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The relationship between demographic variables and behavioral challenges in early elementary school reading achievement

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BOSTON UNIVERSITY
WHEELOCK COLLEGE OF EDUCATION & HUMAN DEVELOPMENT

Dissertation

**THE RELATIONSHIP BETWEEN DEMOGRAPHIC VARIABLES
AND BEHAVIORAL CHALLENGES IN EARLY ELEMENTARY
SCHOOL READING ACHIEVEMENT**

by

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“Era todavía demasiado joven para saber que la memoria del corazón elimina los malos recuerdos y magnifica los buenos, y que gracias a ese artificio logramos sobrellevar el pasado.”

– Gabriel García Márquez

DEDICATION

Este texto está dedicado a mi mamá y mi papá, quienes con su amor y sacrificio me dieron alas para volar.

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ABSTRACT

Socioemotional factors may greatly contribute to the way a child learns and interacts with their environment. Early elementary school has proven to be a significant period of development for foundational reading skills. For children of color, specifically Latino students, there are few studies that examine the relationship between sociodemographic variables such as ethnicity and gender, with challenging behaviors such as inattention and hyperactivity. This interaction is evaluated using multivariate analysis of variance (MANOVA) in order to gauge the impact on reading achievement. Additionally, these relationships are explored with a cohort of Latino students (n=89) to determine whether Latino children are adequately rated for the presentation of inattentive and or hyperactive behaviors. This study then explores these interactions further with a diverse cohort of Latino, Black, Asian, and White students (n=274) and aims to discuss the implications for educational outcomes and development. Of particular interest, is the exploration of the achievement gap between children of different backgrounds as early elementary school may provide a critical window of intervention.

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LIST OF ABBREVIATIONS

ADHD	Attention Deficit Hyperactivity Disorder
CD	Conduct Disorder
CDC	Center for Disease Control
COM	ADHD Combined Type
HI	Hyperactivity-Impulsivity
INA	Inattention
NCES	National Center for Educational Statistics
ODD	Oppositional Defiant Disorder
SWAN	The Strengths and Weakness of ADHD-Symptoms and Normal-Behavior
TOWRE	The Test of Word Reading Efficiency
WJBR	Woodcock Johnson Basic Reading
WJPC	Woodcock Johnson Passage Comprehension

CHAPTER ONE

Introduction

The achievement gap in the United States continues to perpetuate disparities in education. For decades, researchers, policy makers, and clinicians in education related fields have referenced an achievement gap as the primary reason for variation in academic achievement, attainment, and success between different group demographics i.e., race, ethnicity, gender, or socioeconomic status. While some variation exists in how this term has been applied in educational settings and policy, in general, it has been defined as a disparity in academic performance between two groups, typically determined by the use of standardized testing (NCES, 2020). Recently there has been an effort to address the disparities in access typically characterized by the achievement gap with an alternate term reflecting the systemic inequalities many children of color face in education, this term is opportunity gap. While similar to the achievement gap, opportunity gap places the onus on the systemic differences in resources, rather than individual achievement, that may affect children of color in schools. Regardless of the terminology used, disparities in access, achievement, and identification exist.

A commonly overlooked yet significant aspect in a child's educational experience is their social and emotional well-being, specifically their mental health needs. Extant research has shown that social and emotional health in school may affect academic achievement both proximally and distally (Darney, Reinke, Herman, Stormont, & Ialongo, 2013; Grills-Taquechel, Fletcher, Vaughn, Denton, & Taylor, 2013; Hardaway, Larkby, & Cornelius, 2014; Porche, Costello, & Rosen-Reynoso, 2016). Additionally,

many schools serve as an initial gateway for identification of mental health needs, thus relying on teachers to be able to distinguish between behavioral challenges, special education needs, and mental health needs. Differences between these behavioral classifications are typically nuanced and require significant developmental and clinical training that teachers do not receive. Difficulty recognizing mental health or behavioral disorders in the classroom may lead to additional challenges for both teachers and students that may further perpetuate disparities in achievement. For example, children with higher rates of externalizing and internalizing behaviors have lower grades, poorer relationships with peers and teachers, and higher dropout rates (Grills-Taquechel et al., 2013; Porche et al., 2016).

Previous research has established the influence of classroom based behavioral difficulties, such as hyperactivity and inattention associated with Attention Deficit Hyperactive Disorder (ADHD), on children's achievement and test performance (e.g., Massetti et al., 2007; Merrell & Tymms, 2001; Rabiner & Coie, 2000; Tannock & Brown, 2009). Preliminary research has also revealed that internalizing difficulties, such as inattention, may predict poorer achievement outcomes for youth (Grills-Taquechel et al., 2013). Many times, these classroom-based behaviors are subjectively evaluated by the child's teacher and require detection of subtle nuances in behavior or attention, thus affecting the referral that they make for the child's needs. This may lead to disparities in identification of these disorders. Moreover, at times, nonidentification or misidentification of these mental health related challenges may result in disciplinary consequences for children who may need additional or different supports or treatment

(Darensbourg, Paris, & Blake, 2010). These behavioral difficulties may also affect their relationships with their peers and teachers (Miller-Lewis, Sawyer, Searle, Mittinty, Sawyer & Lynch, 2014), for example, disruptive behaviors in the classroom may be interpreted as disrespect or defiance. This may then create a negative interactional cycle in the classroom that may ultimately affect academic achievement, as these patterns may persist throughout the year and interfere with learning (Hamre & Pianta 2001, Hamre & Pianta, 2005).

Variations in ratings of inattention or hyperactivity by students' demographic characteristics may also be a concern in perpetuating gaps in achievement, as previous research has shown that teachers may show negative bias towards youth who are rated as more hyperactive or inattentive (DuPaul et al., 1997; Lawson, Nissley-Tsiopinis, Nahmias, McConaughy, & Eiraldi, 2017). Specifically, for children of color in schools, under-identification or misidentification of mental health needs may further the achievement gap between themselves and peers, as early as Kindergarten (Morgan, Staff, Hillemeier, Farkas, & Maczuga, 2014). Additional research is necessary in order to establish best practices for providing equitable educational opportunities and access to mental health care, as well as to understand why these gaps persist.

Similar disparities exist within the mental health system. These disparities may present as inaccessible treatment, inaccurate diagnostic criteria, and or difficulty recognizing symptoms in diverse populations. While there are long-term negative outcomes associated with poor academic achievement in elementary school for all students (e.g., low school engagement, higher school dropout rates, and increased mental

health concerns) (Darney et al. 2013; Hardaway et al. 2014), the need for further investigation when factoring in the vast discrepancies in achievement, social and emotional functioning, and behavioral referrals specifically for Latino youth, is critical, as there is a large gap in the understanding of these variables and their relationship with achievement. Although Latino children comprise more than a quarter of the population in United States' public schools and are projected to comprise a third of the public-school population in the United States by 2030 (NCES, 2020), little research exists exploring variables specifically related to academic achievement for this population of youth. Preliminary research shows that Latino children experience similar or higher rates of mental health problems as compared to non-Latino children in the United States (CDC, 2020), and at times this may affect academic performance (DuPaul & Stoner, 2014). Due to a variety of systemic and funding issues within educational policy in the past 20 years, as well as conflicting streams of research, Latino children and children of color have been found to be both underrepresented and overrepresented in special education services (Morgan et al., 2016).

This study aims to explore these relationships while considering the persistent achievement gap. Particularly, this study will explore one possible explanation for this gap that has not been extensively explored, behavioral challenges associated with Attention Deficit Hyperactivity Disorder. It is critical to understand the relationship between these variables as developmentally, the older a child gets, the more they need to make use of executive functioning skills. Therefore, helping a child develop strategies for managing their ADHD symptoms at a young age may support them to achieve as well as

minimize the adverse effects of ADHD symptoms. Altogether, early elementary school may serve as a catalyst for developmental intervention in order to improve the trajectory of students before the achievement gap widens.

Racial and Ethnic Makeup of the Achievement Gap

The achievement gap is a collection of decades of research on the gaps in education achievement between students of color, most typically Black and Latino students, and their White counterparts. Originally, Coleman's (1965) results attributed the gap between Black and White students to differences in family values and upbringing. These original conclusions, shaped education policy for years, moving the focus from schools, curriculum, and resources to placing a greater emphasis on individual merit. The remnants of these policies can continue to be seen through systemic lack of resources in schools, as well as inequities in high school graduation rates, college attainment, and course selection. Although steady progress has been made in subjects such as mathematics and reading, gaps based on demographics such as gender, ethnicity, and race continue to persist.

It should be noted that although the achievement gap for students of color students and their White counterparts has been well-established, emerging research by critical race scholars has identified issues in the use of the term "achievement gap" and the pressure it places on individual differences attributed to race. Emerging research suggests that while gaps in achievement exist between racial and ethnic groups, these gaps can be attributed to education policy that has not taken into account racism as perpetuated by lack of access, lack of understanding, and lack of anti-racist curriculum

(Quinn, Desruisseaux, & Nkansah-Amankra, 2019) rather than individual merit.

Furthermore, it has been suggested that perpetuating the concept of an achievement gap with the inference that it is solely due to merit, may increase stereotypes regarding children of color's performance and ability (Quinn, et al., 2019). Similarly, research has suggested that the language used regarding achievement and disparities in education, can influence teacher perceptions of students (Quinn, et al., 2019).

Despite differing philosophies regarding the achievement gap, it is clear that there are disparities in academic achievement among children of color and their White counterparts, despite improvements made to increase resources in schools that primarily serve Latino and Black students. A review of statistical data from the National Center for Education Statistics (2017) showed that by the 4th grade 50% of Black students and 46% of Latino students were below basic proficiency in reading, compared to only 22% of White students. In terms of advanced proficiency in reading, only 16% of Black students and 18% of Latino students showed advanced proficiency, while 34% of their White counterparts show advanced proficiency.

Students of color are also less likely to be considered proficient in reading and score lower on standardized tests when compared to White students (National Center for Education Statistics, 2020). While there are a number of explanations offered for the achievement gap among students of color, there does not appear to be a consensus as to why the achievement gap persists despite efforts to improve educational outcomes. However, since poor achievement in elementary school can lead to a greater likelihood of disengagement, risky behaviors, and dropout in adolescence (Hardaway et al. 2014), it is

critical to understand the association between social and emotional difficulties and their possible effects on academic achievement.

Gender, Ethnicity, Behavior, and Achievement. While the role of ethnicity in the achievement gap has been established, there are mixed results for the role of gender in regard to achievement, with boys being ahead of girls in certain subjects, and girls being ahead of boys in others. While some have attributed the achievement gap between males and females to innate biological factors in the way students learn (Cox, 2006), others have suggested environmental factors such as teachers' gendered responses to students as a possible explanation, suggesting that school is more geared towards female learning. Some suggest that this may dissuade boys from pursuing certain subjects such as reading (Cox, 2006). Others have identified these discrepancies through evaluation, for instance, teachers may rate male achievement (grades) as less than female achievement, even when there is no difference on standardized scores (Cornwell, Mustard, and Van Parys, 2013).

Some have suggested disciplinary consequences for behavioral challenges as one possible reason for the achievement gap, showing a complex relationship between gender, ethnicity, behavior, and achievement. This research has suggested that regardless of ethnicity, males are disproportionately disciplined for hyperactive behaviors, while others suggest that current literature has failed to address the racial and ethnic variances in these data. Promising research has identified a disparity between Black girls and their White counterparts (male and female) (Columbia Law School Center for Intersectionality and Social Policy Studies, 2015) as data from across the United States, suggest that Black girls are twice as likely to be suspended from school than White females and males, and

girls of color (including Latina) are five times more likely to be suspended (National Women's Law Center, 2017) than their White counterparts, limiting their time in the classroom, thus limiting their time learning. Additionally, later in schooling, this effect may be more prominent, as Black and Latina females are more likely to drop of school than White females and males (National Center for Education Statistics, 2016).

Furthermore, gender and ethnicity alone may not be significant variables affecting achievement when considering a student's intersectional identities such as ethnicity and socioeconomic status (Else-Quest, Mineo, & Concetta, 2013; Curran & Kellogg, 2016; Reardon, Fahle, Kalogrides, Podolsky, & Zárate, 2018) suggesting the intersection of additional variable to continue to explain the gap in achievement. For instance, in a systematic study of gender achievement gaps in U.S. school districts, Reardon and colleagues (2018) identified that gender achievement gaps only existed in school districts with a high percentage of underrepresented students (ethnicity and socioeconomic status). Results indicated that math and ELA gender achievement gaps vary among school districts with some districts favoring males, while some favor females.

Others have suggested that students of color are especially at risk for gaps in achievement when considering their gender, ethnicity, and possible behavioral challenges as well (Cornwell, Mustard, and Van Parys, 2013; Duncan & Magnusson, 2011). Duncan and Magnusson (2011) found racial interactions with achievement and behavior. Using a Kindergarten cohort followed until 5th grade, they identified significant attention and engagement gaps between Latino students and their White peers. Although these gaps did not persist until 5th grade, the gap in academic achievement in both Math and Reading

between Latino students and White students persisted. They additionally found significant differences when accounting for socioeconomic status, suggesting that school resources and setting are a significant factor in perpetuating the achievement gap between students.

Similarly, in a longitudinal study examining the interaction between gender, race, and achievement, Cornwell and colleagues (2013) found that despite similar achievement as evidenced by standardized testing in Kindergarten, grade distribution significantly favored females of all races over males. The study concluded that although boys achieved at similar rates to their female peers on math, reading, and science measures, this achievement was not reflected when teachers assigned their grades, with males of all races receiving lower scores than their testing reflected. However, this effect was lost when combined with teacher ratings of noncognitive skills such as engagement, self-regulation, problem solving, and interpersonal skills. When this component was added to the analysis, results indicated that White students of both genders outperformed both Latino and Black students significantly. Cornwell and colleagues (2013) attributed these results to possible cultural expectations that teachers may have for students. A significant result of this study is the idea that noncognitive skill interaction with gender and race, when rated by teachers, may affect achievement. For many students with ADHD symptoms, these are areas of difficulty for classroom functioning.

Gender also proved to influence behavioral ratings, as teachers may report boys as exhibiting more hyperactive and impulsive behaviors than girls (DuPaul, Power, Anastopoulos, Reid, McGoey, & Ikeda, 1997). This finding is consistent with extant

ADHD literature and prevalence rates that consistently show that males are both more likely to be referred and to be diagnosed with ADHD despite females having poorer educational outcomes when not identified earlier with ADHD (Ramtekkar, Reiersen, Todorov, & Todd; 2010).

Teachers, Demographics, Behavior, and the Achievement Gap

While the gap in achievement has been explored with the basis of ethnicity, race, and gender, few studies have explored the possibility of demographics and perceived behavioral challenges and their combined contribution to the gap in achievement. Behavioral challenges alone, may contribute to difficulties in school and may be a typically unexplored explanation for the continued gaps in achievement between students of color and White students. When examining this possible reason for the achievement gap, it is imperative to remember that typically, evaluation of student behaviors in school settings often occurs via teacher observation. This compounds the critical role that teachers play not only as educators, but as behavioral evaluators. For many students, teachers are the first observers of challenging behaviors that may need additional services. This relationship between teacher ratings, evaluation, and achievement, is often complex, as additional demographic variables such as teacher identity or possible biases, or student identity, may contribute to the way a teacher views problematic behavior in the classroom.

Teacher observations when combined with demographic variables, such as culture, ethnicity, gender, or behavioral ratings have been found to be predictive of negative distal outcomes such as lower achievement (Clemans, Musci, Leoutsakos, &

Ialongo, 2014). Though some studies have identified other informant streams as more predictive of future achievement (Clemans et al., 2014), teacher ratings of behavior have served as the primary informant for many studies exploring the relationship between demographics, ratings of behavior, and achievement (DuPaul, Power, Anastopoulos, Reid, McGoey, & Ikeda, 1997; Eisensmith & Kaine, 2019; Rabiner & Coie, 2000; Rabiner et al., 2004).

Demographics, Behavior, and the Achievement Gap

One such study by DuPaul and colleagues' (1997) has been used as a model to test for interactions between teacher perceptions of social and emotional behaviors and gender, socioeconomic status, or ethnicity. Although the initial study (1997) found variance in teacher ratings of hyperactivity and inattention when moderated by ethnicity, Black (18.3%) and Latino students (5.4%) were somewhat underrepresented in the sample of children (4–19 years old, grades K–12). The analyses confirmed DuPaul and colleagues' (1997) hypothesis that demographic variables would be more predictive of higher ratings of ADHD related behaviors. Specifically, results found that Black children were rated significantly more hyperactive and inattentive than White children. These ratings were consistent throughout the various age points in the study. Latino students were only rated more hyperactive and inattentive during the adolescent time period (14–18). This finding was unusual given that ratings of hyperactivity and inattention appeared to decrease as children in the study got older.

Additionally, DuPaul and colleagues' (1997) results suggest that teachers' ratings of hyperactive behaviors decline throughout a student's schooling, suggesting the need

for more research as to the effects of these ratings in early elementary school. A similar study conducted with data drawn from the Early Childhood Longitudinal Study-Kindergarten Cohort of 2011, using a nationally representative sample of about 20,000 first graders (Eisensmith & Kaine, 2019), found statically significant higher ratings of attention difficulties among Black and Latino students when rated by their teachers. This study additionally found that students with higher ratings of attention difficulties, had significant differences in reading achievement by the end of their 2nd grade year, with Black and Latino students scoring significantly lower on reading assessments than their White peers (Eisensmith & Kaine, 2019). This effect was not seen for White students who showed attention difficulties, suggesting a possible relationship between ethnicity, ratings of behavioral challenges, and reading achievement. While identifying a relationship between demographics, attention, and achievement, this study did not use a validated measure of attention, instead relying on broad interpretations of attention through five questions.

Similarly, Hosterman and colleagues (2005) determined that teachers were more likely to rate Latino and Black students as having symptoms of ADHD, however, this study was cautious not to attribute these higher ratings to biases on the part of teachers. Instead, they suggested that students were in fact displaying significantly higher levels of ADHD symptoms. Despite studies and national samples in which students show higher levels of mental health needs, national data still suggests lower levels of identification, diagnosis, and treatment, that is disproportionate (CDC, 2020), suggesting that although students are displaying levels of need in the classroom, these students may not

necessarily receive appropriate treatment.

Culture and Ethnicity. Some studies have accounted for teacher's perception of culture as a significant factor when rating hyperactivity or inattention (de Ramirez & Shapiro, 2005). When evaluating 410 teachers, de Ramirez & Shapiro (2005) found that teacher ethnicity was significantly different in ratings of behavior between Latino and White students. Latino teachers were more likely to rate Latino students higher on inattentive and hyperactive scales than White teachers, this effect was not found for White students when teachers were identified as either ethnicity. The evaluators in this study suggested that different levels of acculturation or different values within Latino culture might contribute to this variance (de Ramirez & Shapiro, 2005). Of note, however, is that this study was not a classroom-based study, and instead used sample video vignettes, whereas in vivo classroom interaction may provide different information as to ratings of behavior. DuPaul and colleagues found similar findings (2016) with Latino and Black teachers rating students of color on inattentive and hyperactive scales higher than White students, suggesting a possible interaction between teacher and student culture.

While findings are mixed regarding ratings for attentive and hyperactive behaviors, Latino and Black children are more likely to experience punitive disciplinary consequences for behavioral challenges in the classroom. Children of color displaying aggression in association to behavioral or emotional functioning are less likely to receive positive feedback or redirection from their teachers, and instead are more likely to confront harsh disciplinary practices which may lead to lower school engagement later in

their academic careers and a greater likelihood of dropping out of school (Raver & Knitzer, 2002). Furthermore, these behaviors may affect the amount of time spent in school, as the national rate of students of color suspended and expelled between 2000 and 2016 has risen dramatically (National Survey of Children's Health, 2016). Similar to findings regarding inattention and hyperactivity, studies specifically addressing disciplinary practices with Latinos are mixed. Again, these inconsistencies may be a result of the variance within the Latino population. In general, national samples (NCES, 2019) and several studies have concluded significant overrepresentation of Latinos in punitive forms of discipline such as removal from the classroom (Gregory, Skiba, & Noguera, 2010; Skiba, Michael, Nardo, & Peterson, 2002). Age however has shown to help mediate this interaction, as some studies have found that younger Latino children, such as those in preschool and Kindergarten do not experience statistically significant overrepresentation in punitive disciplinary practices (Gopalan & Nelson, 2019; Skiba, et al., 2019).

Building upon the previously discussed DuPaul and colleagues' (1997) model, Rabiner, Murray, Schmid, and Malone (2004) investigated the relationship between academic achievement, socioemotional behavior, and ethnicity. The study attempted to explain the achievement gap by expanding upon DuPaul's (1997) model to include inattentive classroom behavior, oppositional behavior, hyperactivity, and anxiety using a sample of White, African American, and Latino first graders. Rabiner and colleagues' (2004) sample of children included 621 first grade students from eight different public elementary schools. Unlike DuPaul and colleagues' (1997) sample, Rabiner's (2004)

sample was diverse where almost half of the sample was Black (49.9%), with the remainder being, multiethnic/multiracial- including Asian- (6.7%), Latino (23.7%), or White (19.6%). Results showed that teachers significantly rated Latino students below both White and Black students in terms of their grade level achievement which was rated on a 5-point scale ranging from far below grade level to far above grade level. Significant variance was not found in terms of teacher ratings of Latino student's behavior with the exception of rating Latinos as "shyer". Inattention was found to be significantly predictive of poorer achievement, however this result was only moderate for Latino students in the sample. Gender, ethnicity, and behavior did not significantly interact in this study. Although the study was not able to extrapolate biases in teacher ratings, it did identify increased ratings of behavior for children of color (Rabiner, Murray, Schmid, & Malone, 2004).

Importantly, most studies conducted using demographic variables (DuPaul, Power, Anastopoulos, Reid, McGoey, & Ikeda, 1997; Rabiner et al., 2004), found that teachers were more likely to perceive attention problems in youth of color, which is concerning for young students beginning their academic life. Though often overlooked, early elementary school appears to be a transition period in which interventions can be established to prevent long-term negative achievement results. This time serves as a transition between the relaxed environment of Kindergarten and the school centric achievement driven curriculum in later elementary school. Additionally, research has identified behavioral issues in first grade as significantly correlated with negative distal outcomes, such as poor academic achievement and school dropout for both males and

females of color (Darney, Reinke, Hermant, Stormont, and Iolongo, 2013). While studies have focused on the achievement gap in terms of race and ethnicity, few have explored the possible combined effects of ethnicity, gender, and ADHD symptoms when understanding achievement in young students.

Diagnosing ADHD in Children

In order to meet criteria for a diagnosis for ADHD, an individual must meet a level of functional impairment (5th ed.; DSM–5; American Psychiatric Association, 2013) and for many children, these impairments first appear in school (DuPaul & Stoner, 2014). Current recommendations from the American Psychiatric Association based on *The Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM–5; American Psychiatric Association, 2013) state that onset of ADHD symptoms is typically towards the age of 12 (5th ed.; DSM–5; American Psychiatric Association, 2013) though, research suggests that many children display onset symptoms of inattention and or hyperactivity much earlier than that, usually around age 7 (Murray et al., 2018). Despite the recommendation of the American Psychiatric Association of early puberty as onset for ADHD symptoms, much more White children are still diagnosed by age 7 (CDC, 2020), with Black and Latino children being diagnosed much later in childhood towards the beginning of puberty (CDC, 2020).

Both clinicians and teachers alike, face similar challenges when detecting specific behavioral nuances in order to distinguish ADHD from other behavioral disorders such as trauma related behaviors or behaviors associated with educational disabilities. For clinicians specifically, distinguishing these disorders requires attention to history, social

ecology, culture, and specificity regarding symptom onset, presentation, and acuity.

Many clinicians will also use teacher ratings to assess functional impairment in school in to support a diagnosis, thus requiring teachers to have a similar understanding of how these behaviors present in the classroom. Clinicians may also observe classroom behavior to supplement this diagnosis or if they feel that teachers' behavioral ratings may be inaccurate. Therefore, in order to support a diagnosis of ADHD, both clinicians and teachers need to be able to discern the differences in child behaviors.

Hyperactivity and Inattention. In order to discern the differences in ADHD presentation, it is important to understand the different categories of ADHD. ADHD can be comprised of two major capacities of executive functioning, inattention and hyperactivity; within the diagnosis of ADHD there is also combined type with is combined inattention and hyperactivity. According to *The Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM–5; American Psychiatric Association, 2013) the symptoms of ADHD include a persistent pattern of inattention and/or hyperactivity for a prolonged period of time (>6 months). Symptoms must lead to functional impairment in in two or more settings, this may include home, school, or socially.

Inattention is commonly categorized by failing to pay close attention to details in work, leading to mistakes or careless errors (American Psychiatric Association, 2013). At times it may present as failing to hold attention for a developmentally appropriate amount of time. A child with attentive features may appear to not be listening or may not follow through with instructions. At times, this child may not have difficulty planning tasks. Avoidance is common with inattentive children, as they may avoid tasks that require

significant attention. Additionally, children with inattentive features may appear disorganized, frequently losing track of assignments or classroom materials necessary for instruction. In order to be diagnosed with ADHD- Inattentive type, a child must meet criteria for six or more symptoms (American Psychiatric Association, 2013).

Hyperactivity-impulsivity is categorized by fidgety behavior where a child may appear to be restless or have difficulty sitting still (American Psychiatric Association, 2013). This child may also be very physically active and not appear to be fearful of climbing or jumping in inappropriate locations (i.e., on desks, jungle gyms, classrooms). Sometimes this child may be described as constantly moving or will talk rapidly. In class, children with hyperactive-impulsive behaviors may have trouble waiting their turn or raising their hand to speak, many times these children may blurt answers without being called on. In order to be diagnosed with ADHD- Hyperactive-impulsive type, a child must meet criteria for six or more symptoms. Combined presentation, which is the most common type of ADHD, requires that a child meet criteria for six or more symptoms of each type (American Psychiatric Association, 2013).

Inattention in particular has been found to have a profound effect on academic functioning (Bierderman, 2004; DuPaul and Stoner, 2014; Leopold, Christopher, Olson, Petrill, & Willcutt, 2019; Pham, 2016). One such study, evaluated the relationship between what researchers defined as executive function deficits, categorized as “the ability to maintain an appropriate problem set for attainment of future goals” (Welsh & Pennington, 1989, p. 201, as cited in Bierderman, et al., 2004). Some of these skills can be defined as the ability for a child to plan, reason, manage inhibition, and maintain

attention. Although these are common deficits in children with ADHD, they are not always present or vary in acuity in different children. In order to examine their prevalence and their effect on achievement Bierderman and colleagues (2004) assessed 259 children and adolescents recruited from pediatric and psychiatric clinics. Findings determined that ADHD with significant levels of executive functioning deficits are associated with negative academic achievement, however, these findings were also present for children with ADHD not displaying significant levels of executive functioning deficits. These effects were present even when controlling for socioeconomic status, diagnosis of learning disabilities, and IQ level, which researchers extrapolated to mean that youth with significant levels of executive functioning deficits may have lower math and reading achievement skills than peers without ADHD or executive functioning deficits. This sample however was a clinical sample already experiencing higher rates of ADHD symptoms (Bierderman, et al., 2004).

Similar results regarding inattention were found in a longitudinal study of 489 children assessed prior to Kindergarten then followed throughout high school in order to determine which symptoms of ADHD lead to later functional impairment in three different areas: social, academic, and recreational (Leopold, Christopher, Olson, Petrill, & Willcutt, 2018). Parent ratings of ADHD symptoms and functional impairment were assessed at different developmental time points, most notably after Kindergarten, first, second, fourth, and ninth grades. Although parent ratings of behavior do not necessarily represent an accurate picture of classroom-based behaviors, these ratings still were associated with an increased level of functional impairment throughout the

developmental trajectory. These ratings and impairments were not found to be significantly different between genders. Results showed that all domains had an impact on different areas of functioning, for example, hyperactivity-impulsivity was found to have a significant effect on social impairment in early grades. Similarly, inattention was found have a significant effect on social impairment after first grade, second grade, and fourth grade. Hyperactive-impulsive symptoms early in evaluation (Kindergarten-second grade) were associated with an increase in recreational impairment, however this was only present in early years of evaluation. Whereas higher ratings of inattentive symptoms at any time point increased the likelihood of additional recreation impairments in the remaining evaluation points (Leopold, et al., 2018).

Inattention was the only domain which consistently predicted lower academic achievement across each development time point. Ratings of inattention and academic impairment were also found to cumulatively increase across developmental time points. Only when combined with inattention is hyperactivity significant in later academic impairment. These results indicate that although much emphasis is placed on hyperactive behaviors, likely due to the ability to easily distinguish them, inattention is extremely significant in a child's academic trajectory (Leopold, et al., 2018).

Unlike inattention, the findings regarding hyperactive behaviors and their effect on achievement are mixed. Some behaviors associated with hyperactivity, such as assertiveness by responding to questions impulsively, have been shown to be positive in the classroom (Tymms & Merrel, 2011). In their study with 4148 younger children, ages 4 to 7 ranging from preschool to first grade, researchers found that children were more

likely to be rated as inattentive, rather than hyperactive/impulsive, or combined type. This rating was attributed partially to the developmental level of the children, as hyperactivity was shown to have a positive effect on achievement. It was concluded that hyperactivity at this early schooling age, may be developmentally appropriate and may not necessarily interfere with learning. Inattention was found to negatively affect achievement (Tymms & Merrel, 2011), unlike hyperactivity, inattention may interfere with learning as children at young age would not be able to grasp early-stage curriculum without paying attention.

Prevalence of ADHD among young Latino Students. While symptoms are hard to identify in most young children, for Latino children, the extant research is mixed as to whether students are being under identified or overidentified for ADHD. Mixed findings indicate different possible effects on achievement dependent on when a child is identified as having ADHD. Findings have reflected a pattern in the age of diagnosing with most Latino children being diagnosed after age 11 (CDC, 2020). By Kindergarten, Latino children from non-English speaking households, are more likely to be underdiagnosed with ADHD as compared to their White peers, even when displaying ADHD behaviors (Morgan et al., 2013). Later in childhood, children of color are still less likely to be assessed and treated for ADHD symptoms (Morgan et al., 2013). Research indicates that not only is this population being diagnosed at a rate lower than their peers, but intervention is also delayed, leaving many children with years of unidentified symptoms that may affect their overall functioning, as well as their academic performance. However, given the impact of ADHD symptoms on achievement, understanding this

relationship may be key in understanding the persistent achievement gap between Latino students and their peers

After a study done using data from the National Health Interview Survey during 2016–2018, the Centers for Disease Control (2020) reported that when compared with Black and White students, Latinos age 3 to 17 were diagnosed with ADHD at a significantly lower rate than their peers. This National Health Interview Survey estimates the rate of ADHD among Latinos at 6.1% lower than White (12%), Black (12.8%) and Other (7.7%) individuals (CDC, 2020). Additionally, while Latino students are more likely to be diagnosed with a learning disability, rather than ADHD, despite exhibiting symptoms consistent with ADHD (Slobodin & Masalha, 2020), they were still significantly less likely than their White or Black peers to receive either diagnosis (i.e., learning disability or ADHD; CDC, 2020). Latino children living at less than 100% of the federal poverty level, were also less likely to be diagnosed with either disorder (CDC, 2020). Although these numbers might reflect difference in diagnosing, they might also reflect a disparity among the rates of diagnoses for young Latino students.

Furthermore, there is additional complexity when examining research regarding the prevalence and diagnosing of ADHD among Latino students. Many times, Latino is used as a monolith term for an incredibly diverse population with varying levels of immigration status, language, socioeconomic status, and/or acculturation. Due to this complexity, academic research varies in the terms used to define the population with the use of several terms such as Latino, Latinx, Latino/a/x, and Hispanic to name a few, with other terms specifically delineating ethnic origin within Latin America (i.e., Chicano,

Boricua, etc.). Latino is also not considered a race and is instead typically defined by scholars as an ethnicity; therefore, research may also include terms such as Black, Non-Hispanic or White Non-Hispanic, but rarely includes Hispanic/Latino mixed identities. For the purposes of this scholarly work, the term Latino will be used to encompass the complex demographics included in this study.

Other possible explanations for the discrepancies in identification of Latino children, might suggest that although Latino students may be experiencing hyperactivity and inattention in the classroom, this may not be categorized by raters as mental health needs, instead it may be interpreted as Conduct Disorder (CD) or Oppositional Defiance Disorder (ODD). A study evaluating the prevalence of CD and ODD among 1,173 Black and Latino youth in residential treatment facilities found that while these populations are underdiagnosed for ADHD, only a quarter of White youth received a diagnosis of CD, compared to about 43% of Latino youth and 34% of Black youth, which the researchers concluded was a significant overrepresentation within the sample (Cameron & Guterman, 2007).

Identification of symptoms may also not take into account environmental factors that youth of color, particularly Latino students may encounter in their schools or communities. For example, youth of color in urban environments may face a constellation of factors that could contribute to additional social and emotional difficulties that might affect achievement in school. Racial discrimination, anxiety, depression, abuse, trauma, and various other forms of socioemotional difficulties have been shown to have a lasting impact on students' academic achievement (Delaney-Black,

Covington, and Ondersma, 2002) and significantly impact achievement when combined with inattentive symptoms (Grills-Tauechel, Fletcher, Vaughn, Denton, and Taylor, 2013). While youth of color in urban environments may already be exposed to greater risk due to social and environmental factors, when compounded with additional difficulties such as anxiety, this may further affect their cognitive abilities in school, thus affecting achievement. For example, when evaluating a sample of 127 first graders, researchers found that when compounded with anxiety symptoms, students rated as inattentive had experienced lower reading achievement (Grills-Tauechel, Fletcher, Vaughn, Denton, and Taylor, 2013). First graders exposed to trauma also showed significant variance in reading ability when controlling for variables such as gender, socioeconomic status, home environment, and prenatal substance abuse (Delaney-Black, et al., 2002). Researchers concluded that a child experiencing trauma or violence exposure would likely have a 7.5 drop in IQ and 9.8 drop in reading achievement (Delaney-Black, et al., 2002).

Finally, when addressing the variance in identification, diagnosis, and treatment, research suggests healthcare obstacles such as lack of help seeking behaviors on the part of the family or cultural stigma around mental health as possible contributing factors (Alegria, Canino, Lai, Ramirez, Chavez, & Rusch, 2004). Little research suggests the systemic issues found in healthcare, such as language barriers, lack of access, inaccessibility of services, or lack of cultural sensitivity within the mental healthcare system. Similar to the language used with the achievement gap, the burden of care is placed on families to not only identify mental health issues, but navigate complex

systems rooted in Western styles of treatment and assessment. This further speaks to the critical need to understand the prevalence, as well as the correlation between ADHD symptoms and achievement in Latino youth, in order to possibly explain the achievement gap between Latino students and their peers.

Specific Aims and Hypotheses

In summary, both hyperactivity and inattention have been related to poorer achievement outcomes for younger children both proximally and distally. However, results have been mixed for Latino students, especially when rated by their teachers. The purpose of the current study was to expand upon prior work by evaluating the relationship between ethnicity, gender, and achievement in early elementary school, specifically assessing potential differences among Latino students in regard to gender, as well as, when compared with their Black and White peers.

The objectives of this study were to:

- 1) Determine the prevalence of hyperactive and inattentive behaviors among young Latino students and whether there are significant differences that emerge when compared to their Black and White peers. This information will be useful in understanding whether Latino children in elementary school are displaying behaviors that may be useful in identifying them for an ADHD diagnosis.
- 2) Determine whether differences emerged in achievement among ADHD type or by gender for Latino boys or girls identified as displaying inattentive, hyperactive, or combined hyperactive-inattentive behaviors.

- 3) Determine if differences by ADHD type were significantly different when accounting for gender and race among same age peers.

Based on the current literature, it is expected that:

- 1) While there have been mixed results as to whether Latinos are significantly rated with either lower or higher inattentive or hyperactive-impulsive behaviors, it is expected that cultural and other confounding factors in terms of biases may result in higher ratings of inattentive or hyperactive behaviors.
- 2) It is expected that findings will mirror achievement gap literature indicating that when demographic variables are combined (e.g., gender and ethnicity), interactions may show significance in the relationship between demographic factors, ratings of behavior, and reading achievement in young Latino children. It is expected that higher ratings of inattention, hyperactivity, and combined type symptoms, will result in poorer reading achievement among both Latino boys and girls, with poorer achievement measure scores for Latino males, imitating the gender achievement gap seen in later school years.

Similarly, it is expected that when examining the relationship between these variables with the broader sample, similar interactions will result. This information will be useful in determining that which type of ADHD symptoms will result in poorer reading achievement which variable interactions will also show significance when exploring racial and gender associations. Specifically, just in terms of gender, it is

expected that there will be gaps in reading achievement based on inattention, in which females would perform poorer than males. Similarly, hyperactivity would result in similar expectations for males in the sample. In terms of ethnicity, it is expected that based on current literature, there might be a gap between Black and Latino students and their White and Asian counterparts without any additional covariates. In terms of the interaction between gender and race, it is expected that females of color (Black and Latino) will perform poorly when rated as inattentive, similarly, males of color will also perform poorer than White and Asian students when rated as hyperactive. Although studies have not explored combined type ADHD in detail, it is expected that this type will also affect reading achievement mirroring the effects of inattention and hyperactivity.

CHAPTER TWO

Method

Methodology Selected

Due to the variables in this study and the way they will be examined, a quantitative approach was used to analyze the data.

Setting

The larger randomized control trial of which data were collected was conducted in 10 different elementary schools in Southeastern Texas at two different school districts in an urban area. As reported in Denton et al., 2014:

“The populations of participating schools in this district were primarily Hispanic (81%), with 12% African American, 6% White, and 1% Asian and other ethnicities; about 89% of the students attending these schools qualified for free or reduced-price lunch (an indication of low socioeconomic status). The other six schools were located in a large urban school district about 150 miles from the smaller district. The populations of the participating schools in this district were predominantly African American (55%) and Hispanic (31%), with 10% White and 5% Asian and other ethnicities; about 77% of students in these schools qualified for free or reduced-priced lunch”.

Participants

Participants in this study were drawn from a larger randomized control trial in a diverse area in Southeastern Texas, investigating a response to intervention model for

reading difficulties in at-risk early elementary school children (see Denton et al., 2014, for intervention study details). This cohort of first and second grade-students consisted of 350 participants. Of the original 350 participants in the combined cohorts, 311 had both gender and race data with 101 Latino students (32%), 186 Black students (60%), and 24 students identified as Other (8%).

Of that 311, 160 (51%) identified as female and 151 (49%) as male. The researchers in this study acknowledge the gender spectrum, though for the purposes of this study, only male and female data were obtained. Similarly, articles referenced only had information including the categories of male and female as well, as data concerning children and gender is typically limited to male and female categories. This is not an endorsement of the gender binary, however a general limitation in the field.

Of the 101 Latino students, 52 (51%) identified as female and 49 (49%) identified as male. For sociodemographic characteristics see table 1.

Table 1

Sociodemographic Characteristics of Participants

Race/ Ethnicity	Female		Male		Total
	<i>n</i>	%	<i>n</i>	%	<i>n</i>
Latino	52	51%	49	49%	101
Black	97	52%	89	48%	186
White	11	46%	13	54%	24
Total	160	51%	151	49%	311

Prior to the commencement of the academic year, these students were screened with the Texas Primary Reading Inventory (TPRI; Texas Education Agency and the University of Texas System, 2004–2006) an assessment already administered by participating school districts, in order to identify the potential for reading difficulties

during the school year. The assessment is used to identify students who may be at risk for reading difficulties in Kindergarten, first grade, and second grade, and to then set individual learning objects for these students. The categorization of “at-risk” is determined based on tallied raw scores for the screening task, these raw scores are then categorized in relation to their descriptive score. Students are then categorized as Developed, not likely to be at risk for reading difficulties, or Still Developing, which captures students who may not yet reach grade-level performance. According to developers, the assessment is meant to overly identify students in order to provide a majority of students with early reading intervention (TPRI; Texas Education Agency and the University of Texas System, 2004–2006).

Prior to intervention, students received a standardized assessment battery, which included the Basic Reading subtests of The Woodcock-Johnson Psychoeducational Test Battery-III (Woodcock, McGrew, & Mather, 2001) and The Test of Word Reading Efficiency (TOW; Torgesen, Wagner, & Rashotte, 1999), as well as a number of additional measures not included in this study. Students identified as at risk for reading difficulties received supplemental small group reading intervention. These measures were used to assess achievement for this study.

Additionally, students were assessed for social and emotional difficulties, such as anxiety, depression, and behavioral challenges, using a variety of measures. Most pertinent to this study is The Strengths and Weakness of ADHD-Symptoms and Normal-Behavior (SWAN) (Swanson et al., 2006) completed by teachers at the beginning of the school year, as well as at the end of the school year. For psychometric properties of the

measure, please see below. For this study, only ratings from the beginning of the school year were used in order to get an accurate depiction of behavior without possible interactions from reading intervention measures. The 14-point measure was used both as a whole and with its subscales. Questions 1 through 7 are classified as the Inattention subscale and questions 8 through 14 are classified as the Hyperactive-Impulsive subscale, when used as a whole, the measure describes total ADHD symptoms and may be classified as Combined-type (inattention and hyperactivity-impulsivity).

Measures

The Strengths and Weakness of ADHD-Symptoms and Normal-Behavior (Swanson et al., 2006) was used to by teachers to evaluate inattention (INA; 9-item scale) and hyperactivity-impulsivity (HI; 9-item scale). Ratings are made using a 7-point scale, ranging from “far below average” (-3) to “far above average” (+3) with lesser (negative) scores representing more difficulties with inattention or hyperactivity. The total score (1-18) may be used for a combined type (COM) rating of ADHD symptoms. The Cronbach’s alpha for SWAN scales in this study is $\alpha=.96$, indicating excellent internal consistency.

Scores were classified based upon developer’s recommendation that scores below zero classify as positive ADHD symptoms (Swanson et al., 2006). These scores were then coded as 1 for ADHD positive symptoms, or a zero for no presence of symptoms. Leaving four categories of symptoms: No ADHD, Inattention (INA), Hyperactivity-Impulsivity (HI), and Combined Type (COM).

The Woodcock-Johnson PsychoEducational Test Battery-III (Woodcock, McGrew, & Mather, 2001) Basic Reading composite (WJBR) and Passage Comprehension (WJPC) scores were examined. WJBR assesses decoding skills by evaluating children's ability to read real words and phonetically correct nonsense words. The WJPC assesses students' language comprehension and reading skills using a cloze procedure.

The Test of Word Reading Efficiency (TOW; Torgesen, Wagner, & Rashotte, 1999) measures word reading fluency, accuracy, and decoding. The composite of Sight Word Efficiency and Phonemic Decoding Efficiency, which ask students to read as many real words or non-words as quickly and accurately as possible within 45 secs., was used.

CHAPTER THREE

Data Analytic Plan

Descriptive information was examined for each achievement measure and compared with existing normative data (see table 2). Within the larger study it was determined not to cluster students by analyses (i.e., multilevel modeling) because several classrooms had one participant or one teacher per Denton (2014), “Groups could have been clustered by classroom teacher but, again, several classrooms had only one participant. The randomization was clearly effective and school level effects minimized by having all conditions in each school. Therefore, for this study it was determined to use OLS methods as described below.

Table 2

Descriptive Statistics by Measure

	WJBR		WJPC		TOWRE		<i>n</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Sample	95.16	15.51	88.71	13.88	87.73	17.14	332
Normative	100	15	100	15	100	15	

Chi-square test was run in order to determine the goodness fit of the model and data. The Chi-square test was used to determine the relationship between the variables of race and hyperactive, inattentive, or combination of both symptoms. This variable was created based on any teacher endorsement of positive symptoms associated with hyperactivity and or inattention. The model’s level of significance was ascertained in order to determine whether additional analyses were necessary.

Subsequent correlations between teacher ratings of inattention, hyperactivity, or both were analyzed alongside with reading achievement measures. Since this study aimed to analyze reading achievement through the use of three different reading achievement measures, a multivariate analysis of variance or MANOVA, was used. This was used to examine the interaction of several different independent variables with the dependent variable. One MANOVA were conducted with two demographic gender variables (Male=0, Female=1), three demographic racial ethnic variables (Latino, Black, Other), and type of ADHD symptoms (No ADHD symptoms, Inattentive, Hyperactive, Combined) as independent variables, and with achievement measures (WJBR, WJPC, TOWRE) as the dependent variables. This analysis was completed to determine the predictive and interactive relationship between race, gender, symptom type, and reading achievement. This analysis was conducted first with just the cohort of Latino students and subsequently with the larger cohort of students to determine racial, gender, and symptomatology interactions.

Results

Descriptive Analyses

Prevalence of Symptoms Among Latino Students. A chi-square test of independence was performed to examine the relation between ratings of ADHD symptoms and race to determine whether there is a prevalence of behavioral ratings among Latino students. The relation between these variables was not significant, $X^2 (2, N = 272) = 11.93, p = .064$. There is not a significant relationship between race or ethnicity and teachers' ratings of ADHD symptoms for this sample of

children, see Table 2. The effect size for this finding, Cramer's V, was low, .15 (Cohen, 1988). As shown in table 3, data indicate that teachers rate 64% of Latino students and 67% of Black students with ADHD symptoms, and to 40% of White students.

Table 3

Relationship of ADHD Symptom Endorsement and Race/Ethnicity

		Latino	Black	White	Total
ADHD Symptom Endorsement	No ADHD Symptoms	32	54	12	98
	ADHD Symptoms	57	109	8	174
Total		89	163	20	272

$=p> .05$

ADHD Symptoms and Reading Achievement in Latino Students

Descriptive statistics were run for each dependent variable using just the scores of the Latino students to determine the mean average of scores by gender and ADHD symptom type. See table 4 for mean estimates by gender and table 5 for mean estimate by ADHD symptom type.

Table 4*Mean Estimates for Latino Students*

Dependent Variable	Gender	Mean	SE	95% Confidence Interval	
				Lower Bound	Upper Bound
WJBR	Male	98.18	2.13	93.95	102.41
	Female	98.46	2.75	92.99	103.93
WJPC	Male	88.58	1.96	84.68	92.48
	Female	92.56	2.53	87.53	97.59
TOWRE	Male	89.62	2.45	84.76	94.49
	Female	93.91	3.16	87.62	100.20

Table 5*Mean Estimates for Latino Students by ADHD Symptoms*

Dependent Variable	ADHD Symptom Type	Mean	SE	95% Confidence Interval	
				Lower Bound	Upper Bound
WJBR	No Symptoms	109.88	2.37	105.15	114.61
	Inattention	86.04	3.06	79.94	92.13
	Hyperactivity	105.15	5.27	94.66	115.64
	Combined Type	92.22	2.34	87.55	96.89
WJPC	No Symptoms	102.30	2.19	97.94	106.65
	Inattention	79.54	2.82	73.93	85.15
	Hyperactivity	95.00	4.85	85.34	104.66
	Combined Type	85.44	2.16	81.14	89.73
TOWRE	No Symptoms	107.59	2.73	102.15	113.02
	Inattention	78.48	3.52	71.47	85.49
	Hyperactivity	97.00	6.06	84.94	109.06
	Combined Type	84.01	2.70	78.64	89.37

Analyses of the relationship between gender, ethnicity, symptom type, and reading achievement were conducted using MANOVAs. Initial multivariate analyses between males and females by ADHD type initially revealed that the relationship between gender and ADHD type in Latino students was not significant, as well as the relationship between gender and reading achievement, however the relationship between ADHD symptom type and reading achievement was, $p < .001$, see table 6. Due to the significant interaction, additional MANOVAs were conducted with ADHD symptom type and significant findings are reported, see table 7.

Table 6
Significant Multivariate Effects (at $p < .001$ level)

Effect		Value	<i>F</i>	<i>df</i>	Error <i>df</i>	<i>p</i>
ADHD Symptom Type	Pillai's Trace	0.48	4.83	9	231	<.001

Table 7
Tests of Between-Subjects Effects

Source	Dependent Variable	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>
ADHD Symptom Type	WJBR	7652.75	3	2550.92	16.08	<.001
	WJPC	6798.17	3	2266.06	16.86	<.001
	TOWRE	11919.44	3	3973.15	18.95	<.001

Further analyses of each dependent variable, each reading measure (WJBR, WJPC, and TOWRE), indicated that students rated as inattentive and combined type, showed significant drops in means when compared to students rated as hyperactive or not

rated as having ADHD symptoms. On WJBR, students rated as inattentive had a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-23.76$, $SD=3.85$) and a lower mean difference than students rated as hyperactive ($M=-19.86$, $SD=5.66$). Additionally, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-18.63$, $SD=3.23$) and a lower mean difference when compared to students rated as hyperactive ($M=-14.73$, $SD=5.26$). There were no significant mean differences between inattentive ratings and combined type ratings, or students rated as hyperactive compared to students without ADHD ratings, see table 8.

Table 8
Significant Multiple Comparisons by Symptom Type- WJBR

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
WJBR	No Symptoms Endorsed	Inattention	23.76*	3.85	<.001	16.10	31.42
		Combined Type	18.63*	3.23	<.001	12.20	25.06
	Inattention	No Symptoms	-23.76*	3.85	<.001	-31.42	-16.10
		Hyperactivity	-19.86*	5.66	<.001	-31.12	-8.59
	Hyperactivity	Inattention	19.86*	5.66	<.001	8.59	31.12
		Combined Type	14.73*	5.26	<.001	4.27	25.20
	Combined Type	No Symptoms	-18.63*	3.23	<.001	-25.06	-12.20
		Hyperactivity	-14.73*	5.26	.006	-25.20	-4.27

*The mean difference is significant at .05 level

This interaction pattern was present for all measures. On WJPC, students rated as inattentive again had a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-22.45$, $SD=3.54$) and a lower mean difference than students rated as hyperactive ($M=-15.61$, $SD=5.21$). As on WJBR, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-18.18$, $SD=2.97$) and a lower mean difference when compared to students rated as hyperactive ($M=-11.33$, $SD=4.84$). Again, there were no significant mean differences between inattentive ratings and combined type ratings, or students rated as hyperactive compared to students without ADHD ratings, see table 9.

Table 9
Significant Multiple Comparisons by Symptom Type- WJPC

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
WJPC	No Symptoms Endorsed	Inattention	22.45*	3.54	<.001	15.40	29.50
		Combined Type	18.18*	2.97	<.001	12.26	24.10
	Inattention	No Symptoms	-22.45*	3.54	<.001	-29.50	-15.40
		Hyperactivity	-15.61*	5.21	<.001	-25.97	-5.24
	Hyperactivity	Inattention	15.61*	5.21	<.001	5.24	25.97
		Combined Type	11.33*	4.84	.022	1.70	20.97
	Combined Type	No Symptoms	-18.18*	2.97	<.001	-24.10	-12.26
		Hyperactivity	-11.33*	4.84	.022	-20.97	-1.70

*The mean difference is significant at .05 level

A similar interaction pattern continued for with TOWRE as the dependent variable. Again, students rated as inattentive again had a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-29.11$, $SD=4.42$) and a lower mean difference than students rated as hyperactive ($M=-18.35$, $SD=6.50$). As on WJBR and WJPC, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-25.23$, $SD=3.71$) and a lower mean difference when compared to students rated as hyperactive ($M=-14.47$, $SD=6.04$). Again, there were no significant mean differences between inattentive ratings and combined type ratings, or students rated as hyperactive compared to students without ADHD ratings, see table 10.

Table 10

Significant Multiple Comparisons by Symptom Type- TOWRE

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
WJPC	No Symptoms Endorsed	Inattention	29.11*	4.42	<.001	20.30	37.92
		Combined Type	25.23*	3.71	<.001	17.83	32.62
	Inattention	No Symptoms	-29.11*	4.42	<.001	-37.92	-20.30
		Hyperactivity	-18.35*	6.50	.006	-31.30	-5.40
	Hyperactivity	Inattention	18.35*	6.50	.006	5.40	31.30
		Combined Type	14.47*	6.04	.019	2.44	26.50
	Combined Type	No Symptoms	-25.23*	3.71	<.001	-32.62	-17.83
		Hyperactivity	-14.47*	6.04	.019	-26.50	-2.44

*The mean difference is significant at .05 level

Demographic Variables and Reading Achievement in Young Students

Demographic statistics indicated that most of the students in the sample, regardless of race or ethnicity were rated as either combined type, both inattentive and hyperactive (43%) or not rated with ADHD type symptoms (36%). A smaller percentage were rated as solely inattentive (36%) or hyperactive (14%). Table 11 has additional percentages by race and ethnicity.

Table 11

Race and Symptom Demographic Statistics for Sample

		Race						Total	
		Latino		Black		White			
ADHD Symptom Type	No Symptom	32	36%	54	33%	12	60%	98	36%
	Inattention	18	20%	21	13%	0	0%	39	14%
	Hyperactive	7	8%	12	7%	0	0%	19	7%
	Combination	32	36%	76	47%	8	40%	116	43%
Total		89		163		20		272	

Analyses of the relationship between gender, ethnicity or race, symptom type, and reading achievement were conducted using MANOVAs. Initial multivariate analyses of gender, ADHD symptom type, and race/ethnicity revealed that only gender and ADHD symptom type were significant, see table 12. Due to the significant interaction, additional MANOVAs were conducted with ADHD symptom type and significant findings are reported.

Table 12*Multivariate Tests of Gender and ADHD Type for Students*

Effect		Value	<i>F</i>	<i>df</i>	Error <i>df</i>	<i>p</i>
Gender	Pillai's Trace	0.08	6.580b	3	245	<.001
ADHD Symptom Type	Pillai's Trace	0.23	6.81	9	741	<.001

Gender and Reading Achievement. Descriptive statistics were run for each dependent variable for all students to determine the mean average of scores by gender, see table 13. The pairwise comparison of gender was only significant with males having lower mean scores than females than females on WJPC ($M=-4.66$, $SD=1.96$), see table 14.

Table 13*Mean Estimates by Gender*

Dependent Variable	Gender	Mean	<i>SE</i>	95% Confidence Interval	
				Lower Bound	Upper Bound
WJBR	Male	97.49	1.54	94.47	100.52
	Female	97.52	1.64	94.30	100.75
WJPC	Male	88.12	1.34	85.48	90.77
	Female	92.78	1.43	89.97	95.60
TOWRE	Male	89.55	1.64	86.32	92.77
	Female	92.38	1.74	88.94	95.81

Based on modified population marginal mean.

Table 14
Significant Pairwise Comparisons by Gender

Dependent Variable	Gender		Mean Difference	SD	p	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
WJPC	Male	Female	-4.660*	1.96	.018	-8.52	-0.80
	Female	Male	4.660*	1.96	.018	0.80	8.52

Based on estimated marginal means

* The mean difference is significant at the .05 level.

ADHD Symptom Type and Reading Achievement. Descriptive statistics were run for each dependent variable for all students to determine the mean average of scores by ADHD symptom type, see table 15.

Table 15
Mean Estimates for Students by ADHD Symptoms

Dependent Variable	ADHD Symptom Type	Mean	SE	95% Confidence Interval	
				Lower Bound	Upper Bound
WJBR	No Symptoms	105.30	1.69	101.97	108.64
	Inattention	87.05	2.28	82.57	91.53
	Hyperactivity	104.53	3.45	97.75	111.32
	Combined Type	92.00	1.88	88.29	95.71
WJPC	No Symptoms	97.64	1.48	94.73	100.56
	Inattention	81.38	1.99	77.46	85.29
	Hyperactivity	97.38	3.01	91.44	103.31
	Combined Type	84.70	1.65	81.46	87.94
TOWRE	No Symptoms	100.42	1.81	96.87	103.98
	Inattention	79.63	2.42	74.86	84.41
	Hyperactivity	99.29	3.67	92.06	106.52
	Combined Type	83.50	2.01	79.55	87.45

Multiple comparison analyses by symptom type conducted for each dependent variable (WJBR, WJPC, TOWRE) indicated that ADHD symptom type significantly affected reading achievement. Results indicated that students rated as inattentive and combined type, showed significant drops in means when compared to students rated as hyperactive or not rated as having ADHD symptoms. On WJBR, students rated as inattentive had a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-18.25$, $SD=2.84$) and a lower mean difference than students rated as hyperactive ($M=-17.48$, $SD=4.13$). Additionally, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-13.30$, $SD=2.53$) and a lower mean difference when compared to students rated as hyperactive ($M=-12.53$, $SD=3.93$). There were no significant mean differences between inattentive ratings and combined type ratings, or students rated as hyperactive compared to students without ADHD ratings, see table 16.

Table 16*Significant Multiple Comparisons by Symptom Type- WJBR*

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
WJBR	No Symptoms Endorsed	Inattention	18.25*	2.84	<.001	12.66	23.84
		Combined Type	13.30*	2.53	<.001	8.31	18.29
	Inattention	No Symptoms	-18.25*	2.84	<.001	-23.84	-12.66
		Hyperactivity	-17.48*	4.13	<.001	-25.61	-9.35
	Hyperactivity	Inattention	17.48*	4.13	<.001	9.35	25.61
		Combined Type	12.53*	3.93	.002	4.80	20.27
	Combined Type	No Symptoms	-13.30*	2.53	<.001	-18.29	-8.31
		Hyperactivity	-12.53*	3.93	.002	-20.27	-4.80

*The mean difference is significant at .05 level

Similar results were found on WJPC, students rated as inattentive had a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-16.27$, $SD=2.48$) and a lower mean difference than students rated as hyperactive ($M=-15.997$, $SD=3.61$). Additionally, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-12.95$, $SD=2.21$) and a lower mean difference when compared to students rated as hyperactive ($M=-12.68$, $SD=3.43$). There were no significant mean differences between inattentive ratings and combined type ratings, or students rated as hyperactive compared to students without ADHD ratings, see table 17.

Table 17*Significant Multiple Comparisons by Symptom Type- WJPC*

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
WJPC	No Symptoms Endorsed	Inattention	16.27*	2.48	<.001	11.39	21.15
		Combined Type	12.95*	2.21	<.001	8.59	17.30
	Inattention	No Symptoms	-16.27*	2.48	<.001	-21.15	-11.39
		Hyperactivity	-15.997*	3.61	<.001	-23.10	-8.89
	Hyperactivity	Inattention	15.997*	3.61	<.001	8.89	23.10
		Combined Type	12.68*	3.43	<.001	5.92	19.43
	Combined Type	No Symptoms	-12.95*	2.21	<.001	-17.30	-8.59
		Hyperactivity	-12.68*	3.43	<.001	-19.43	-5.92

*The mean difference is significant at .05 level

Similar results were found on TOWRE, students rated as inattentive had a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-20.79$, $SD=3.02$) and a lower mean difference than students rated as hyperactive ($M=-19.66$, $SD=4.40$). Additionally, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-16.92$, $SD=2.70$) and a lower mean difference when compared to students rated as hyperactive ($M=-15.79$, $SD=4.18$). There were no significant mean differences between inattentive ratings and combined type ratings, or students rated as hyperactive compared to students without ADHD ratings, see table 18.

Table 18
Significant Multiple Comparisons by Symptom Type- TOWRE

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
TOWRE	No Symptoms Endorsed	Inattention	20.79*	3.02	<.001	14.84	26.74
		Combined Type	16.92*	2.70	<.001	11.60	22.23
	Inattention	No Symptoms	-20.79*	3.02	<.001	-26.74	-14.84
		Hyperactivity	-19.66*	4.40	<.001	-28.33	-10.99
	Hyperactivity	Inattention	19.66*	4.40	<.001	10.99	28.33
		Combined Type	15.79*	4.18	<.001	7.55	24.03
	Combined Type	No Symptoms	-16.92*	2.70	<.001	-22.23	-11.60
		Hyperactivity	-15.79*	4.18	<.001	-24.03	-7.55

*The mean difference is significant at .05 level

Race/Ethnicity and Reading Achievement. Descriptive statistics were run for each dependent variable for all students to determine the mean average of scores by race and ethnicity, see table 19. There were no significant interactions for the relationship between race/ethnicity and reading achievement.

Table 19
Mean Estimates for Students by Race/Ethnicity

Dependent Variable	Race/Ethnicity	Mean	SE	95% Confidence Interval	
				Lower Bound	Upper Bound
WJBR	Latino	98.32	1.87	94.64	102.00
	Black	96.02	1.40	93.26	98.77
	White	98.86	3.11	92.73	105.00
WJPC	Latino	90.57	1.63	87.35	93.79
	Black	90.36	1.22	87.95	92.76
	White	90.42	2.72	85.06	95.78
TOWRE	Latino	91.77	1.99	87.84	95.69
	Black	89.55	1.49	86.62	92.49
	White	92.17	3.32	85.64	98.70

Gender, Race/Ethnicity, ADHD Symptom Type, and Reading Achievement.

Descriptive statistics were run for each dependent variable for all students to determine the mean average of scores by gender and ADHD symptom type, see table 20, as well as ADHD Symptom Type and race/ethnicity, see table 21. Additional descriptive statistics illustrate the mean estimates for students by gender, ADHD symptom type, and race/ethnicity by each dependent variable. See table 22 for WJBR, table 23 for WJPC, and table 24 for TOWRE.

Table 20*Mean Estimates for Students Gender x ADHD Symptom Type*

Dependent Variable	Gender	ADHD Symptom Type	Mean	SE	95% Confidence Interval	
					Lower Bound	Upper Bound
WJBR	Male	No Symptoms	104.93	2.59	99.82	110.03
		Inattention	88.38 ^a	3.51	81.47	95.30
		Hyperactivity	105.82 ^a	4.11	97.73	113.90
		Combined Type	90.58	2.56	85.54	95.61
	Female	No Symptoms	105.68	2.18	101.38	109.98
		Inattention	85.72 ^a	2.90	80.02	91.43
		Hyperactivity	103.25 ^a	5.54	92.35	114.15
		Combined Type	93.42	2.77	87.97	98.87
WJPC	Male	No Symptoms	95.14	2.27	90.68	99.60
		Inattention	79.52 ^a	3.07	73.48	85.56
		Hyperactivity	96.33 ^a	3.59	89.27	103.40
		Combined Type	81.37	2.23	76.97	85.77
	Female	No Symptoms	100.15	1.91	96.40	103.90
		Inattention	83.24 ^a	2.53	78.25	88.22
		Hyperactivity	98.42 ^a	4.84	88.89	107.94
		Combined Type	88.03	2.42	83.27	92.79
TOWRE	Male	No Symptoms	99.46	2.76	94.02	104.89
		Inattention	79.53 ^a	3.74	72.16	86.89
		Hyperactivity	99.00 ^a	4.38	90.38	107.62
		Combined Type	80.02	2.72	74.65	85.38
	Female	No Symptoms	101.39	2.32	96.81	105.97
		Inattention	79.74 ^a	3.09	73.66	85.82
		Hyperactivity	99.58 ^a	5.90	87.97	111.20
		Combined Type	86.99	2.95	81.18	92.79

^a Based on modified population marginal mean.

Table 21*Mean Estimates for Students ADHD Symptom Type x Race/Ethnicity*

Dependent Variable	ADHD Symptom Type	Race/Ethnicity	Mean	SE	95% Confidence Interval	
					Lower Bound	Upper Bound
WJBR	No Symptoms	Latino	109.88	2.56	104.85	114.92
		Black	101.80	1.88	98.10	105.49
		White	104.23	3.97	96.41	112.05
	Inattention	Latino	86.04	3.30	79.55	92.52
		Black	88.07	3.14	81.89	94.25
		White	. ^a	.	.	.
	Hyperactivity	Latino	105.15	5.67	93.98	116.32
		Black	103.92	3.92	96.21	111.63
		White	. ^a	.	.	.
	Combined Type	Latino	92.22	2.52	87.25	97.19
		Black	90.28	1.60	87.13	93.43
		White	93.50	4.79	84.06	102.94
WJPC	No Symptoms	Latino	102.30	2.23	97.90	106.70
		Black	93.92	1.64	90.69	97.15
		White	96.71	3.47	89.88	103.55
	Inattention	Latino	79.54	2.88	73.87	85.21
		Black	83.21	2.74	77.81	88.62
		White	. ^a	.	.	.
	Hyperactivity	Latino	95.00	4.96	85.24	104.76
		Black	99.75	3.42	93.01	106.49
		White	. ^a	.	.	.
	Combined Type	Latino	85.44	2.21	81.09	89.78
		Black	84.54	1.40	81.79	87.29
		White	84.13	4.19	75.87	92.38
TOWRE	No Symptoms	Latino	107.59	2.72	102.22	112.95
		Black	94.59	2.00	90.65	98.53
		White	99.09	4.23	90.75	107.42
	Inattention	Latino	78.48	3.51	71.57	85.39
		Black	80.79	3.34	74.20	87.37
		White	. ^a	.	.	.

Hyperactivity	Latino	97.00	6.04	85.10	108.91
	Black	101.58	4.17	93.37	109.80
	White	^a	.	.	.
Combined Type	Latino	84.01	2.69	78.71	89.30
	Black	81.25	1.70	77.90	84.60
	White	85.25	5.11	75.19	95.31

^a This level combination of factors is not observed; thus, the corresponding population marginal mean is not estimable.

Table 22*Mean Estimates for Students Gender x ADHD Symptom Type x Race- WJBR*

Gender	ADHD Symptom Type	Race/ Ethnicity	Mean	SE	95% Confidence Interval	
					Lower Bound	Upper Bound
Male	No Symptoms	Latino	110.58	3.92	102.87	118.29
		Black	103.59	2.89	97.90	109.29
		White	100.60	6.06	88.66	112.55
	Inattention	Latino	86.63	4.79	77.18	96.07
		Black	90.14	5.13	80.05	100.24
		White	^a	.	.	.
	Hyperactivity	Latino	106.80	6.06	94.86	118.75
		Black	104.83	5.54	93.93	115.74
		White	^a	.	.	.
	Combined Type	Latino	88.71	2.96	82.89	94.54
		Black	88.02	2.02	84.04	92.00
		White	95.00	6.78	81.65	108.36
Female	No Symptoms	Latino	109.18	3.29	102.70	115.65
		Black	100.00	2.40	95.28	104.72
		White	107.86	5.13	97.76	117.95
	Inattention	Latino	85.44	4.52	76.54	94.35
		Black	86.00	3.62	78.86	93.14
		White	^a	.	.	.
	Hyperactivity	Latino	103.50	9.59	84.61	122.39
		Black	103.00	5.54	92.10	113.90

	White	^a	.	.	.
	Latino	95.73	4.09	87.67	103.78
Combined Type	Black	92.53	2.48	87.66	97.41
	White	92.00	6.78	78.65	105.36

^a This level combination of factors is not observed; thus, the corresponding population marginal mean is not estimable.

Table 23*Mean Estimates for Students Gender x ADHD Symptom Type x Race- WJPC*

Gender	ADHD Symptom Type	Race/ Ethnicity	Mean	SE	95% Confidence Interval	
					Lower Bound	Upper Bound
Male	No Symptoms	Latino	102.42	3.42	95.68	109.15
		Black	94.00	2.53	89.03	98.98
		White	89.00	5.30	78.56	99.44
	Inattention	Latino	74.75	4.19	66.50	83.00
		Black	84.29	4.48	75.47	93.11
		White	^a	.	.	.
	Hyperactivity	Latino	96.00	5.30	85.56	106.44
		Black	96.67	4.84	87.14	106.19
		White	^a	.	.	.
	Combined Type	Latino	81.14	2.59	76.05	86.24
		Black	82.98	1.77	79.50	86.46
		White	80.00	5.92	68.33	91.67
Female	No Symptoms	Latino	102.18	2.87	96.52	107.84
		Black	93.84	2.10	89.72	97.97
		White	104.43	4.48	95.61	113.25
	Inattention	Latino	84.33	3.95	76.55	92.11
		Black	82.14	3.17	75.91	88.38
		White	^a	.	.	.
	Hyperactivity	Latino	94.00	8.38	77.50	110.50

	Black	102.83	4.84	93.31	112.36
	White	^a	.	.	.
	Latino	89.73	3.57	82.69	96.76
Combined Type	Black	86.10	2.16	81.84	90.36
	White	88.25	5.92	76.58	99.92

^a This level combination of factors is not observed; thus, the corresponding population marginal mean is not estimable.

Table 24*Mean Estimates for Students Gender x ADHD Symptom Type x Race- TOWRE*

Gender	ADHD Symptom Type	Race/ Ethnicity	Mean	SE	95% Confidence Interval	
					Lower Bound	Upper Bound
Male	No Symptoms	Latino	106.58	4.17	98.37	114.80
		Black	96.18	3.08	90.11	102.25
		White	95.60	6.46	82.87	108.33
	Inattention	Latino	75.63	5.11	65.56	85.69
		Black	83.43	5.46	72.67	94.19
		White	^a	.	.	.
	Hyperactivity	Latino	97.00	6.46	84.27	109.73
		Black	101.00	5.90	89.38	112.62
		White	^a	.	.	.
	Combined Type	Latino	79.29	3.15	73.08	85.50
		Black	78.27	2.15	74.02	82.51
		White	82.50	7.22	68.27	96.73
Female	No Symptoms	Latino	108.59	3.50	101.69	115.49
		Black	93.00	2.55	87.97	98.03
		White	102.57	5.46	91.82	113.33

	Latino	81.33	4.82	71.85	90.82
Inattention	Black	78.14	3.86	70.54	85.75
	White	^a	.	.	.
	Latino	97.00	10.22	76.88	117.12
Hyperactivity	Black	102.17	5.90	90.55	113.79
	White	^a	.	.	.
	Latino	88.73	4.36	80.15	97.31
Combined Type	Black	84.23	2.64	79.04	89.43
	White	88.00	7.22	73.77	102.23

^a This level combination of factors is not observed; thus, the corresponding population marginal mean is not estimable.

Additional post hoc analyses revealed further significant relationships between the three different variables, gender, race, and ADHD symptom type, and the dependent variables, WJBR, WJPC, and TOWRE. When examining the relationship between ADHD symptom type, again, students rated as inattentive had lower means when compared to those without ADHD symptom ratings ($M=-17.66$, $SD=2.60$) and students rated as hyperactive ($M=-17.87$, $SD=3.81$). Additionally, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-13.98$, $SD=1.88$) and a lower mean difference when compared to students rated as hyperactive ($M=-14.19$, $SD=3.36$). There were no significant mean differences between inattentive ratings and combined type ratings, or

students rated as hyperactive compared to students without ADHD ratings, see table 25.

Table 25

Post Hoc Significant Multiple Comparisons by Symptom Type- WJBR

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
WJBR	No Symptoms Endorsed	Inattention	17.66	2.60	<.001	12.53	22.78
		Combined Type	13.98	1.88	<.001	10.27	17.68
	Inattention	No Symptoms	-17.66	2.60	<.001	-22.78	-12.53
		Hyperactivity	-17.87	3.81	<.001	-25.37	-10.36
	Hyperactivity	Inattention	17.87	3.81	<.001	10.36	25.37
		Combined Type	14.19	3.358	<.001	7.57	20.80
	Combined Type	No Symptoms	-13.98	1.88	<.001	-17.68	-10.27
		Hyperactivity	-14.19	3.36	<.001	-20.80	-7.57

The mean difference is significant at .05 level

Similarly, post hoc analyses identified students rated as inattentive and combined type on WJPC with lower means. Students rated as inattentive had lower means when compared to those without ADHD symptom ratings ($M=-15.48$, $SD=2.27$) and students rated as hyperactive ($M=-16.66$, $SD=3.33$). Additionally, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-12.80$, $SD=1.64$) and a lower mean difference when compared to students rated as hyperactive ($M=-13.98$, $SD=2.93$). There were no significant mean differences between inattentive ratings and combined type ratings, or students rated as hyperactive compared to students without ADHD ratings, see table 26.

Table 26*Post Hoc Significant Multiple Comparisons by Symptom Type- WJPC*

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
WJPC	No Symptoms Endorsed	Inattention	15.48	2.27	<.001	11	19.96
		Combined Type	12.80	1.64	<.001	9.56	16.03
	Inattention	No Symptoms	-15.48	2.27	<.001	-19.96	-11
		Hyperactivity	-16.66	3.33	<.001	-23.21	-10.10
	Hyperactivity	Inattention	16.66	3.33	<.001	10.10	23.21
		Combined Type	13.98	2.93	<.001	8.20	19.75
	Combined Type	No Symptoms	-12.80	1.64	<.001	-16.03	-9.56
		Hyperactivity	-13.98	2.93	<.001	-19.75	-8.20

The mean difference is significant at .05 level

Following a similar pattern, post hoc analyses identified students rated as inattentive and combined type on TOWRE with lower means. Students rated as inattentive had lower means when compared to those without ADHD symptom ratings ($M=-19.74$, $SD=2.77$) and students rated as hyperactive ($M=-20.55$, $SD=4.06$). Additionally, students rated as combined type showed similar gaps with a lower mean difference compared to students who were not rated with ADHD symptoms ($M=-17.59$, $SD=2.00$) and a lower mean difference when compared to students rated as hyperactive ($M=-18.40$, $SD=3.58$). There were no significant mean differences between inattentive ratings and combined type ratings, or students rated as hyperactive compared to students

without ADHD ratings, see table 27.

Table 27

Post Hoc Significant Multiple Comparisons by Symptom Type- TOWRE

Dependent Variable	ADHD Symptom Type		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
TOWRE	No Symptoms Endorsed	Inattention	19.74	2.77	<.001	14.28	25.20
		Combined Type	17.59	2.00	<.001	13.64	21.53
	Inattention	No Symptoms	-19.74	2.77	<.001	-25.20	-14.28
		Hyperactivity	-20.55	4.06	<.001	-28.55	-12.56
	Hyperactivity	Inattention	20.55	4.06	<.001	12.56	28.55
		Combined Type	18.40	3.58	<.001	11.35	25.45
	Combined Type	No Symptoms	-17.59	2.00	<.001	-21.53	-13.64
		Hyperactivity	-18.40	3.58	<.001	-25.45	-11.35

The mean difference is significant at .05 level

Additionally, race and ethnicity were identified to have a significant relationship with reading achievement on TOWRE as Black students had significantly lower means than their Latino ($M=-4.90$, $SD=1.94$) and White peers ($M=-7.25$, $SD=3.42$), see table 28. There were no significant interactions between gender, race, and ADHD symptom type when analyzed together.

Table 28*Significant Multiple Comparisons by Race/Ethnicity*

Dependent Variable	Race/Ethnicity		Mean Difference	SE	p	95% Confidence Interval	
						Lower Bound	Upper Bound
TOWRE	Latino	Black	4.90	1.94	.012	1.09	8.71
	Black	Latino	-4.90	1.94	.012	-8.71	-1.09
		White	-7.25	3.42	.035	-13.99	-0.50
	White	Black	7.25	3.42	.035	0.50	13.99

Based on observed means.

The error term is Mean Square (Error) = 208.765.

The mean difference is significant at the .05 level.

CHAPTER FOUR

Discussion

The purpose of this study was to expand upon current literature examining the relations among race, gender, symptoms of inattention and hyperactivity, and reading achievement. It is important to better understand the interactions among these variables, especially during early elementary school, given the potential achievement gap that these differences might result in, particularly among Latino and Black students.

The specific objectives of this study were to: 1) Determine the prevalence of hyperactive and inattentive behaviors among young Latino boys and girls as rated by their teachers; 2) Determine whether differences emerged in achievement for Latino boys or girls identified as displaying inattentive, hyperactive, or combined hyperactive-inattentive behaviors; and 3) Determine if these differences were significantly different than that found when accounting for gender and race among their same age peers.

First, considering just the cohort of Latino students, based on the current literature, it was expected that cultural factors in terms of biases may result in higher ratings of inattentive or hyperactive behaviors among Latino students. It was expected that further analyses would mirror achievement gap literature indicating that when demographic variables are combined (e.g., gender and ethnicity), interactions may show significance in the relationship between demographic factors, ratings of hyperactive or inattentive behavior, and reading achievement in young Latino and Black children. It was also expected that higher ratings of inattention, hyperactivity, and combined type symptoms, would result in poorer reading achievement. While the results followed the

pattern of larger studies, these results should be interpreted with caution, as the sample and subsample participant size were small.

Prevalence of ADHD Symptoms Among Latino Students

Chi-square tests revealed that within this population of students and ratings of behaviors, race/ethnicity did not have a significant relationship with teacher ratings of ADHD related behaviors. It was expected that certain behaviors, like those associated with hyperactivity or impulsivity, might be more prominently identified in a classroom setting, as previous literature has shown that children of color are more likely to be identified for these behaviors (Rabiner, Murray, Schmid, & Malone, 2004). Despite the presence of some of these behaviors and their ratings, they were not significant enough to demonstrate a significant relationship between ethnicity and ratings of behavior. However, the effect size indicated a low but present relationship. Furthermore, the analysis demonstrated that in this small population of students, teachers rate 64% of Latino students and 67% of Black students with ADHD symptoms, compared to 40% of White students.

Although this does not signify a prevalence of ratings towards Latino students, it may show a smaller trend of identification towards Latino and Black students with hyperactive and inattentive behaviors in the classroom. However, since only teacher ratings were used in this study, this data could also indicate that these students were displaying more of these ADHD symptom behaviors, as there are not parent or peer reports to compare. These results are similar to previous studies in which Latino students have not been rated significantly higher or lower in terms of ADHD symptoms when

compared to peers. Rather, previous studies attempting to assess the rates at which Latino students have been identified for ADHD symptoms have shown mixed results. For instance, national data has shown that Latino students are underdiagnosed with ADHD when compared to peers (CDC, 2020) and additional research has supported this finding (Morgan et al., 2013). However, most studies, have not identified a significant relationship between Latino students and teacher ratings of ADHD related symptoms. Thus, it may be that there are differences regarding those symptoms identified by teachers based on their observations and *clinically* diagnosed ADHD.

Regardless, there is an identified gap in mental health between Latino students and their peers that emerges later on in development, as national samples have shown (CDC, 2020). While this may be attributed to lack of appropriate identification by psychologists and pediatricians, lack of cultural explanation of diagnoses to families, difficulty discerning symptoms during this developmental period, or lack of accessibility to services for diagnosis; delayed intervention beyond early elementary school can further perpetuate this gap for Latino students. As national data show, only 10% of Latino children are diagnosed with ADHD between ages 3 and 10. Furthermore, these children are typically not diagnosed until puberty (CDC, 2020), leading to years of possibly unidentified and untreated symptoms which may continue to widen the achievement gap and lead to school disengagement. Although this study's sample is small and does not advocate for the overdiagnoses of Latino children, there is a discrepancy between the rates of identification, diagnoses, and treatment for Latino children that may consequentially further the gaps in achievement between Latino students and their

counterparts. Furthermore, as these results show, inattention in this population creates a significant difference in means on basic reading, reading comprehension, and word reading skills. Although mean scores for this population do not indicate a significant deviation from the standard mean scores of the achievement measures used, the significant differences between reading score means by ADHD type in early elementary school may continue to widen. Delayed intervention may then further the achievement gap between Latino students with ADHD symptoms of inattention and their peers without, as early elementary school is critical in developing early reading skills.

Studies have also suggested that cultural values may affect how or whether Latino students are identified with symptoms. As explained previously, the term Latino is used many times in identifying a complex and diverse population. While the term frequently describes a population comprised of several races, ethnicities, cultural values, languages, socioeconomic status, and other demographics, it is typically used as an all-encompassing term. The use of such a broad term within academia may also contribute to the misidentification of symptoms, as cultural values may vary based on a teacher's demographics (de Ramirez & Shapiro, 2005) or based on student's demographics. The broadness of the spectrum of students that may be categorized as Latino may also contribute to the lack of significant ratings, as it may not be possible to delineate between the cultural nuances within the population when using a broad descriptor.

Previous studies have shown that when additional demographic variables (i.e., socioeconomic status, gender, specific ethnic identity, teacher cultural identification etc.) (Reardon, et al., 2018) have been added to analyze the relationship between ethnicity and

ratings of behaviors, it has impacted the interaction between different variables. The addition of these variables has shown variance in the results, suggesting additional interactions beyond gender and ethnicity that impact achievement. For example, studies have identified that within some districts, gaps in achievement are perpetuated by disparities in school resources, a stark contrast to Coleman's (1968) original report on the achievement gap which suggested that gaps were only due to personal and familial merit, not school resources. Similarly, some studies have identified Latino teachers more likely to over rate Latino students for disruptive behaviors, suggesting that different levels of acculturation may have a role in identification of behaviors (de Ramirez & Shapiro, 2005). Additionally, this may suggest that current measures teachers use to rate ADHD symptoms may not adequately assess for cultural differences among different populations. Altogether results, suggest integration of additional variables to better understand the gap in achievement between Latino students and their peers.

ADHD Symptoms and Reading Achievement in Latino Students

The only significant associations with achievement for Latino students emerged for the inattention and combined type symptom categories. This association was evident for all achievement measures, suggesting that among Latino students, higher ratings of inattention and combined type ADHD symptoms were associated with poorer achievement in areas of reading fluency, reading comprehension, and sight reading. Gender, between Latino boys and girls was not found to be a significant predictor of poorer achievement when paired with ADHD symptom type. This result is concurrent with literature in which gender was not found to have a significant interaction with

ADHD symptom type at this early developmental stage of learning (DuPaul et al., 1997, Rabiner et al., 2004). However, this result also suggests a critical time for intervention before the established achievement gap in reading widens between the sexes. In particular, for Latino students, this also indicates that neither sex is being overrepresented in terms of symptoms, a finding that is more prominent later in development, with males being overrepresented for hyperactivity symptoms and females for inattentive symptoms (Morgan et al., 2013).

The findings for hyperactivity symptom ratings were not significant for any of the reading outcomes examined. These results are consistent with past research examining hyperactivity and poor academic achievement more broadly (DuPaul et al., 1997, Rabiner et al., 2004). Hyperactivity in younger students specifically has not previously been identified to poorly significantly impact academic achievement (DuPaul et al., 1997, Rabiner et al., 2004) and in some instances has shown a positive effect on achievement, as children with more hyperactive symptoms are more likely to participate and answer questions (Tymms & Merrel, 2011). In addition, hyperactivity may be developmentally acceptable in younger children in early elementary school. The lack of relationship between hyperactivity and reading achievement in this study is consistent with prior literature.

Few studies had explored the relationship between the combined-type symptoms of ADHD and reading achievement. In this current study, this relationship significantly impacted Latino students' reading achievement on all measures. Due to the absence of the relationship between hyperactivity and achievement, it may be inferred that the

relationship between combined-type ADHD symptoms and achievement is only significant due to the inattentive symptoms associated with this type. Post-hoc observations confirmed that most of the children rated with both symptoms had much higher rating levels in inattention.

Inattention ratings were consistent with prior literature suggesting that this aspect of ADHD may be the most critical in predicting poorer achievement in students (Bierderman, 2004; DuPaul and Stoner, 2014; Leopold, Christopher, Olson, Petrill, & Willcutt, 2019; Pham, 2016). In terms of reading, inattention may prevent a child from grasping critical proficiencies necessary for early literacy skills. For urban Latino students who may already be at a disadvantage in regard to reading achievement upon Kindergarten entry due to sociocultural or sociodemographic factors such as language or lack of early foundational reading skills, these results may suggest that understanding the presentation of inattention in this population may be critical to lessening the achievement gap between students.

ADHD Symptoms and Reading Achievement in Young Students

This study explored further the relationship between race, teacher ratings of attention, and reading achievement, with analyses mirroring those of Latino students, suggesting that inattention strongly predicts lower reading achievement indeterminate of race or gender. Ratings of hyperactivity were consistent with the previous analysis, as were those of the combined type of ADHD symptoms. Students in the sample had significantly lower achievement means on all reading measures when rated as inattentive, this finding was also true for the combined type ADHD. However, initially, without the

addition of race or ADHD type variables, gender was found to be significant as males performed poorer on the reading comprehension measure when compared to females. Though significant gender interactions with race and ADHD type were not found, males' especially males of color, means tended to be consistently lower when measuring reading comprehension. Research is mixed as to why there is an early developmental gap between male and female reading comprehension skills. Some research attributes this to the similar reasons for the gender gap in achievement, such as socialization. This suggests that females are more likely to be socialized to enjoy reading and literature may be more geared towards their interests (Oakhill & Petrides, 2007). Regardless of the reasons between the gap in reading comprehension, this is concerning given that lower early reading comprehension achievement may predict poorer reading achievement long term (Manu, et al., 2021).

Similar trends were present for females and inattention, however though, they were not significant, as inattention was such a strong predictor of poorer reading mean scores regardless of gender. Inattention again proved to be extremely significant in affecting young children's reading abilities. Though the samples identified as inattentive were relatively small, this effect was similar to the pattern seen with larger samples. One possible explanation for lower mean scores for children identified as inattentive is that, reading requires substantial executive skill functioning such as organizing ideas, recalling information, and being attentive to specific details. Inattention can interfere with all these functions making it difficult for a child to acquire, retain, and recall information and may be the most detrimental of all ADHD symptoms long-term (Bierderman, 2004; DuPaul

and Stoner, 2014; Leopold, Christopher, Olson, Petrill, & Willcutt, 2019; Pham, 2016).

However, some additional sociodemographic variables were absent from this study, therefore results should be interpreted with caution. Previously, interactions of gender and ethnicity have yielded significant interactions only when combining other demographic variables, such as language or socioeconomic status, to better understand the associations between intersectional identities and achievement. Further replication should consider adding these variables to better evaluate the complexity of identity, behavioral challenges, and achievement in younger students. As discussed previously, teacher identity and values may also be a contributing factor as to differences or lack of difference in ratings of behavior influenced by ethnicity, race, or gender. Though this pattern is seen consistently for Latino students, with the exception of literature that has added additional sociodemographic variables, results are mixed for Black students, with many studies proposing that despite peers not being rated significantly for ADHD type behaviors, Black students are rated disproportionately higher (DuPaul et al., 1997).

While this study did not identify that Black students are rated disproportionately higher than peers, when examining just racial differences in achievement, it was found that Black students in the sample had significantly lower mean scores on all reading achievement measures when compared to White peers. Similarly, Black students had significantly lower mean scores than Latino students on TOWRE and sight reading. These results may suggest an additional point of future research as this may infer an early achievement gap in terms of early literacy skills entering early elementary school. Additionally, the achievement gap between Black students and their peers continues to

persist. When adding in ADHD type to the model, Black students continued to trend towards lower means than their peers. Replication of these findings is necessary, especially given that some population sizes in the analyses were relatively small and subsequently, the interactions were also smaller.

Implications for Practice

Although the sample for this study was small, results may provide valuable information regarding race, ethnicity, and gender and their interaction with behavioral ratings at an early developmental stage. Understanding these relationships may be critical to minimizing the gaps in achievement between students.

For instance, it might infer that racial, ethnic, or sex bias may not necessarily be significantly contributing to behavioral ratings at this early developmental stage. Although these biases may be seen more prominent later on in schooling (Quinn, Desruisseaux, & Nkansah-Amankra, 2019) these results coincide with findings supporting their absence in early elementary school (Rabiner et al., 2004). This may serve as timepoint for educators to explore nongendered curriculum as a way to engage children from all gender identities. This may also indicate a time period in which differences in ADHD symptom identification may not be as prominent, which may be beneficial for clinicians to acknowledge, as clinicians are taught that males and females may present with different ADHD symptoms though research has repeatedly identified that the prevalence of symptoms is not as significant.

Additionally, results suggest the importance of identification. As previously discussed, identification requires nuanced developmental and cultural lenses to properly

distinguish between behaviors. Additional trainings for both teachers and clinicians may help students acquire the necessary resources needed in order to receive appropriate diagnoses. These trainings should integrate developmental knowledge to be able to detect the subtle differences between developmentally appropriate behavior and challenging behaviors in the classroom. Similarly, culturally sensitive training may integrate possible sociodemographic stressors that may appear as ADHD type symptoms but may be related to other challenges. These trainings may also provide teachers with a greater sense of understanding of their students, possibly improving the relationship between teachers and students with challenging behaviors. Trainings may also address possible biases and address identification and referrals from an anti-racist perspective.

Furthermore, education policy should consider mental health services and their integration within schools. Additional mental health counselors embedded within schools may provide additional support for teachers discerning difficult behaviors, while also providing another viewpoint of challenging behaviors. This integrative model may also help facilitate diagnoses by viewing a child in an area of impairment. Policy changes might also consider the age at which children are typically referred, considering that most children of color are not referred for treatment until puberty (CDC, 2020). Additionally, both the field of psychology and education might consider policy changes that respond to barriers to treatment for families of color, which may engage more families to pursue treatment.

Limitations and Future Directions

In addition to limitations previously discussed, this study's sample size was small,

limited by the use of one informant of behavior (teachers), had limited demographic variables, and included only one time point of analysis. Although significant, the interactions described were small and cannot be extrapolated beyond the population. As previous studies have suggested, longitudinal analyses of data may benefit when replicating these results, as it may provide more information regarding interactions at different developmental timepoints. This may also provide evidence to support different points of intervention for children with mental health needs.

While these results specifically addressed the achievement gap in reading achievement, additional studies might consider adding measures to evaluate other areas of learning in which the gaps in achievement widen throughout a child's education, such as STEM fields.

Given the mixed results in this study and additional studies, one might consider additional measures to account for different cultural or sociodemographic variables that may help to further understand the interaction between ADHD related behaviors in the classroom and academic achievement. Additional variables may also help to account for other environmental or sociocultural interactions that may affect a young child's mental health such as trauma, development, or language. In terms of Latino students specifically, variables addressing their particular ethnic identity, language, acculturation, and socioeconomic status may help account for interaction patterns that may be missed when using broad descriptors. Similarly, it would be beneficial to add demographic variables that consider a teacher's intersectional identities to further delineate between possible bias and difference in cultural values. Moreover, adding additional informant data from

parents, peers, or self-ratings, may continue to help delineate between behavioral nuances.

Furthermore, as this population of Latino students continues to be under identified in terms of identification and diagnosis, cultural awareness paired with developmental training for teachers and clinicians can help close the gap in achievement between children with ADHD symptoms and those without. For many children, school continues to be a gateway for access to mental health services, as it is the place where many are first identified. Intervention services to address inattentive behaviors at this early stage of development may result in improved reading ability and better achievement outcomes. Therefore, in order to properly assess and intervene early enough before the gap widens, disparities between populations increase, and achievement suffers, it is necessary to further understand and create pathways for access to care.

Conclusion

In conclusion, findings from the present study add to growing literature exploring the relationship of demographic variables with socioemotional variables in order to evaluate children's early academic experiences and achievement. Further, this study is consistent with previous literature (DuPaul et al., 1997, Rabiner et al., 2004) identifying a relationship between achievement and inattentive behaviors. This study identifies a period of development in which intervention may reduce inattentive behaviors and contribute to eliminating the gap in achievement between students. Given that inattention was particularly significant with Latino students and the larger sample of students, it is important that training of clinicians and teachers include methods of identifying these

symptoms in these populations. Finally, these results elucidate the continued need of awareness of mental health needs in underserved populations.

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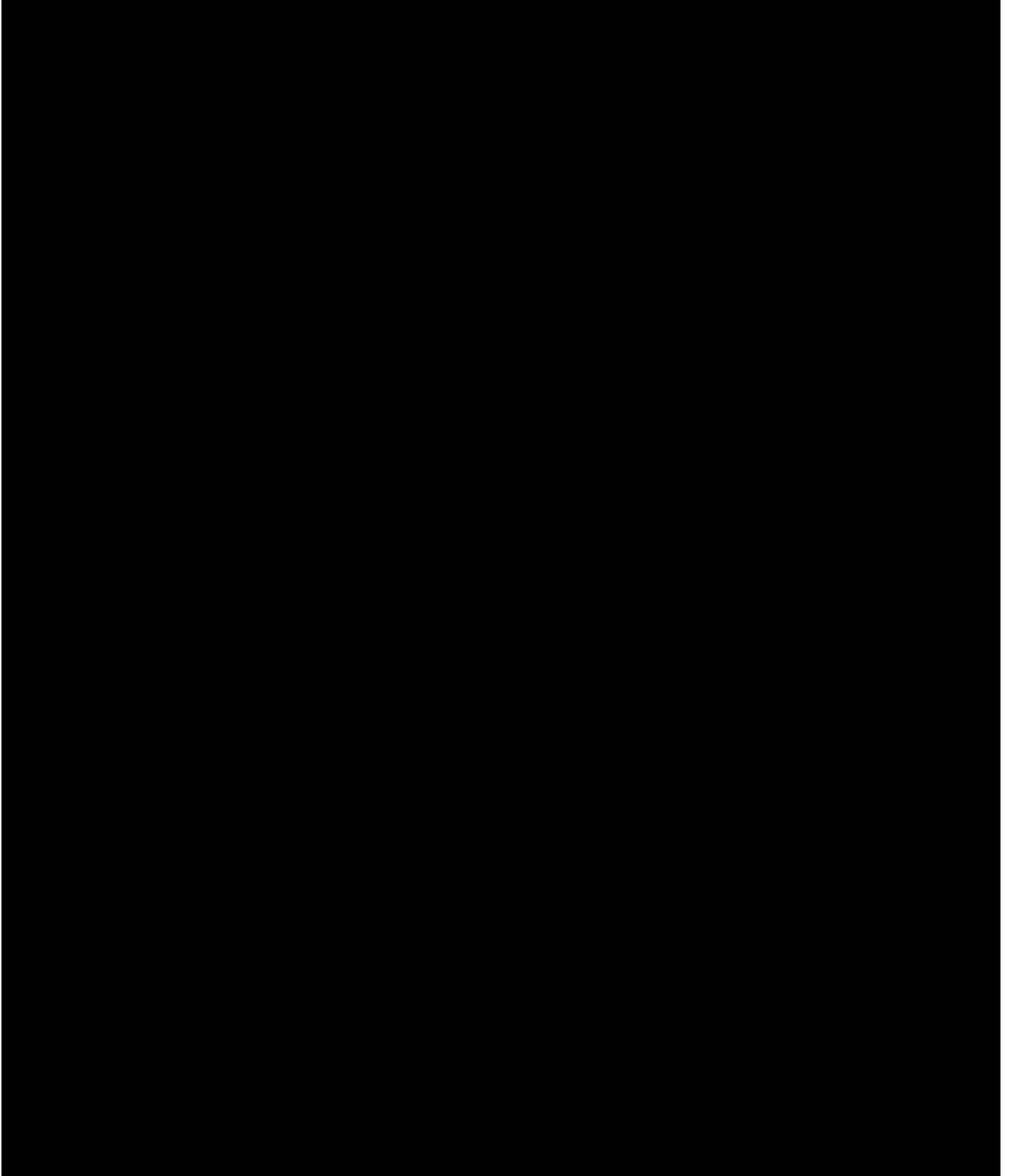
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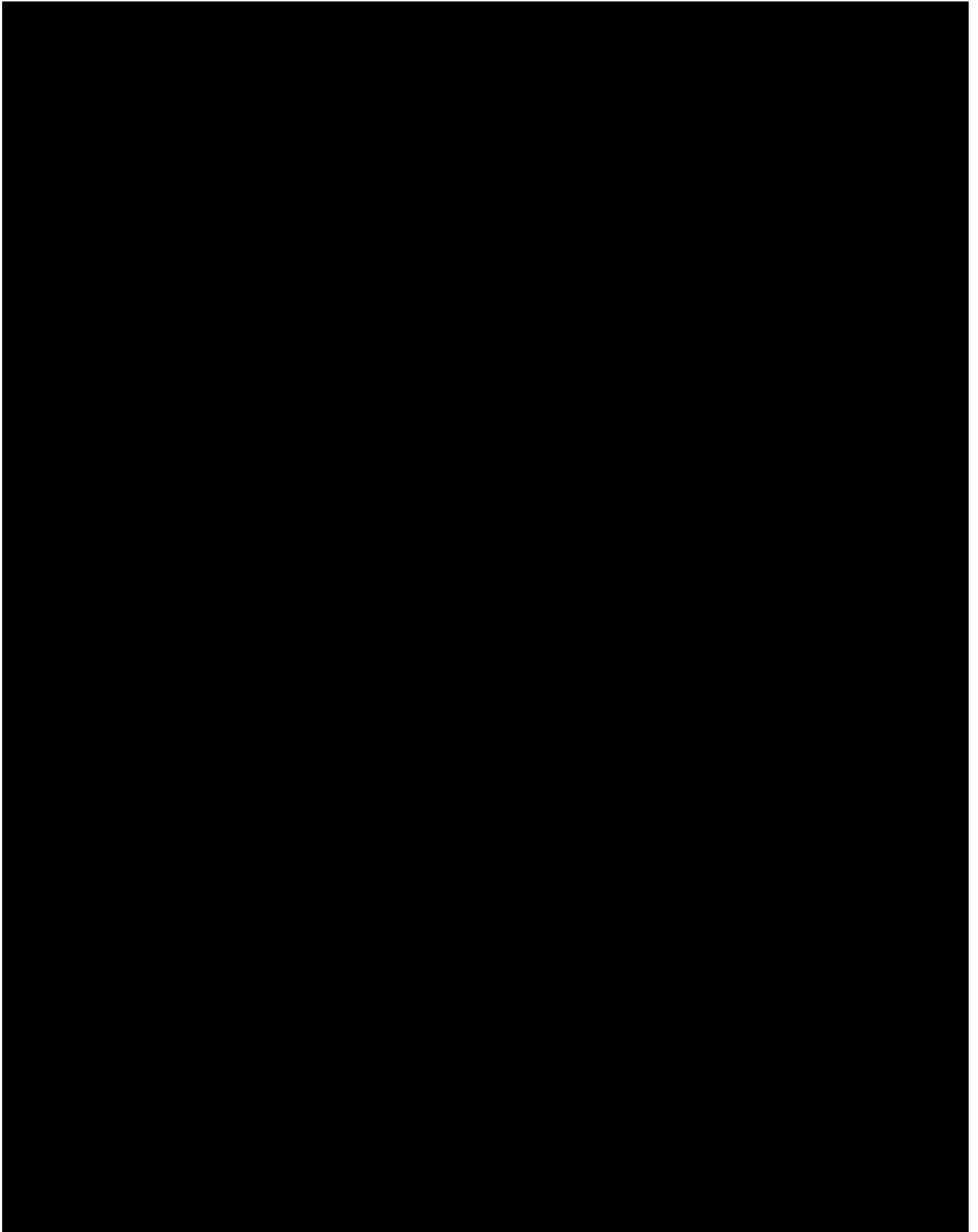
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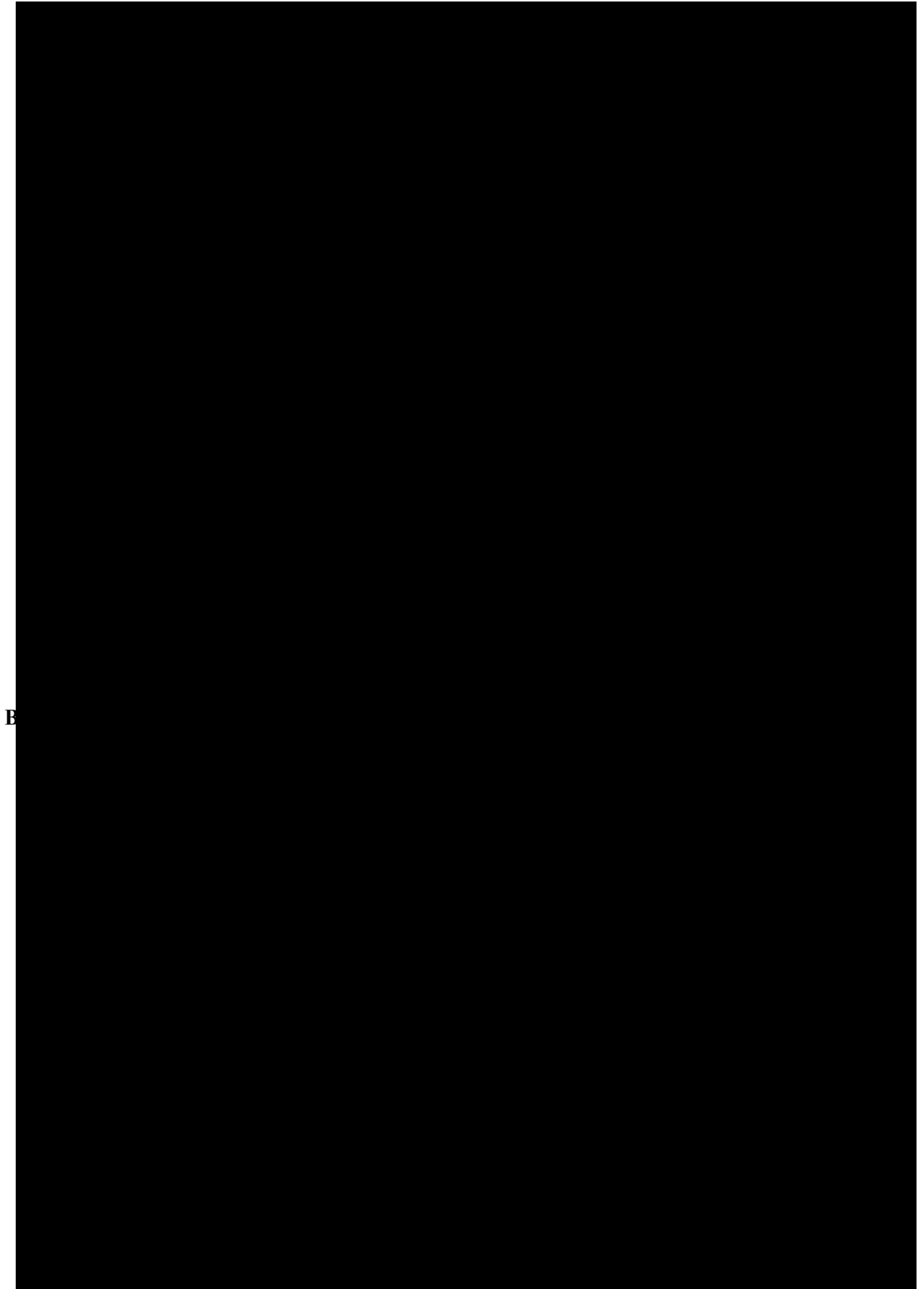
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