model and included the DSM-5 diagnostic information coded dichotomously for ADHD, an anxiety disorder (i.e., generalized anxiety disorder, social anxiety disorder, or adjustment disorder with anxious mood), autism spectrum disorder, specific learning disorder, and as in the other model whether they were receiving any accommodations.

To answer the questions regarding students' performance on stated mandated tests, a repeated measures hierarchical linear modeling procedure was used. The Level 1 file included state-mandated test scores. The Level 2 file included the independent variables described above.

Because dichotomous combinations of variables can be organized by common shared variance as in multiple regression, a principal components analysis was used to determine the linear combinations of accommodation variables with the 27 different accommodations used. The resultant components showed the linear combination of accommodation variables with the largest proportion of shared commonality. Accommodation variables by component were tested with the outcome variables as follow-up statistical tests to identify specific accommodations that were associated with the student outcome variables if the overall accommodation variable (i.e., the student received any accommodation) was statistically significant.

## **RESULTS**

Means and standard deviations of reading, math, and science grades for general education, special education, and the total sample were calculated. The means for reading grades in middle and high school for the total sample ranged from 78.53% to 90.33% and can be found in Table 3. The means for math grades for the total sample ranged from 78.06% to 85.30% and can be found in Table 4. The means for science grades for the total sample ranged from 77.51% to 91.21% and can be found in Table 5.

Means and standard deviations of reading, math, and science state test scores for general education, special education, and the total sample were calculated. Means for state-mandated tests for the total sample in reading ranged from 450.13 to 456.40. Math state test score means ranged from 442.86 to 449.84, and the eighth grade science state test score mean was 252.24. See Table 6 for more detailed information.

To determine the number of time points used for grades, descriptive statistics and information related to missing data was analyzed using the Level 1 data file. For reading, the average number of time points which represents quarterly grades for the sample was 8.78 ( $SD = 3.52$ ,  $Min = 2$ ,  $Max = 18$ ). In the Level 1 file for reading grades, 320 cases included the first time point (0); 146 cases included nine time points; and 88 cases included 10 time points. The average number of time points for math was 8.79 ( $SD = 3.61$ ,  $Min = 2$ ,  $Max = 18$ ). In the Level 1 file for math grades; 320 cases included the first time point (0); 149 cases included nine time points; and 85 cases included 10 time points. The average number of time points for science was 7.70 ( $SD = 3.83$ ,  $Min = 0$ ,  $Max = 14$ ). In the Level 1 file for science grades, 320 cases included the first time point (0); 143 cases included nine time points; and 78 cases included 10 time points. For reading, math, and science, approximately 50% of cases included 9 time points (i.e., reading  $n = 146$ , math  $n = 149$ , and science  $n = 143$ ), which was used for the number of time points analyzed with the HLM growth curve analyses.

## **Grades**

**Special education model.** For this model, the Level 1 model tested the effect of time on the outcome variable. The Level 2 model tested the effects of whether the student's special education eligibility as academically gifted, learning disabled, other health impaired, autistic, intellectually disabled, whether they received curriculum assistance, or whether they received accommodations showed effects on the outcome variable. Separate analyses were conducted for reading, math, and science grades. The best-fit HLM model was the linear model, as opposed to the quadratic model (i.e., for each outcome measure less than five percent of the variance was explained,  $p > .05$ ); therefore, results of the linear model are interpreted. Results of the HLM model for grades are presented in Table 7. To more accurately interpret the results of the

coefficient differences by each tested variable it should be noted that the intercept coefficient shows the average grade percent or EOG score at the initial y-intercept. Statistically significant negative coefficients of the tested variables entered into the model are subtracted from the intercept; whereas, statistically significant positive coefficients of the tested variables entered into the model are added to the intercept and similarly for the effects of the slope coefficients.

**Reading grades.** The model testing the effect of student disability categories, curriculum assistance, and accommodations on reading grades showed a significant difference between a fixed intercept for students with an academic gifted status (92.4%) and a fixed intercept on average (85.43%). In addition, a significant difference was found between a fixed intercept for receiving accommodations (77.19%) and a fixed intercept on average. No other fixed intercepts were statistically significant in the special education model. Significant differences were found between the fixed slope effect (-0.48%) and the fixed slope for students in the curriculum assistance setting (-4.58%) and for receiving accommodations (3.84%). No other fixed slope effects were significantly different from the average fixed slopes for reading grades.

**Math grades.** The model testing the effect of student disability categories, curriculum assistance, and accommodations on math grades showed a significant difference between a fixed intercept for students that were academically gifted (90.79%) and the average fixed intercept (84.77%). In addition, a significant difference was found between a fixed intercept for students with learning disabilities (76.21%) and a fixed intercept on average (84.77%) for math grades. No other fixed intercepts were significantly different from the average fixed intercept in this special education model. Significant differences were found between the average fixed slope (-1.41%) and the fixed slope of the curriculum assistance class (-3.84%) and receiving

accommodations (2.97%). No other fixed slopes were significantly different from the average fixed slopes for math grades.

**Science grades.** The model testing the effect of student disability categories, curriculum assistance, and accommodations on science grades showed a significant difference between a fixed intercept for students who were academically gifted (95.33%) and a fixed intercept on average (90.93%). No other fixed intercepts were significantly different from the average fixed intercepts in this special education model. Significant differences were found between the average fixed slope (-2.59%) and the fixed slope for the students with a the learning disability (-6.89%). No other fixed slopes were significantly different from the whole sample fixed slope for science grades.

**Mental health diagnoses model.** For the mental health diagnoses, the Level 1 model tested the effect of time. The Level 2 model tested the effects of the DSM-5 diagnoses of ADHD, an anxiety disorder (i.e., generalized anxiety disorder, social anxiety disorder, and adjustment disorder with anxious mood), autism spectrum disorder, specific learning disorder, and students receiving accommodations on students' grades over time. Separate analyses were conducted for reading, math, and science grades. The best-fit HLM model was the linear model, as opposed to the quadratic model; therefore, results of the linear model are presented below. Results of the HLM model for grades are presented in Table 7.

**Reading grades.** The model testing the effect of mental health diagnoses according to the DSM-5 and accommodations on reading grades revealed a significant difference between a fixed intercept for receiving accommodations (80.13%) and a fixed intercept on average (86.76%). No other fixed intercepts were significantly different from the average in this mental health diagnoses model. Significant differences were found between the fixed slope on average (-

0.47%) and the fixed slope of individuals with anxiety diagnoses (-2.83%). No other fixed slopes were significantly different from the average fixed slopes for reading. Figure 1 shows reading grades over time for the fixed effects on average and the fixed effects of the accommodations.

**Math grades.** The model testing the effect of mental health diagnoses according to the DSM-5 and accommodations on math grades revealed a significant difference between a fixed intercept for receiving accommodations (79.33%) and a fixed intercept on average (85.96%). No other fixed intercepts were significantly different from the average fixed intercepts in this mental health diagnoses model. Significant differences were found between the fixed slope on average (-1.24%) and the fixed slope for receiving accommodations (0.61%). No other fixed slopes were significantly different from the average fixed slopes for math grades. Figure 1 shows math grades over time for the fixed effects on average and the fixed effects of accommodations.

**Science grades.** The model testing the effect of mental health diagnoses according to the DSM-5 and accommodations on science grades revealed no significant differences between fixed intercepts and the average fixed intercept (91.80%) in this model. Significant differences were found between the fixed slope on average (-2.35%) and the fixed slope for students with a specific learning disorder (-4.60%). No other fixed slopes were significantly different from the average fixed slope for science grades.

### **State-Mandated Test Scores**

**Special education model.** For EOG scores, a repeated measures hierarchical model was used to test the effect of special education variables and mental health disorder variables.

Separate analyses were conducted for reading, math, and science. Results of the HLM model for state-mandated test scores are presented in Table 8.

***Reading state-mandated tests.*** The model testing the effect of student disability categories, curriculum assistance, and accommodations on reading state test scores showed a significant difference between a fixed intercept for accommodations (446.83) and a fixed intercept on average (456.89). No other fixed intercepts were significantly different from the average in this special education model.

***Math state-mandated tests.*** The model testing the effect of student disability categories, curriculum assistance, and accommodations on math state test scores showed a significant difference between a fixed intercept for students who were academically gifted (456.17) and a fixed intercept on average (449.61). In addition, a significant difference between a fixed intercept for students with a specific learning disability (444.96) and a fixed intercept on average (449.61) was found for math state test scores. No other fixed intercepts were significantly different from the whole sample fixed intercepts in this special education model.

***Science state-mandated tests.*** The model testing the effect of student disability categories, curriculum assistance, and accommodations on science state test scores showed no statistically significant differences between fixed intercepts on average (253.03) and fixed intercepts of the variables in the special education model.

***Mental health diagnoses model.*** For state-mandated test scores, a repeated measures hierarchical model was used to test the effect of special education variables and mental health diagnosis variables. Separate analyses were conducted for reading, math, and science. Results of the HLM model for state-mandated test scores are presented in Table 8.

***Reading state-mandated tests.*** The model testing the effect of mental health diagnoses according to the DSM-5 and accommodations on reading state test scores showed a significant difference between the fixed intercept for receiving accommodations (445.91) and a fixed

intercept on average (457.81). In addition, the fixed intercept for students receiving anxiety diagnoses (451.01) were significantly different from the fixed intercept on average (457.81). No other fixed intercepts were significantly different from the average in this mental health diagnoses model.

*Math state-mandated tests.* The model testing the effect of mental health diagnoses according to the DSM-5 and accommodations on math state test scores found a significant difference between the fixed intercept for receiving accommodations (442.65) and a fixed intercept on average (451.34). In addition, the fixed intercept for students receiving anxiety diagnoses (440.92) was significantly different from the intercept on average (451.34). No other fixed intercepts were significantly different from the average fixed intercept in this mental health diagnoses model.

*Science state-mandated tests.* The model testing the effect of mental health diagnoses according to the DSM-5 and accommodations on science state test scores found no significant differences between fixed intercepts and the average fixed intercepts (254.54) in this mental health diagnoses model.

### **Principal Components Analysis**

The results of the principal components analysis conducted with the accommodation variables are shown in Table 9. Varimax rotation with a Kaiser Normalization procedure was used to show the associated variables by component score. Nine components with eigenvalues greater than one were derived from the accommodation variable dataset. The accommodation variables aligned by the principal components analysis were used in stepwise multiple regression analyses to determine their association with the sixth grade students' performance on the state-

mandated achievement tests in reading and math and eighth grade students' performance on the state-mandated achievement test in science.

### **Stepwise Multiple Regression**

Stepwise multiple regression analyses were used to address the effect of each associated accommodation variable on state-mandated tests for sixth grade math and reading and eighth grade science. Analysis of component 1 accommodations revealed that copies of teacher notes, extended time on tests, and study guides were significantly negatively associated with test scores for sixth grade reading. Separate setting, graphic organizers, and copies of teacher notes were significantly negatively associated with test scores for sixth grade math. Extended time for assessments was significantly negatively associated with eighth grade science state test scores. Analysis of component 2 accommodations revealed that modified classwork and breaks in testing sessions were significantly negatively associated with sixth grade reading state-mandated test scores. Modified classwork was significantly negatively associated sixth grade math state-mandated test scores, and modified tests were significantly negatively associated with eighth grade science state-mandated test scores. Analysis of component 3 accommodation variables revealed that typed assignments was significantly negatively associated with eighth grade science state-mandated test scores. Analysis of component 7 accommodations found that word bank and teacher rubrics were significantly negatively associated with sixth grade reading and math state-mandated test scores and eighth grade science state-mandated test scores. Analysis of all other components revealed no significant effects of accommodations on sixth grade reading and math state-mandated test scores and eighth grade science state-mandated test scores. See Table 10 for multiple regression results.

## DISCUSSION

The purpose of this study was to investigate the difference in the change in students' grades over time and their performance on state mandated achievement tests by their special education disability, mental health diagnoses, and their accommodations compared to average students in a natural setting. Previous research either descriptively investigated special education student grades or test scores over time or conducted experimental studies investigating the effects of an accommodation on measured outcomes. Thus, there is limited research on the effects of accommodations on school-based academic outcomes in a natural school setting. It was hypothesized that students with disabilities would have lower initial grades than students without disabilities and similar rates of growth for grades to their peers over time based on research conducted by Deshler and colleagues (2002). In addition, it was hypothesized that students with mental health diagnoses according to the DSM-5 would show lower grades when compared to students without a mental health diagnosis based on previous research (Bussing et al., 2012; Frojd et al., 2008; Mazzone et al., 2007). In terms of accommodations, it was hypothesized that receiving accommodations would be associated with higher grades based on research by Elliott and colleagues (2009). Findings from Deshler and colleagues (2002) indicated that students in special education have lower grade point averages than students in general education. The current study expands on those findings by providing specific information related to the academic areas that students with eligibility for special education often fall behind in and which disability categories were associated with these academic outcomes.

Contrary to the first hypothesis, students with disabilities did not have significantly lower initial reading grades than the average student. This is also contrary to a previous research study that specifically assessed grades for students in special education and indicated that high school

students in special education have lower grades than their general education peers (Deshler et al., 2002). One possible explanation for this inconsistency is that many of the students with disabilities were receiving accommodations (see Tables 1 and 2). It is possible that the effects associated with the students' disabilities and grades is better explained by the academic accommodations they received which were intended to have a direct influence on their academic performance.

Consistent with the first hypothesis, students with a learning disability had a significantly lower initial math grade. It is possible that accommodations received for children with learning disabilities did not allow the students to perform at the level of the average student. In terms of the students' changes in grades over time, students with disabilities had similar rates of change over time for reading and math compared to the average student. This is consistent with previous research that shows that achievement gaps between students in special education and general education remain stable over time for measures of individual achievement (e.g., Catts, Bridges, Little, & Tomblin, 2008; Morgan, Frisco, Farkas, & Hibel, 2010). These findings contribute to the research literature because there is limited research related to the grade point averages of middle and high school students in special education compared to the average student. Deschler and colleagues (2002) previously found a gap in grades between students in special education and students in general education; however, the researchers did not investigate trends in grades over time. The current research expands previous findings that the gap between students with disabilities and the average student remains stable over time for reading and math grades, as well. For all special education students who received services in the curriculum assistance setting, this was associated with significantly decreasing grades over time for reading. It may be

that the unstructured nature of curriculum assistance doesn't specifically target learning strategies that would be helpful for students in their reading classes.

In addition, students with disabilities did not have significantly lower initial science grades than the average student, which also contrasts previous research by Deshler and colleagues (2002). Furthermore, students with learning disabilities showed a reduction in grades over time in science, indicating that the students fell further behind. Possible explanations for this effect on science grades may be that the accommodations were insufficient for students with disabilities given the broad content that is expected to be covered during middle school and the match of accommodations to the specific science content being taught is reported to be difficult to achieve (Mutch-Jones, Puttick, & Minner, 2012). Previous researchers found that teachers generate accommodations for students with learning disabilities in science, but that with an intervention for teachers to work together (e.g., the special education and science teacher working together to share knowledge), science teachers did not gain more knowledge of learning challenges and special education teachers did not learn the specific science content to better assist students in science with disabilities (Mutch-Jones et al., 2012). It may be that there is not sufficient time in teachers' work days to implement strategies other than accommodations that may further assist students with learning disabilities. Lastly, intellectually gifted students initially had higher science grades than the average student.

No significant differences in initial grades were found for students diagnosed with mental health diagnoses according to the DSM-5 (i.e., ADHD, anxiety, autism, and specific learning disorders) when compared to the average student. However, students with a diagnosis of an anxiety disorder showed significant decreases in reading grades over time. Although the initial grade was not lower, this partially supports previous research that shows that anxiety was

associated with lower grades (Mazzone et al., 2007). Anxiety disorder symptoms can include difficulty concentrating (American Psychiatric Association [APA], 2013). It may be that difficulty concentrating and other symptoms of anxiety impacted the students' ability to maintain reading grades over time. Furthermore, it may be that anxiety results in less learned content over time, resulting in a widening gap for grades. Interestingly, a diagnosis of ADHD did not have a significant effect on grades. This is contrary to previous research by Bussing and colleagues (2012) that showed that individuals with an ADHD diagnosis have lower grades than individuals without an ADHD diagnosis. It may be that accommodations received were sufficient in creating equity for individuals with ADHD in this setting. Together, these findings partially support the other hypothesis that students diagnosed with mental health diagnoses have lower grades than individuals without a mental health diagnosis depending on the diagnosis.

In terms of the effect of accommodations on grades, it was found that students receiving accommodations initially performed below the average student's grade percent but over time actually surpassed the average student in reading and math; however, this was not the case in science. The improvement of class grades over time with accommodations has not been explained in previous studies. It might suggest that there is an interaction between the students' use and the teachers teaching the use of accommodations over time with classroom work that the student is expected to master. If there is an interactive process, then as students initially use an accommodation or accommodations in the classroom, teachers can assess the outcomes over time and differentiate instruction to provide more explicit instruction with accommodations which strengthens the students' learning over time (e.g., Tricarico & Yendol-Hoppey, 2012).

For state-mandated test scores, it was hypothesized that students with disabilities would have lower state-mandated test scores than their general education peers based on previous

research testing the effects of special education on state-mandated tests (e.g., Fleming et al., 2002; Schulte et al., 2016; Stevens et al., 2015). In addition, it was expected that students' mental health diagnoses would be associated with lower state-mandated test scores based on previous research related to academic achievement for individuals with mental health diagnoses (Bussing et al., 2012; Siperstein et al., 2011; Wei et al., 2014). Consistent with research by Elliott and colleagues (2009), it was expected that students who received accommodations would show higher state-mandated test scores.

An anxiety diagnosis was associated with significantly lower reading and math scores when compared to the average student. It may be that the cumulative effects of anxiety throughout the school year result in less learned content or greater difficulty concentrating on the actual testing. Interestingly, a diagnosis of ADHD did not have a significant effect on state testing scores. This is contrary to previous research by Bussing and colleagues (2012) that showed that individuals with an ADHD diagnosis have lower state testing intercepts than individuals without an ADHD diagnosis. These findings partially support the other hypothesis that students diagnosed with mental health diagnoses have lower test scores than individuals without a mental health diagnosis. These findings provide more information related to the academic subjects that may be impacted by specific mental health diagnoses.

Contrary of the relationship of accommodations and students' grades, receiving accommodations was associated with significantly lower reading and math state-mandated test scores for students with disabilities and mental health diagnoses. This finding is interesting because accommodations are often applied for specific testing situations. However, the findings show that the accommodations were not sufficient to create equity between students with a disability or mental health diagnosis and the average student for state-mandated tests. This is

inconsistent with previous research that found that 78% of students with disabilities received higher test scores when accommodations were individualized to the student (Elliott et al., 2009). Elliott and colleagues (2009) tested the effects of teachers choosing accommodations that were individualized for students for specific performance tasks. The most common accommodations chosen for their study included “verbal encouragement of effort, read directions to the student, simplify language in directions, reread subtask directions, have student restate directions to the teacher in his or her own words, read test questions and content to student, and restate questions with more appropriate vocabulary” (p. 232). These accommodations were not listed or frequently used for the current study’s students with the exception of read aloud test questions and content. It may be that the accommodations used in Elliott and colleagues targeted the students’ understanding of the task requirements and provided better accommodations than those used in the current study’s natural school environment, which led to better task performance. It is also the case that teachers know generally what the state-mandated tests test, although they do not know the specific items so the design used by Elliott and colleagues is not available or practical for teachers at large.

Given the finding that students receiving accommodations had lower state-mandated test scores, follow-up regression analyses were conducted to determine if this was a uniform effect or if specific accommodations might yield positive results as Elliott and colleagues found. Interestingly, different accommodations significantly predicted different state testing scores for sixth grade reading, sixth grade math, and eighth grade science. However, there was a negative effect of receiving these specific accommodations for all models. The read-aloud accommodation did not significantly increase outcomes for the state-mandated test scores analyzed in this study. This is consistent with the findings that the read-aloud accommodation

did not have a significant effect on math testing scores (Buzick & Stone, 2014) but inconsistent with findings that the read-aloud accommodation was associated with an increase in test scores for reading. Previous research found that extended time on math tests improved performance for middle school students with ADHD (Lewandowski et al., 2007). However, extended time was associated with lower state testing scores for sixth grade reading and eighth grade science. It may be that extended time did not address issues with understanding test directions and questions in the current study as other researchers used more specific accommodations for understanding of tasks in the past (Elliott et al., 2009). For more details related to the effects of specific accommodations on academic outcomes, see Table 9.

### **Limitations**

This study provides information related to students with disabilities in a natural school setting and the effects of eligibility category, mental health diagnoses, and accommodations on academic outcomes for grades and state-mandated tests. Although the findings are interesting and provide insight into specific accommodations, the study is not without limitations. One limitation of this study is that the researcher did not have information related to whether or not students were actually receiving these accommodations on every occasion that they should receive them. Teachers are typically responsible for offering accommodations, and it may be that students did not always receive the accommodations listed on their IEPs when they should have. Thus, there was no verification of the consistent use of these accommodations.

### **Future Research**

This research provides a foundation for future research to further investigate the external validity of accommodations and special education services on academic outcomes. More specifically, researchers should conduct experimental studies in which the accommodations are

used when students take tests with similar procedures and content to state-mandated tests. Previous researchers have not specifically manipulated combinations of accommodations matched to the students' needs with outcome measures that are similar to state-mandated tests, and this would provide specific information related to best-practice accommodations that may lead to better state-mandated test scores for students with disabilities and mental health diagnoses.

In addition, future research should further investigate the effects of mental health diagnoses and the match between specific diagnoses and services which lead to better academic outcomes for students. Future research should also investigate whether or not teachers are implementing accommodations when they should to see if this has an impact on academic outcomes for students. The findings from this study are promising in that they indicate that receiving accommodations leads to increases in grades over time. Future research should investigate change in state-mandated test scores over time for accommodations; the number of time points available for state testing scores in this sample was not sufficient to conduct growth curve analysis.

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## TABLES

Table 1. Prevalence of Accommodations for Students in Special Education.

<b>Accommodations</b>	<b>Students within SE</b> <i>n</i> (%) within SE)	<b>Students within SLD</b> <i>n</i> (%) within SLD)	<b>Students within OHI</b> <i>n</i> (%) within OHI)	<b>Students within AU</b> <i>n</i> (%) within AU)	<b>Students within ID</b> <i>n</i> (%) within ID)
Separate setting	94 (89.5)	23 (85.2)	41 (91.1)	19 (86.4)	9 (100.0)
Mark in book	85 (81.0)	23 (85.2)	37 (82.2)	17 (77.3)	8 (88.9)
Extended time	84 (80.0)	23 (85.2)	23 (85.2)	16 (72.7)	8 (88.9)
Copies of teacher notes	69 (65.7)	17 (37.8)	28 (62.2)	14 (63.6)	7 (77.8)
Preferential seating	63 (60.0)	11 (24.4)	34 (75.6)	11 (50.0)	4 (44.4)
Modified tests	37 (35.2)	7 (25.9)	8 (17.8)	12 (54.5)	9 (100.0)
Modified classwork	37 (35.2)	4 (14.8)	12 (26.7)	12 (54.5)	8 (88.9)
Modified homework	36 (34.3)	4 (14.8)	12 (26.7)	11 (50.0)	8 (88.9)
Read aloud	34 (32.4)	13 (48.1)	14 (31.1)	3 (13.6)	4 (44.4)
Pencil and paper testing	33 (31.4)	11 (40.7)	15 (33.3)	4 (18.2)	3 (33.3)
Graphic organizer	28 (26.7)	11 (40.7)	16 (35.6)	1 (4.5)	0 (0.0)
Breaks during tests	16 (15.2)	2 (7.4)	2 (7.4)	2 (9.1)	5 (55.6)
Word bank	12 (11.4)	4 (14.8)	6 (13.3)	2 (9.1)	0 (0.0)
Study guides	12 (11.4)	5 (18.5)	4 (8.9)	0 (0.0)	2 (22.2)
Teacher rubrics	7 (6.7)	3 (11.1)	3 (6.7)	1 (4.5)	0 (0.0)
Dictate to scribe	7 (6.7)	2 (7.4)	1 (2.2)	2 (9.1)	2 (22.2)
Red card	7 (6.7)	1 (3.7)	3 (6.7)	3 (13.6)	0 (0.0)
Test checklist	5 (4.8)	2 (7.4)	2 (4.4)	1 (4.5)	0 (0.0)
Break down assessments	4 (3.8)	1 (3.7)	1 (3.7)	0 (0.0)	0 (0.0)
Visual reminders to turn in homework	3 (2.9)	0 (0.0)	1 (2.2)	2 (9.1)	0 (0.0)
Word processor	2 (1.9)	0 (0.0)	1 (2.2)	0 (0.0)	1 (11.1)
Check for understanding	2 (1.9)	0 (0.0)	2 (4.4)	0 (0.0)	0 (0.0)
Proof reading checklist	2 (1.9)	1 (3.7)	1 (2.2)	0 (0.0)	0 (0.0)
Teacher praise	2 (1.9)	0 (0.0)	1 (2.2)	1 (4.5)	0 (0.0)
Allow typed assignments	2 (1.9)	1 (3.7)	0 (0.0)	0 (0.0)	0 (0.0)
Pair visual and verbal directions	1 (1.0)	0 (0.0)	0 (0.0)	1 (4.5)	0 (0.0)
Intentional grouping of student	1 (1.0)	0 (0.0)	0 (0.0)	1 (4.5)	0 (0.0)
Enlarge assignments	1 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Portable device	1 (1.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

*Note.* SE = Special Education; SLD = specific learning disorder category; OHI = other health impairment category; AU = autism category; ID = intellectual disability category.

Table 2. Prevalence of Accommodations for Students with a Mental Health Diagnosis.

<b>Accommodations</b>	<b>Students within ADHD</b> <i>n</i> (%) within ADHD)	<b>Students within Anxiety</b> <i>n</i> (%) within Anxiety)	<b>Students within ASD</b> <i>n</i> (%) within ASD)	<b>Students within SLD</b> <i>n</i> (%) within SLD)	<b>Students within Language Disorder</b> <i>n</i> (%) within Language Disorder)
Separate setting	26 (78.8)	5 (50.0)	15 (71.4)	32 (82.1)	3 (60.0)
Mark in book	24 (72.7)	4 (40.0)	14 (66.7)	31 (79.5)	3 (60.0)
Extended time	23 (69.7)	6 (60.0)	13 (61.9)	30 (76.9)	3 (60.0)
Copies of teacher notes	17 (51.5)	4 (40.0)	11 (52.4)	22 (56.4)	3 (60.0)
Preferential seating	20 (60.6)	5 (50.0)	9 (42.9)	18 (46.2)	2 (40.0)
Modified tests	5 (15.2)	1 (10.0)	8 (38.1)	7 (17.9)	4 (80.0)
Modified classwork	8 (24.2)	1 (10.0)	8 (38.1)	6 (15.4)	3 (60.0)
Modified homework	8 (24.2)	1 (10.0)	7 (33.3)	6 (15.4)	3 (60.0)
Read aloud	11 (33.3)	1 (10.0)	2 (9.5)	12 (30.8)	3 (60.0)
Pencil and paper testing	13 (39.4)	0 (0.0)	2 (9.5)	13 (33.3)	2 (40.0)
Graphic organizer	8 (24.2)	4 (40.0)	1 (4.8)	11 (28.2)	2 (40.0)
Breaks during tests	4 (12.1)	1 (10.0)	1 (4.8)	7 (17.9)	1 (20.0)
Word bank	2 (6.1)	2 (20.0)	1 (4.8)	6 (15.4)	1 (20.0)
Study guides	4 (12.1)	0 (0.0)	0 (0.0)	4 (10.3)	1 (20.0)
Teacher rubrics	1 (3.0)	0 (0.0)	1 (4.8)	5 (12.8)	0 (0.0)
Dictate to scribe	0 (0.0)	1 (10.0)	2 (9.5)	1 (2.6)	1 (20.0)
Red card	0 (0.0)	0 (0.0)	3 (14.3)	3 (7.7)	0 (0.0)
Test checklist	1 (3.0)	1 (10.0)	1 (4.8)	0 (0.0)	2 (40.0)
Break down assessments	1 (3.0)	1 (10.0)	0 (0.0)	1 (2.6)	1 (20.0)
Visual reminders to turn in homework	0 (0.0)	0 (0.0)	1 (4.8)	0 (0.0)	1 (20.0)
Word processor	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)
Check for understanding	1 (3.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proof reading checklist	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.6)	0 (0.0)
Teacher praise	1 (3.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Allow typed assignments	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.6)	0 (0.0)
Pair visual and verbal directions	0 (0.0)	0 (0.0)	1 (4.8)	0 (0.0)	0 (0.0)
Intentional grouping of student	0 (0.0)	0 (0.0)	1 (4.8)	0 (0.0)	0 (0.0)
Enlarge assignments	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Portable device	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

*Note.* ADHD = attention-deficit/hyperactivity disorder; ASD = autism spectrum disorder; SLD = specific learning disorder.

Table 3. Descriptive Statistics for Math Grades.

Course	General Education		Special Education		Total Sample	
	<i>n</i>	<i>M % (SD)</i>	<i>n</i>	<i>M % (SD)</i>	<i>n</i>	<i>M % (SD)</i>
Sixth Grade Math						
Quarter 1	155	87.43 (8.15)	72	80.74 (12.48)	227	85.30 (10.20)
Quarter 2	155	84.54 (10.63)	72	78.32 (12.24)	227	82.57 (11.51)
Quarter 3	155	85.33 (10.94)	72	77.89 (15.58)	227	82.97 (13.03)
Quarter 4	155	83.42 (10.94)	72	77.94 (13.84)	227	81.68 (12.17)
Seventh Grade Math						
Quarter 1	166	81.73 (10.18)	75	80.40 (12.03)	241	81.32 (10.78)
Quarter 2	166	83.77 (11.36)	74	79.74 (12.84)	240	82.53 (11.95)
Quarter 3	98	82.06 (11.54)	53	78.38 (15.88)	151	80.77 (13.29)
Quarter 4	97	80.69 (13.35)	51	75.25 (18.73)	148	78.82 (15.57)
Eighth Grade Math						
Quarter 1	96	82.05 (11.28)	58	82.98 (9.73)	154	82.40 (10.70)
Quarter 2	95	83.42 (10.42)	58	79.17 (13.23)	153	81.81 (11.71)
Quarter 3	60	81.08 (11.96)	41	78.24 (12.02)	101	79.93 (12.01)
Quarter 4	60	80.57 (13.86)	41	80.68 (12.41)	101	80.61 (13.23)
Math 1						
Quarter 1	77	84.45 (8.51)	42	80.21 (13.67)	119	82.96 (10.76)
Quarter 2	76	84.09 (9.93)	39	81.36 (15.65)	115	83.17 (12.17)
Math 2						
Quarter 1	74	84.69 (8.55)	13	82.00 (15.09)	87	84.29 (9.73)
Quarter 2	74	82.18 (9.90)	12	76.75 (16.14)	86	81.42 (11.02)
Math 3						
Quarter 1	50	82.86 (11.63)	5	82.00 (7.97)	55	82.78 (11.29)
Quarter 2	48	78.31 (16.33)	5	75.60 (14.06)	53	78.06 (16.03)

Table 4. Descriptive Statistics for Reading Grades.

Course	General Education		Special Education		Total Sample	
	<i>N</i>	<i>M % (SD)</i>	<i>n</i>	<i>M % (SD)</i>	<i>N</i>	<i>M % (SD)</i>
Sixth Grade ELA						
Quarter 1	155	88.70 (7.76)	72	80.83 (13.95)	227	86.21 (10.75)
Quarter 2	155	86.08 (10.24)	72	80.88 (12.07)	227	84.43(11.10)
Quarter 3	155	86.03 (9.93)	72	82.29 (12.63)	227	84.85 (10.97)
Quarter 4	155	86.23 (9.20)	72	80.54 (11.49)	227	84.42 (10.30)
Seventh Grade ELA						
Quarter 1	165	84.99 (11.20)	75	78.95 (13.45)	240	83.10 (12.24)
Quarter 2	165	86.17 (9.77)	74	80.85 (13.74)	239	84.52(11.39)
Quarter 3	97	85.25 (10.95)	53	80.72 (12.99)	150	83.65 (11.87)
Quarter 4	96	84.18 (11.98)	51	77.84 (15.80)	147	81.98 (13.71)
Eighth Grade ELA						
Quarter 1	111	84.62 (12.85)	58	80.07 (13.68)	169	83.06 (13.28)
Quarter 2	110	82.65 (13.53)	58	80.05 (12.82)	168	81.75 (13.31)
Quarter 3	71	81.46 (14.89)	41	77.37 (17.47)	112	79.96 (15.93)
Quarter 4	71	81.97 (12.40)	41	79.41 (13.07)	112	81.04 (12.65)
English 1						
Quarter 1	83	85.92 (11.65)	46	76.67 (15.28)	129	82.62 (13.74)
Quarter 2	83	81.41 (14.62)	45	73.22 (18.09)	128	78.53 (16.33)
English 2						
Quarter 1	74	86.72 (10.63)	35	85.11 (9.47)	109	86.20 (10.25)
Quarter 2	73	87.52 (8.98)	31	84.26 (11.15)	104	86.55 (9.74)
English 3						
Quarter 1	28	86.25 (9.61)	19	84.16 (10.74)	47	85.40 (10.02)
Quarter 2	26	86.12 (8.73)	19	83.53 (10.43)	45	85.02 (9.46)

Table 5. Descriptive Statistics for Science Grades.

Course	General Education		Special Education		Total Sample	
	<i>n</i>	<i>M % (SD)</i>	<i>n</i>	<i>M % (SD)</i>	<i>n</i>	<i>M % (SD)</i>
Sixth Grade Science						
Quarter 1	155	93.10 (7.68)	72	87.15 (9.81)	227	91.21 (8.84)
Quarter 2	155	90.34 (10.06)	72	85.07 (12.14)	227	88.67 (11.02)
Quarter 3	155	91.00 (9.73)	72	84.69 (12.01)	227	89.00 (10.89)
Quarter 4	155	90.54 (10.83)	72	85.56 (12.37)	227	88.96 (11.55)
Seventh Grade Science						
Quarter 1	166	84.54 (11.97)	75	76.35 (16.36)	241	81.99 (13.98)
Quarter 2	166	82.20 (15.06)	75	71.31 (21.55)	241	78.81 (18.02)
Quarter 3	99	81.70 (13.74)	54	72.57 (19.94)	153	78.48 (16.72)
Quarter 4	98	80.67 (14.37)	52	71.54 (16.22)	150	77.51 (15.61)
Eighth Grade Science						
Quarter 1	111	85.89 (10.91)	58	78.53 (16.22)	169	83.37 (12.07)
Quarter 2	110	81.41 (14.85)	58	75.78 (12.41)	168	79.46 (14.27)
Quarter 3	71	81.30 (12.96)	41	74.73 (12.07)	112	78.89 (12.98)
Quarter 4	71	81.89 (13.49)	41	74.76 (13.65)	112	79.28 (13.92)
Biology						
Quarter 1	75	85.97 (7.08)	34	83.91 (8.69)	109	85.33 (7.64)
Quarter 2	68	87.06 (10.21)	34	85.15 (10.14)	102	86.42 (10.18)

Table 6. Descriptive Statistics for EOG and EOC Scaled Scores.

Course	General Education		Special Education		Total Sample	
	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>
EOG Reading						
Sixth Grade	160	456.74 (8.38)	71	440.83 (17.85)	231	451.85 (14.13)
Seventh Grade	98	460.59 (10.31)	48	447.83 (11.39)	146	456.40 (12.22)
Eighth Grade	71	455.34 (35.07)	40	440.88 (35.41)	111	450.13 (35.72)
EOG Math						
Sixth Grade	161	451.93 (7.23)	71	438.21 (22.14)	232	447.73 (15.00)
Seventh Grade	98	453.76 (7.62)	48	441.85 (7.60)	146	449.84 (9.43)
Eighth Grade	64	444.66 (34.70)	40	439.98 (5.67)	104	442.86 (27.46)
EOG Science						
Grade 8	71	257.07 (7.91)	35	242.43 (8.67)	106	252.24 (10.67)

Table 7. Linear Growth Curves of Student Grades by Disability Associated Variables.

Outcome	Variable	Intercept Coefficients	Standard Error	Time Coefficients	Standard Error
Reading	SE Model	85.43***	0.90	-0.48	0.35
	AIG	6.97***	1.97	-0.39	0.77
	LD	-6.47	4.36	1.02	1.68
	OHI	-2.55	4.34	-0.23	1.68
	AU	-2.09	4.23	0.60	1.62
	ID	2.77	5.39	-0.93	2.12
	CA	6.26	2.72	-4.10***	1.07
	Accommodations	-8.24*	4.12	4.32**	1.56
	Diagnoses Model	86.76***	0.75	-0.47	0.25
	ADHD	-2.63	2.11	0.69	0.72
	Anxiety Disorders	4.23	2.32	-2.36**	0.79
	DSM Autism	-0.77	2.32	1.26	0.80
	SLD	-2.40	2.23	0.02	0.75
	Accommodations	-6.63***	2.01	1.39*	0.68
Math	SE Model	84.77***	0.80	-1.41***	0.31
	AIG	6.02***	1.75	0.55	0.69
	LD	-8.56*	3.88	-0.78	1.52
	OHI	-7.03	3.86	-0.59	1.52
	AU	-0.43	3.76	-2.28	1.47
	ID	2.29	4.81	-2.49	1.96
	CA	3.88	2.47	-2.43*	0.98
	Accommodations	-4.27	3.66	4.38**	1.41
	Diagnoses Model	85.96***	0.75	-1.24***	0.24
	ADHD	-2.47	2.14	-0.37	0.70
	Anxiety Disorders	1.00	2.36	0.06	0.77
	DSM Autism	2.95	2.36	-0.80	0.80
	SLD	-2.32	2.27	-0.56	0.73
	Accommodations	-6.63***	2.05	1.85**	0.66
Science	SE Model	90.93***	0.82	-2.59***	0.30
	AIG	4.40***	1.79	0.63	0.66
	LD	1.58	4.00	-4.30**	1.46
	OHI	0.39	3.95	-2.86	1.47
	AU	3.22	3.87	-1.98	1.42
	ID	-3.04	5.08	3.31	1.98
	CA	-0.89	2.50	-0.98	-1.02
	Accommodations	-3.29	3.74	2.30	1.32

Table 7 (continued).

Outcome	Variable	Intercept Coefficients	Standard Error	Time Coefficients	Standard Error
Science	Diagnoses Model	91.80***	0.82	-2.35***	0.28
	ADHD	-2.00	2.35	-0.75	0.82
	Anxiety Disorders	0.78	2.58	-0.11	0.89
	DSM Autism	1.55	2.57	0.69	0.96
	SLD	-1.79	2.49	-2.25**	0.85
	Accommodations	-2.56	2.22	-0.17	0.77

*Note.* SE = special education; AIG = Academically/Intellectually gifted; LD = learning disability category; OHI = other health impairment category; AU = autism category; ID = intellectual disability category; CA = curriculum assistance category; SLD = specific learning disorder. \* Indicates significance at the .05 level. \*\* Indicates significance at the .01 level. \*\*\* indicates significance at the .001 level.

Table 8. Repeated Measures Hierarchical Model of Students' EOG Score by Disability Associated Variables.

Outcome	Variable	Intercept Coefficients	Standard Error
Reading	SE Model	456.89***	1.10
	AIG	3.11	2.39
	LD	-1.37	5.32
	OHI	-1.17	5.52
	AU	2.72	5.21
	ID	-14.87	7.79
	CA	-1.71	3.60
	Accommodations	-10.06*	4.90
	Diagnoses Model	457.81***	0.99
	ADHD	-0.32	2.93
	Anxiety Disorders	-6.80*	3.22
	DSM Autism	4.56	3.51
	SLD	-3.23	2.98
	Accommodations	-11.90***	2.83

Table 8 (continued).

Outcome	Variable	Intercept Coefficients	Standard Error
Math	SE Model	449.61***	1.08
	AIG	6.56**	2.37
	LD	-4.65*	5.20
	OHI	-7.30	5.39
	AU	-0.89	5.09
	ID	-11.18	7.67
	CA	-0.26	3.52
	Accommodations	-4.02	4.81
	Diagnoses Model	451.34***	0.96
	ADHD	-0.93	2.82
	Anxiety Disorders	-10.42***	2.82
	DSM Autism	5.89	3.39
	SLD	-3.90	2.85
	Accommodations	-8.69**	2.75
Science	SE Model	253.03***	2.62
	AIG	7.92	5.74
	LD	4.20	14.80
	OHI	2.18	16.17
	AU	3.07	14.56
	ID	-4.84	22.54
	CA	7.65	7.97
	Accommodations	-16.69	15.50
	Diagnoses Model	254.54***	2.68
	ADHD	-2.56	7.96
	Anxiety Disorders	3.60	8.85
	DSM Autism	1.19	7.53
	SLD	3.96	7.63
	Accommodations	-12.81	7.48

*Note.* SE = special education; AIG = Academically/Intellectually gifted; LD = learning disability category; OHI = other health impairment category; AU = autism category; ID = intellectual disability category; CA = curriculum assistance category; SLD = specific learning disorder. \* Indicates significance at the .05 level. \*\* Indicates significance at the .01 level. \*\*\* indicates significance at the .001 level.

Table 9. Principal Components Analysis for Accommodations.

Accommodation	Components								
	1	2	3	4	5	6	7	8	9
Separate setting	.715*	.471	.033	.002	-.003	.118	.244	.018	.111
Mark in book	.751*	.354	-.077	.026	.130	.011	.292	-.004	.059
Extended time	.745*	.360	.062	.017	.105	.061	.208	.127	.140
Copies of notes	.615*	.461	.082	.114	-.011	.174	.082	.203	-.018
Preferential seating	.791*	.050	.119	.138	.127	.098	-.018	.042	.124
Modified tests	.299	.796*	.126	.070	-.018	.007	-.080	.045	.061
Modified classwork	.188	.924*	.113	.037	-.008	.043	-.031	-.014	.080
Modified homework	.181	.918*	.117	.040	-.007	.045	-.029	-.012	.079
Read aloud	.653*	.180	-.026	-.044	-.069	.138	-.047	-.099	-.193
Pencil and paper testing	.777*	-.006	-.014	.050	-.076	-.154	-.061	-.143	-.132
Graphic organizer	.560*	-.173	.039	.008	-.056	.242	.327	.346	.061
Breaks during tests	.077	.521*	-.105	-.098	.018	.075	.203	-.134	-.367
Word bank	.273	-.035	-.006	-.035	-.035	.333	.541*	-.049	.149
Study guides	.493*	.095	.022	.001	-.019	-.082	-.379	.347	-.284
Teacher rubrics	.090	.049	-.013	.059	.008	-.165	.790*	.054	-.188
Dictate to scribe	.144	.045	-.012	.717*	-.003	.022	.228	.015	-.081
Red card	.006	.136	-.026	.417	.560	-.089	.118	.074	-.080
Test checklist	.179	-.047	.004	.052	-.015	.793*	-.011	.045	.057
Break down assessments	-.017	.238	-.039	-.040	.003	.784*	.009	-.043	-.176
Visual reminders for homework	-.026	.047	-.010	.722*	-.004	-.019	-.052	-.047	-.004
Word processor	-.019	.086	-.004	.813*	.019	.017	-.032	.023	.048
Check for understanding	.077	-.112	.007	.711*	.020	.012	-.067	-.018	.032
Proof reading checklist	.017	-.011	-.015	-.031	.000	-.005	.008	.924*	.003
Teacher praise	.005	.120	-.043	-.025	-.013	-.058	-.033	-.022	.794*
Allow typed assignments	.137	.099	.837*	-.018	-.016	-.036	-.087	.035	-.056
Pair directions	.033	-.046	.004	-.047	.972*	.015	-.038	-.025	.015
Grouping	.033	-.046	.004	-.047	.972*	.015	-.038	-.025	.015
Enlarge	-.019	.076	.969*	-.005	.004	.003	.034	-.020	.016
Portable device	-.019	.076	.969*	-.005	.004	.003	.034	-.020	.016

Note. \* indicates accommodations within each component.

Table 10. Multiple Regression for Accommodations which Significantly Predict State Test Scores.

<b>Accommodation</b>	<i>B</i>	<i>SE B</i>	Beta	<i>T</i>	<i>p</i>
6 <sup>th</sup> Grade reading C1					
Constant	456.63	0.86	-	533.96	<.001
Copies of notes	-9.78	2.46	-.275	-3.98	<.001
Extended time	-10.09	2.24	-.301	-4.51	<.001
Study guide	-13.06	3.94	-.189	-3.32	.001
6 <sup>th</sup> Grade Math C1					
Constant	452.14	1.02	-	442.09	<.001
Separate setting	-8.06	2.74	-.2241	-2.94	.004
Graphic organizer	-8.16	3.24	-.163	-2.52	.012
Copies of notes	-7.11	2.97	-.188	-2.40	.017
8 <sup>th</sup> Grade Science C1					
Constant	256.41	0.96	-	266.97	<.001
Extended time	-14.74	1.81	-.625	-8.17	<.001
6 <sup>th</sup> Grade reading C2					
Constant	453.67	0.93	-	488.73	<.001
Modified classwork	-12.54	3.34	-.261	-3.75	<.001
Break in testing	-7.86	3.66	-.149	-2.15	.033
6 <sup>th</sup> Grade Math C2					
Constant	448.85	1.01	-	444.84	<.001
Modified classwork	-11.81	3.28	-.231	-3.60	<.001
8 <sup>th</sup> Grade Science C2					
Constant	253.91	0.93	-	272.26	<.001
Modified tests	-19.69	3.20	-.516	-6.15	<.001
8 <sup>th</sup> Grade Science C3					
Constant	252.45	1.03	-	246.36	<.001
Typed assignments	-22.45	10.55	-.204	-2.13	.036
6 <sup>th</sup> Grade reading C7					
Constant	453.10	0.89	-	511.79	<.001
Word bank	-21.74	4.86	-.282	-4.47	<.001
Teacher rubrics	-16.46	5.19	-.200	-3.17	.002
6 <sup>th</sup> Grade Math C7					
Constant	449.47	0.88	-	510.96	<.001
Word bank	-27.28	4.84	-.333	-5.64	<.001
Teacher rubrics	-26.24	5.16	-.300	-5.08	<.001
8 <sup>th</sup> Grade Science C7					
Constant	253.14	1.00	-	253.67	<.001
Word bank	-12.68	4.80	-.253	-2.64	.009
Teacher rubrics	-16.30	7.48	-.209	-2.18	.031

*Note.* C1 = Component 1; C2 = Component 2; C3 = Component 3; C7 = Component 7.

## FIGURES

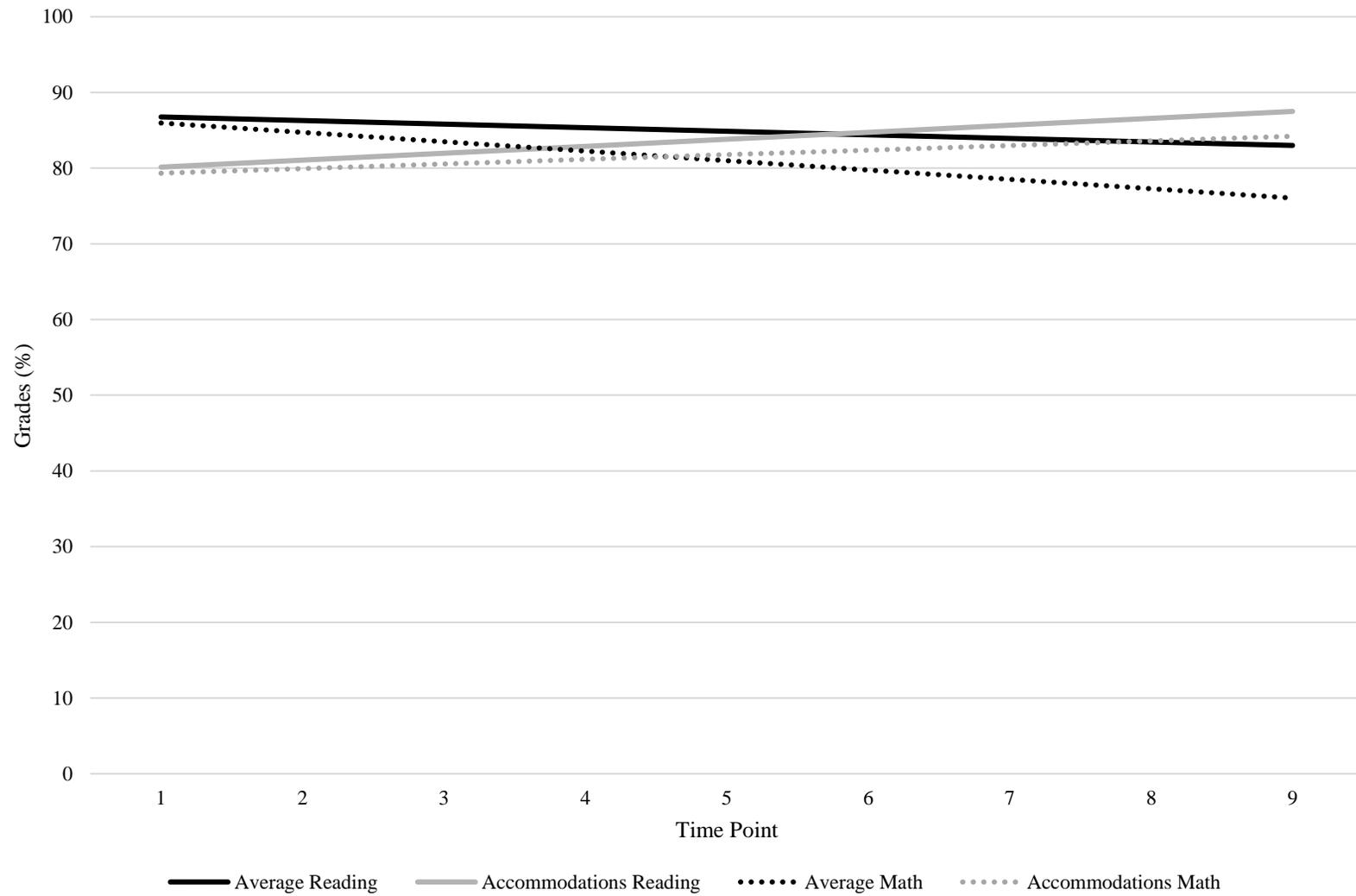


Figure 1. Final estimation of fixed effects for mental health diagnoses model of math and reading growth over time.

**APPENDICES**

## Appendix A

### Services and Accommodations used for Children with Disabilities.

<b>Common Services</b>	<b>Common Accommodations</b>
Speech Language Therapy	Tutors or aids
Audiology Services	Extended time on tests
Psychological Services	Alternative assignments
Physical Therapy	Modified grading
Occupational Therapy	Slower-paced instruction
Therapeutic Recreation	Shorter assignments
Counseling Services	Frequent feedback
Medical Services	Read-aloud for tests
School Health Services	Interpreter for tests
Social Work Services	Peer tutor
Parent Counseling and Training	Behavior Management

*Notes.* The above table is a list of services and accommodations modified from Aron and Loprest (2012).

## Appendix B

### Services and Accommodations used for Children with Anxiety in Schools.

<b>Service or Accommodation</b>	<b>Prevalence of Use</b>
Use of at least one accommodation or service	58-66%
Permission to leave class	32-37%
Extended time on tests	30-32%
Individual or group counseling	22-42%
Safe place to go to when upset	22-40%
A lunch group	20-30%
Extended time on assignments	25%
Small group help with schoolwork	18-22%
Special “signals” to communicate with the teacher	16-18%
A one-on-one aide	6-17%
Planned “rehearsal” of answers to questions	9-16%
A “study buddy” or peer helper	15%
Special consequences for behavior problems	6-9%

*Notes.* The above table is a list of services and accommodations modified from Green and colleagues (2017).

### Appendix C

Services and Accommodations used for Children with Autism Spectrum Disorder.

<b>Service or Accommodation</b>	<b>Prevalence of Use</b>
Speech-language therapy	66-85%
Occupational therapy	23-65%
Special transportation	28-54%
Adaptive physical education	17-50%
Behavior management	34-46%
Case management	39-44%
Learning strategies/study skills	21-44%
Communication services	17-38%
Assistive technology	18-30%
Training, counseling, or services to the family	12-30%
Special computer software	12-24%
Social work	6-22%
Tutoring by special education teachers	9-21%
Mental health services	5-21%

*Notes.* The above table is a list of services and accommodations modified from Wei and colleagues (2014).

## Appendix D

### Services and Accommodations used for Children with Emotional Disturbance.

<b>Service or Accommodation</b>	<b>Prevalence of Use</b>
Extended time on tests	72-75%
Behavior support plan	47-73%
More time for assignments	54-67%
Slower-paced instruction	19-51%
Modified assignments	20-47%
Modified tests	24-46%
Read aloud for tests	28-45%
Mental health services	38-43%
Modified grading	14-37%
Learning strategies/Study skills	27-36%
Case management/service coordination	28-33%
Social work	19-22%
Family support services	8-18%
Peer tutoring	8-17%
Adult tutoring	7-15%

*Notes.* The above table is a list of services and accommodations modified from Wagner and colleagues (2006).

## **Appendix E**

### **Recommended Accommodations for Anxiety and Depression.**

Bryant and Strabavy (2012) recommend the use of 504 Plans for individuals with mental health diagnoses such as anxiety and depression to address concerns related to academic performance. More specifically, the authors suggest using preferred seating, a break from the class when needed to cool down, reductions in assignments, and a plan for transitions into school as accommodations for students with an anxiety diagnosis. The authors also suggest using copies of teacher notes, pairing the student with a study partner, extended time, and testing in a separate setting as accommodations for students with a depression diagnosis.