

ADHD AS A PREDICTOR OF SCHOOL ENGAGEMENT: IS RACE A MODERATOR?

By

Danielle Webb, LMSW

December 2024

Director of Thesis: Jeannie A. Golden, Ph.D./ BCBA-D

Major Department: Department of Psychology

ABSTRACT

Previous research indicates that there are racial disparities in diagnosing Attention Deficit and Hyperactivity Disorder (ADHD) and ADHD treatment. Specifically, Black children are diagnosed with ADHD less frequently than their white peers despite exhibiting more symptoms. Further, Black children receive fewer evidence-based treatments when compared to their white peers. Many studies are addressing ADHD racial disparities. However, only a few discuss the implications of these disparities on school engagement. Considering the symptoms of ADHD are particularly troubling in the school setting, the current research utilized data from the 2019 National Survey of Children's Health (NSCH) to determine if school engagement differed by race among children diagnosed with ADHD. The researchers conducted the current study to determine if there are disparities in ADHD diagnosis based on race and level of school engagement within this population. Data from the current study indicates no significant association between racial identity and frequency of ADHD diagnosis. Additionally, there is no difference in the level of school engagement for Black and white children diagnosed with ADHD. There was no interaction between race and ADHD diagnosis. Further, there was no predicted compounding impact on school engagement for students who were nonwhite and had

ADHD. There are discrepancies between the current study and previous research findings. Thus, more studies analyzing ADHD and social determinants of health, such as social environment or income, may contribute to what researchers know about ADHD disparities.

ADHD AS A PREDICTOR OF SCHOOL ENGAGEMENT: IS RACE A MODERATOR?

A Thesis

Presented To the Faculty of the Department Psychology

East Carolina University

In Partial Fulfillment of the Requirements for the Degree

Psychology M.A.

by

Danielle Webb, LMSW

December 2024

Director of Thesis: Jeannie A. Golden, PhD/BCBA-D

Thesis Committee Members:

Ascher K. Munion, PhD

Christy M. Walcott, PhD

© Danielle Webb, LMSW, 2024

TABLE OF CONTENTS

LIST OF TABLES	v
CHAPTER I: INTRODUCTION AND LITERATURE REVIEW	1
ADHD Overview	2
School Engagement & its relationship to ADHD	4
Behavioral Engagement	4
Emotional Engagement	5
Cognitive Engagement	6
ADHD's Effect on School Engagement in Black Children	7
Current Study	8
Aims & Hypotheses	9
CHAPTER II: METHOD	10
Participants	10
Measures	10
Procedures & Data Analysis	11
CHAPTER III: RESULTS.....	13
Description of Subsample	14
Computation of School Engagement	14
Hypothesis 1	15
Hypothesis 2	16
Hypothesis 3	16
CHAPTER IV: DISCUSSION.....	19
Summary of Findings.....	19

Limitations	21
Future Directions	21
REFERENCES	23

LIST OF TABLES

1. Demographic Characteristics of the Sample	13
2. Means, Standard Deviations, and Correlations with Confidence Intervals for School Engagement Items	15
3. Chi Squared Observed and Expected Frequencies for ADHD Treatment by Race	16
4. Regression Results of ADHD Diagnosis on School Engagement Criterion	17
5. Regression Results for ADHD Diagnosis, Race, and their Interaction on School Engagement	18

CHAPTER I: INTRODUCTION AND LITERATURE REVIEW

Six million children have been diagnosed with Attention Deficit/ Hyperactivity Disorder (ADHD) (CDC, 2022). However, Black children are less likely to receive an ADHD diagnosis when compared to white children. A meta-analysis reviewing racial differences among ADHD prevalence revealed Black children having more reported ADHD symptoms while only being diagnosed two-thirds as often as white children. Further, Black children are less likely than white children to receive evidence-based treatments when they are diagnosed with ADHD (Shippen et al., 2022). Data collected by the *National Household Survey of Children* indicated that disparities in ADHD treatment are a result of a lack of access, rather than utilization, among racial-ethnic minority populations (Yang et al., 2022). These data suggest that minoritized populations are not always granted the same opportunities for ADHD treatment as their counterparts. However, among all children diagnosed with ADHD, symptoms, comorbidities, and access to treatment vary, leaving an impact on how children engage at school (Ruston & Efron, 2020).

ADHD symptoms are vast. Children who are diagnosed with ADHD are affected by its symptoms in multiple settings, often more noticeable at school (Scahill & Schwab-Stone, 2000). In school settings, ADHD symptoms are often attributed as poor behavior among Black students (Kang & Harvey, 2020). In a study about the differences in perception of ADHD behavior, white teachers rated Black boy's ADHD behaviors significantly higher than Black parents (Kang & Harvey, 2020). The significant rating discrepancies between Black parents and white teachers suggest negative perception of Black boys with ADHD. We continue to see discipline disparities negatively impact Black students, creating difficult school experiences and unnecessary barriers in school engagement (Downey & Pribesh, 2004).

In the current study, my first aim was to determine if a diagnosis of ADHD is more common for white students than Black students. My second aim is to determine if a diagnosis of ADHD predicts the level of a student's school engagement. Finally, my third aim is to determine if race is a moderator in the potential relationship between an ADHD diagnosis and level of school engagement.

ADHD Overview

Children with ADHD may have difficulty paying attention, managing impulsive behaviors, and being overly active (CDC, 2022). These symptoms typically affect children in multiple settings—at home, with friends, and at school. Symptoms of ADHD can vary in severity (i.e., mild, moderate, or severe) and subtype (i.e., predominantly inattentive, predominantly hyperactive, and combined) (Epstein & Loren, 2013). In the school setting, hyperactive symptoms of ADHD may consist of fidgeting, being unable to remain seated, running or climbing in inappropriate situations, excessive talking, and interrupting conversations when others are speaking. Inattentive symptoms of ADHD may consist of incomplete assignments, poor planning, frequent errors, and trouble transitioning from activities. In a classroom study, students with ADHD showed lower levels of academic and behavioral engagement due to inattentive behaviors (Moreia et al., 2015). Fortunately, there are many evidence-based treatment options for children diagnosed with ADHD. Typical treatments consist of behavior therapy (e.g., play therapy and talk therapy), behavior management (e.g., behavior intervention plans for the classroom), medication (e.g., Adderall), organization skills training (e.g., Mastermind or Organizational Skills Training program), and parent training (e.g., Parent-Child Interaction Therapy (PCIT)) (CDC, 2023). A combined treatment approach of medication and behavior therapy has revealed the best outcomes (Hinshaw & Abikoff, 2007).

ADHD is prevalent across all ages and genders of children. According to the Centers for Disease Control and Prevention (CDC), boys were 6% more likely to be diagnosed with ADHD than girls (CDC, 2022). Among boys and girls, the percentage of children diagnosed with ADHD was greater with increasing age groups. Thus, adolescents are diagnosed with ADHD more frequently than children. Finally, there are racial discrepancies among children diagnosed with ADHD. In a study assessing the association between race/ethnicity and the diagnosis of ADHD, Asian, Black, and Hispanic children were significantly less likely to be diagnosed with ADHD when compared to white children (Shi et al., 2021).

It is common for children diagnosed with ADHD to experience comorbidities (Dol & Ferro, 2022). Comorbid with ADHD, children may experience internalizing disorders (e.g., anxiety and depression), externalizing disorders (e.g., conduct disorder and oppositional defiance disorder), and social deficits (e.g., bullying and poor emotion regulation) (Zendarski et al., 2017). Clinicians utilize evidence-based treatments for children diagnosed with ADHD (i.e., behavioral treatment, behavior therapy, medication, and social skills training) (CDC, 2023). Treatment for children with ADHD may vary depending on geographic location, access to resources, and willingness to participate in services. Roughly 90% of children with ADHD receive treatment and/or accommodation within their school setting (CDC, 2022). In 2014, more than half of children diagnosed with ADHD received behavioral treatment, less than half received social skills training, and less than a quarter received cognitive behavior therapy (CDC, 2022). Behavioral treatment may consist of behavior therapy, behavior intervention, parent behavior training, coaching, etc. (Ahmann & Tuttle, 2017). Social skills training may consist of teaching children problem-solving skills, how to maintain control of their emotions, and teaching verbal and non-verbal communication skills (Storebo et al., 2019). According to the CDC, 77% of

children with an ADHD diagnosis receive treatment (i.e., medication only, behavior therapy only, both) leaving the remaining 23% of children with ADHD without treatment (CDC, 2022). Though ADHD treatment options are vast, adequate access to care differs by race such that Black students are less likely to receive treatment than white students (Miller & Miller, 2009).

School Engagement & Its Relationship to ADHD

School engagement is a multifaceted concept; researchers have yet to rely on a single definition to describe it (Fredricks et al., 2004). Instead, studies have highlighted that school engagement is comprised of many components that sometimes overlap but work together to create this concept overall. School engagement has often been categorized into three subgroups—emotional, behavioral, and cognitive (Fredricks et al., 2004). In a classroom study, children diagnosed with ADHD demonstrated significantly lower rates of school engagement than their peers (Junod et al., 2006). School engagement is essential because it can lead to better academic outcomes, more positive school attitudes, and a greater likelihood of staying in school (Li & Xue, 2023).

Behavioral Engagement

Over many years, studies have defined behavioral engagement as participatory actions. Behavioral engagement involves participating in extracurricular, social, or academic activities. Participating in sports or extracurriculars at school is an example of behavioral engagement (Finn, 1993; Finn et al., 1995 as cited in Fredricks et al., 2004). Behavioral engagement can be measured in several ways. Behavioral engagement is most measured through task persistence, participation in class activities, homework completion, and test preparation (DiPerna & Volpe, 2002). In addition, the children's teachers or parents could be asked to complete a rating scale. Rating scales could assess the student's conduct, involvement in classwork and homework, and

participation in school activities (Fredricks et al., 2004). Observational methods could also be used to obtain data about behavioral engagement. The observational method provides data about the student's on-task and off-task behaviors. However, the limitation in obtaining observation data is that the observer will lack details about the student's level of thinking, effort, and participation beyond the observation timeframe. Likewise, stimming/fidgeting could be a coping mechanism that enables task completion but instead be observed as an off-task behavior.

Children diagnosed with ADHD may experience difficulties with behavioral engagement. A meta-analysis examined the long-term outcomes of childhood ADHD and found that ADHD is twofold associated with arrests, convictions, and incarcerations (Mohr-Jensen & Steinhausen, 2016). Fortunately, there are protective factors, such as involvement in extracurricular activities, that aid in behavioral engagement. Researchers targeted children with ADHD in a small, randomized control trial. They found that after-school activities focusing on psychosocial development effectively improved children's social functioning, hyperactivity, and academic progress (Lax et al., 2021). However, difficulties with social-emotional skills and absenteeism are prevalent among children with ADHD. Consequently, these factors may create barriers to becoming and remaining involved in extracurricular, social, or academic activities.

Emotional Engagement

Emotional engagement can be defined as student's positive and negative reactions at school that either motivate or fail to motivate them (Fredricks et al., 2004). Children diagnosed with ADHD may experience difficulties with emotional engagement. A study about the relationships between children's ADHD symptoms, student-teacher closeness, and emotional engagement, concluded that higher ADHD symptoms are associated with lower emotional engagement with school directly (Rushton et al., 2020). Further, survey results show that ADHD

symptoms impact emotional engagement by having a negative effect on a child's experience with school—anything from classroom motivation to extracurricular motivation (Fredricks et al., 2004). Emotional engagement can be measured through surveys (e.g., “Does this person try to do well at school?”) (Abbott et al., 1988). Many researchers assess emotional engagement by asking children their general feelings about their teacher or their school (Fredricks et al., 2004).

Assessing emotional engagement through surveys is typical across research, but there are various approaches to surveying depending on a child's age, ability level and comfort with the administrator. Emotional engagement is believed to be a precursor to behavioral and cognitive engagement (Rushton & Efron, 2020). Researchers believe that if we understand emotional engagement, this will help us understand behavioral and cognitive engagement.

Cognitive Engagement

Cognitive engagement can be defined as investment and motivation put forth in one's effort to learn (Rushton & Efron, 2020). In addition, cognitive engagement involves a willingness to apply the necessary effort to comprehend complex skills and ideas (Fredricks et al., 2004). Researchers often study cognitive engagement through assessing an individual's psychological investment (Fredricks et al., 2004). This often consists of the measurement of goals, task-focus, mastery, and self-surveys. In past studies, children have been given questionnaires that measure metacognition (i.e., setting goals, planning, and organizing), effort (i.e., work completion), and cognitive strategy (i.e., exchanging ideas, justifying answers, self-monitoring, etc.). Cognitive engagement and executive functioning have overlapping definitions. They both rely on inhibition control, attention skills, and prioritization skills, which are areas of difficulty for children with ADHD. Poor executive functioning skills may have implications for a child's cognitive engagement; thus, impacting their overall school

performance (Moody, 2016). Notably, correlations have been found between ADHD and poor executive functioning (Biederman et al., 2004; Langberg, Dvorsky, & Evans, 2013; Miller & Hinshaw, 2010). Despite some people's beliefs, ADHD does not impact a child's level of general intelligence (Loe & Feldman 2014). However, specific cognitive skills are implicated, such as processing speed, working memory, and planning (Coghill et al., 2018). The relationship between ADHD and cognitive engagement remains the least clear among researchers (Rushton & Efron, 2020).

ADHD's Effect on School Engagement in Black Children

School engagement has a protective relationship against declining achievement and school dropout, as well as other adverse outcomes such as emotional distress, suicidality, and low mood in teens (Nguyen et al., 2019). Black children diagnosed with ADHD face unique challenges compared to their white peers. Specifically, societal structures such as systemic racism may prevent school engagement from being a protective factor for some Black children. Further, Black students diagnosed with ADHD may be at a greater risk for school troubles than their white peers because symptoms of their ADHD, such as distractibility and poor focus, make class engagement more challenging and may be misinterpreted as purposefully disruptive behaviors. Contextually, Black students face suspensions twice as frequently as white students, which could result in lower levels of school engagement (Wald & Losen, 2003). Discipline disparities are the result of direct and indirect attitudes about Black students, and studies have found that teachers view Black students' behavior as more problematic than their white peers. In a study, teachers rated Black children's ADHD behaviors more severely than white children (Green et al., 2020). In addition, Black children are more likely than white children to be diagnosed with ADHD in conjunction with a behavioral disorder, such as oppositional defiance

disorder (ODD) or conduct disorder (CD). In contrast, white children were more likely than other children to be diagnosed with ADHD but not accompanied by any behavioral disorders (Visser et al., 2016). Other factors such as gender and socioeconomic status also result in a disadvantage for Black students in comparison to their peers. Researchers found that low-income Black male youth living in poverty and having ADHD are related to academic failure, higher rates of punishment, and an increase in disruptive behaviors (Tucker & Dixon, 2009).

As mentioned, there are disparities in treatment for Black children diagnosed with ADHD, when compared to white children. In a study analyzing the disparities among children diagnosed with ADHD, Black children were less likely than white children to receive special services for ADHD and Black children were more likely to be diagnosed with emotional disturbance (Mandell et al., 2008). Analyzing this system further proves poor implications for Black children. These data highlight that many Black children are at-risk of feeling unsafe, unwanted, and unprotected in their school and community. These experiences are linked to an increased risk of dropping out and/or encounters with the juvenile justice system. Black and Hispanic children who are diagnosed with ADHD are overrepresented in the juvenile justice system, accounting for more than 60% of juvenile offenders (Bailey & Ofoemezie, 2013).

Current Study

As reviewed above, children diagnosed with ADHD have a higher risk for academic difficulties and may also be at-risk for lower school engagement. Black children diagnosed with ADHD may be at an even greater risk, as their behaviors are often influenced by implicit racial bias. The current study will determine if there is a relationship between children diagnosed with ADHD and their level of school engagement. Further, the study will determine if race influences the relationship between ADHD diagnoses and level of school engagement.

Aims & Hypotheses

For the purpose of this study, the following aims will be addressed:

1. To determine if a diagnosis of ADHD is more common for white students than Black students in the NSCH sample.
2. To determine if having a diagnosis of ADHD predicts lower levels of school engagement in the NSCH sample.
3. To determine if race moderates the potential relationship between an ADHD diagnosis and level of school engagement in the NSCH sample.

Thus, my hypotheses are as follows:

- H1: I hypothesize that the diagnosis of ADHD will be more common for white students than for Black students in the sample.
- H2: I hypothesize that an ADHD diagnosis will be associated with lower levels of school engagement in the sample.
- H3: I hypothesize that the predicted difference in school engagement for those with ADHD (compared to those without ADHD) will be greater for Black students than for white students in the sample.

CHAPTER II: METHOD

Participants

The current study involve analysis of an existing, publicly-available dataset, the 2019 *National Survey of Children's Health* (NSCH). The NSCH is a household survey conducted annually by the United States Census Bureau and produces state and national level data about health status and health services needs of children across the nation. Details of the sampling and data collection procedures are available in the *2019 National Survey of Children's Health Methodology Report* (<https://www2.census.gov/programs-surveys/nsch/technical-documentation/methodology/2019-NSCH-Methodology-Report.pdf>). In 2019, 184,000 household addresses were used in the NSCH's national sample. One child from each household was randomly selected and the eligible child was then the subject of a more detailed topical questionnaire. Children ages reported on the NCHS survey ranged from 0 to 17 years old. In 2019, 68,5001 screener questionnaires were completed, and 35,760 were then eligible for a topical questionnaire follow-up. To conclude the NSCH survey, 29,433 households completed follow-up topical interviews.

Using the publicly available, de-identified dataset from the Census Bureau (<https://www.census.gov/programs-surveys/nsch/data/datasets.html>), the sample used for this study were Black and white children from the ages of 0 to 17. The final sample included 29,433 children with a mean age of 10-years-old. Additional demographic characteristics of the sample are reported in Table 1 and described in Chapter 3.

Measures

The following variables were assessed in the current study: sex, race, age, socioeconomic status, ADHD currently, currently taking ADHD medication, received behavioral treatment (past

12 months), conduct problems currently, and level of school engagement (i.e., conglomerate). Guardians were asked to complete demographic survey questions regarding their child's sex, race, age, and socioeconomic status. In addition, guardians were given dichotomous survey questions and asked to respond to the following question : “Does your child have current or lifelong health conditions from a list of 26 health conditions?”, “Does your child have ADHD currently?”, “Is this child currently taking medication for ADD or ADHD, age 3-17 years?”, “Does your child received behavioral treatment in the past 12 months?”, and “Does your child have conduct problems currently?”.

The engagement measure was comprised of three areas—emotional, behavioral, and cognitive. The first variable represents the emotional engagement component of school engagement — [cares_19] which represents “children who care about doing well in school”. Two variables represented behavioral engagement: 1) [homework_19] which represents “children who do all required homework” and 2) [sports_19] which represents “children participated in sports teams or sports lessons after school or on weekends. The fourth variable represents the cognitive engagement component of school engagement — [K7Q84_R] which represents “works to finish tasks started”. A Cronbach's alpha score was computed to test for reliability. Reliable Cronbach's alpha scores are as follows: above .90 is excellent reliability, above .80 is good reliability, above .70 is acceptable reliability, and above .60 is questionable reliability (Cronbach, 1951). In the current study, the school engagement measure had a Cronbach's alpha score of 0.81, which indicates good reliability.

Procedures & Data Analysis

Details of the sampling and data collection procedures are available in the *2019 National Survey of Children's Health Methodology Report* (<https://www2.census.gov/programs->

[surveys/nsch/technical-documentation/methodology/2019-NSCH-Methodology-Report.pdf](https://nces.ed.gov/ipeds/data/ntdes/nsch/technical-documentation/methodology/2019-NSCH-Methodology-Report.pdf)). For this study, the data were retrieved and downloaded using R Studio software. Descriptive analyses were calculated for study variables: sex, race, age, socioeconomic status, ADHD currently, currently taking ADHD medication, received behavioral treatment (past 12 months), conduct problems currently, and level of school engagement. A Cronbach's alpha coefficient was computed to determine the reliability of the outcome variable, school engagement. Listwise deletion was utilized for management of the missing data due to the large sample size. There was no indication of MNAR and due to the large sample size, the reduction power is not impactful.

There were three hypotheses for this research. Chi-square test of independence was computed to determine the first hypothesis of if the predicted diagnosis of ADHD was more common for white students than for Black students in the NSCH study. Linear regression was computed to analyze the second hypothesis of the relationship between race, ADHD diagnosis, and level of school engagement. Finally, linear regression was also computed to analyze the third hypothesis of if the predicted difference in school engagement for those with ADHD would be greater for Black students than for white students.

CHAPTER III: RESULTS

Description of Subsample

Descriptive analyses were calculated for study variables: sex, race, age, socioeconomic status, ADHD currently, currently taking ADHD medication, received behavioral treatment (past 12 months), conduct problems currently, and level of school engagement. These are reported in Table 1.

Table 1

Demographic Characteristics of the Sample

	Black		White		Full Sample	
	N	%	N	%	N	%
Sex						
Male (1)	715	37.8%	8226	40.3%	15323	52.1%
Female (2)	688	36.4%	7299	35.8%	14110	47.9%
Age						
≤7 years old	526	27.8%	5580	27.4%	10895	37%
8-12 years old	388	20.5%	4264	20.9%	8088	27.5%
13-17 years old	371	19.6%	5681	27.8%	10450	35.5%
Socioeconomic Status						
0-199% FLP	307	16.2%	3774	18.5%	8124	27.6%
200-299% FLP	231	12.2%	2509	12.3%	4806	18.2%
300-399% FLP	270	14.3%	2544	12.5%	4519	15.4%
400% FLP or greater	595	31.4%	6698	32.8%	11984	40.7%
ADHD Diagnosis						
Yes	148	7.8%	1564	7.7%	2732	9.3%
No	1073	56.7%	12050	59.1%	22995	78.1%

**Taking ADHD
Medication**

Yes	68	3.6%	746	3.7%	1336	4.5%
No	104	5.5%	1019	5.0%	1776	6.0%

**Receiving Behavior
Treatment**

Yes	71	3.8%	681	3.3%	1277	4.3%
No	77	4.1%	883	4.3%	1455	4.9%

Conduct Problems

Yes	91	4.8%	1018	5.0%	1875	6.4%
No past diagnosis	22	0.1%	258	1.3%	473	1.6%
No	1108	58.6%	12404	60.8%	23489	79.8%

**Level of School
Engagement**

*Participates in Sports
Teams*

Yes	352	18.6%	3962	19.4%	7792	26.5%
No	630	33.3%	7228	35.4%	13169	44.7%

Note. Percentages are based on row totals within each variable. They may not sum to 100% due to rounding.

Computation of School Engagement

To assess whether the school engagement indicators should be used as outcomes in separate models or combined into a single composite, we examined correlations between items and the reliability of the four-item total score. All items were strongly and significantly correlated, as shown in Table 2. Further, the items demonstrated acceptable internal consistency reliability, by both Cronbach's alpha ($\alpha = .81$) (Cronbach, 1951) and by McDonald's omega ($\omega = .76$) (Hayes & Coutts, 2020). Thus, the composite School Engagement score was used for analyses.

Table 2

Means, standard deviations, and correlations with confidence intervals for school engagement items

Variable	<i>M</i>	<i>SD</i>	1. Care	2. Homework	3. Finish Task
1. Care	1.57	0.73			
2. Homework	1.57	0.74	.69** [.68, .69]		
3. Finish Task	1.83	0.70	.54** [.53, .55]	.54** [.52, .55]	
4. Sports	1.35	0.48	.15** [.13, .16]	.16** [.15, .18]	.13** [.12, .15]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014).

** indicates $p < .01$.

Hypothesis 1

I hypothesized that the reported diagnosis of ADHD will be more common for white students than for Black students. There was no significant association between ADHD diagnosis and race ($\chi^2(1) = .447, p = .504$). As a post hoc analysis (specified after the data were seen), I examined if race was associated with receiving behavioral treatment for ADHD. In this sample, the proportion of Black students with ADHD receiving behavioral treatment was higher than expected and the proportion of White students receiving behavioral treatment was lower than expected ($\chi^2(2) = 12.18, p = .002$). See Table 3 for observed and expected frequencies.

Table 3*Chi Squared Observed and Expected Frequencies for ADHD Treatment by Race*

Observed	White Students	Black Students
ADHD with Treatment	903	110
ADHD without Treatment	1127	81
No ADHD	15833	1475
Expected	White Students	Black Students
ADHD with Treatment	926.58	86.42
ADHD without Treatment	1104.95	103.05
No ADHD	15831.47	1476.53

Hypothesis 2

I hypothesized that an ADHD diagnosis would be associated with lower levels of school engagement. As shown in Table 4, the association between having an ADHD diagnosis and school engagement was statistically significant due to the large sample size (slightly higher school engagement for those without ADHD), but it only accounted for a trivial amount of variance in school engagement ($R^2 = 0.0064$, $F[1,2296] = 14.7723$, $p = 0.0001$).

Hypothesis 3

I hypothesized that the predicted difference in school engagement for those with ADHD (compared to those without ADHD) would be greater for Black students than for white students. When adding ADHD diagnoses and the interaction between race and school engagement, there was no significant increase in variance accounted for ($\Delta R^2 = 0.0022$, $F[2,2294]$, $F = 2.52$, $p = .081$). Coefficients for the model are displayed in Table 5. Further displayed in Table 5, race

was the only significant predictor of school engagement, with Black students still having a lower predicted school engagement. There was a significant difference in school engagement between Black and white students. On average, Black students had lower engagement than white students. As shown by the functionally trivial squared semi-partial correlation, this difference accounted for no variance and was likely only statistically significant due to the large sample size.

Table 4

Regression Results of ADHD Diagnosis on School Engagement Criterion

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	Fit
(Intercept)	8.13**	[8.03, 8.22]			
ADHD Diagnosis	-0.64**	[-0.96, -0.31]	.01	[.00, .01]	
					<i>R</i> ² = .006** 95% CI[.00,.01]

Note. A significant *b*-weight indicates the semi-partial correlation is also significant. *b* represents unstandardized regression weights. *sr*² represents the semi-partial correlation squared. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

** indicates *p* < .01.

Table 5*Regression Results for ADHD Diagnosis, Race, and their Interaction on School Engagement*

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	Fit
(Intercept)	7.37**	[6.66, 8.07]			
ADHD Diagnosis	-0.58	[-2.88, 1.73]	.00	[-.00, .00]	
Race	0.37*	[0.03, 0.70]	.00	[-.00, .01]	
ADHD Diagnosis: Race	-0.03	[-1.12, 1.05]	.00	[-.00, .00]	
					<i>R</i> ² = .009** 95% CI[.00,.02]

Note. A significant *b*-weight indicates the semi-partial correlation is also significant. *b* represents unstandardized regression weights. *sr*² represents the semi-partial correlation squared. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively.

* Indicates *p* < .05. ** indicates *p* < .01.

CHAPTER IV: DISCUSSION

Summary of Findings

In the current study, we replicated the finding that there is a disparity between Black and white student's level of school engagement, but there was no difference in engagement between students with and without an ADHD diagnosis and no interaction between diagnosis and race as was hypothesized. Other researchers have linked this disparity in school engagement to discipline disparities and lower-quality education in urban schools. Scholars have forwarded many reasons for lower, on average, school engagement among students of color (e.g., Konold et al., 2017). These include perceptions of school climate, lower connectedness with school, and greater concerns about safety than White peers. However, Konold and colleagues also found that building a positive school climate promotes student engagement across racial groups (Konold et al., 2017).

We expected to find that a diagnosis of ADHD would be associated with race based on some estimates in the literature that Black students are underdiagnosed. However, we found there was no significant association between an ADHD diagnosis and race in this sample. Based on this composition, ADHD diagnosis was not associated with race, but this finding does not rule out the interaction in the population. In the U.S., diagnosis of ADHD has increased from 1997 to 2016, after which rates seem to have leveled off (Li et al., 2023). With increased attention on the diagnosis of ADHD, physicians and other diagnosticians have improved methods to identify ADHD across racial groups. More research is needed to examine racial differences in diagnostic patterns. In the current study, we found that, on average, Black students had lower school engagement than white students. However, the effect size was small and warrants further testing

under alternative characterizations of school engagement and more nuanced conceptualization of racial identity.

Finally, we expected to find that the predicted difference in school engagement for those with ADHD (compared to those without ADHD) would be more significant for Black students than for white students; however, we found no significance interaction between race and ADHD diagnosis in school engagement. Based on this measure of school engagement, there is no difference between racial groups regarding the presence of ADHD. Educators frequently attribute Black student's ADHD symptoms to poor behavior (Kang & Harvey, 2020). School personnel need to be aware of the biases that exist against Black students and provide necessary support for black students' symptoms of ADHD, not see them as indications of poor behavior. In the current study, we found that race was associated with receiving behavioral treatment, such that the proportion of Black students with ADHD receiving behavioral treatment was higher than expected, and the proportion of white students receiving behavioral treatment was lower than expected. When Black students are diagnosed with ADHD, school personnel should consider a variety of evidence-based treatments, such as behavioral treatment and medication, instead of relying solely on behavioral interventions. Further, using a large national dataset like the NSCH means that my sample might reflect nationwide trends rather than local trends. This could fail to highlight differences that might be more noticeable in specific regions or communities. Finally, school engagement is influenced by many factors like family support, school environment, and peer relationships, thus race and diagnosis may not be the main factor influencing engagement, especially if these other factors play a bigger role in student's school experience. My findings might suggest that while there are disparities in ADHD diagnosis and school engagement, they may simply be less noticeable in large, diverse samples.

Limitations

Initial psychometric tests confirmed good reliability for the school engagement measure (Cronbach's $\alpha > .70$), however, more advanced analyses, such as examining the impact and differential item functioning of the measures, were not conducted. This could have potentially presented biases across different groups. Future research should address these limitations by conducting comprehensive psychometric evaluations to ensure the measures are both reliable and equitable across diverse populations. Additionally, further work should also examine if the lack of expected associations persists across other samples and alternative characterizations of school engagement. The data collection method also presented limitations, because the current study depends solely on parent reports which could be subject to bias. Finally, the conglomerate school engagement measure, although proven reliable, may not capture all aspects of school engagement.

Future Directions

Future directions beyond the current study may be to gain more information by analyzing the disparity between Black and white students' level of school engagement that is not a result of having an ADHD diagnosis or not having an ADHD diagnosis. Further, replicating the analysis and controlling for income could suggest a systemic correlation between ADHD and school engagement. Notably, the current study found that race is associated with receiving behavioral treatment, such that the proportion of Black students with ADHD receiving behavioral treatment was higher than expected, and the proportion of white students receiving behavioral treatment was lower than expected. Further, future studies re-examining the hypotheses in a propensity-score matched sample so that racial identity is the only difference between comparison groups. Finally, future studies could also explore subpopulations or look at the impact of different

interventions and community support on school engagement for children with ADHD. In sum, these findings highlight the need to further explore the complexities of ADHD and school engagement, and how schools can ensure equitable support for marginalized students.

REFERENCES

- Abbott, R. D., O'Donnell, J., Hawkins, J. D., Hill, K. G., Kosterman, R., & Catalano, R. F. (1998). Changing teaching practices to promote achievement and bonding to school. *American Journal of Orthopsychiatry*, 68(4), 542-552.
- Ahmann, E., Saviet, M., & Tuttle, L. J. (2017). Interventions for ADHD in children and teens: A focus on ADHD coaching. *Pediatric Nursing*, 43(3), 121-126.
- Bailey, R. K., & Ofoemezie, E. K. (2013). The impact of attention deficit/hyperactivity disorder in African Americans; current challenges associated with diagnosis and treatment. *Attention Deficit Hyperactivity Disorder in Children and Adolescents*, 193-206.
- Brock, L. L., Rimm-Kaufman, S. E., Nathanson, L., & Grimm, K. J. (2009). The contributions of “hot” and “cool” executive function to children’s academic achievement, learning-related behaviors, and engagement in kindergarten. *Early Childhood Research Quarterly*, 24(3), 337-349.
- Blumenfeld, P. C., Kempler, T. M., & Krajcik, J. S. (2006). Motivation and cognitive engagement in learning environments. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 475-488). Cambridge University Press.
- Centers for Disease Control and Prevention (CDC). (2022). Data and statistics about ADHD. <https://www.cdc.gov/ncbddd/adhd/data.html>
- Centers for Disease Control and Prevention (CDC). (2023). Treatment of ADHD. <https://www.cdc.gov/ncbddd/adhd/treatment.html>
- Coghill, D., Toplak, M., Rhodes, S., & Adamo, N. (2018). Cognitive functioning in ADHD: Inhibition, memory, temporal discounting, decision-making, timing, and reaction time

- variability. In T. Banaschewski, D. Coghill, & A. Zuddas (Eds.), *Oxford Textbook of Attention Deficit Hyperactivity Disorder* (pp. 94-102). Oxford University Press.
- Coker, T. R., Elliott, M. N., Toomey, S. L., Schwebel, D. C., Cuccaro, P., Tortolero Emery, S., & Schuster, M. A. (2016). Racial and ethnic disparities in ADHD diagnosis and treatment. *Pediatrics*, 138(3).
- Cree, R. A., Bitsko, R. H., Danielson, M. L., Wanga, V., Holbrook, J. R., Flory, K., & Cuffe, S. P. (2023). Surveillance of ADHD among children in the United States: Validity and reliability of parent report of provider diagnosis. *Journal of Attention Disorders*, 27(2), 111-123.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *psychometrika*, 16(3), 297-334.
- DiPerna, J. C., & Volpe, R. J. (2002). A model of academic enablers and elementary reading/language arts achievement. *School Psychology Review*, 31(3), 298-312.
- Dol, M., Reed, M., & Ferro, M. A. (2022). Internalizing–Externalizing comorbidity and impaired functioning in children. *Children*, 9(10), 1547. <https://doi.org/10.3390/children9101547>
- Downey, D. B., & Pribesh, S. (2004). When race matters: Teachers' evaluations of students' classroom behavior. *Sociology of Education*, 77(4), 267-282.
- Epstein, J. N., & Loren, R. E. (2013). Changes in the definition of ADHD in DSM-5: Subtle but important. *Neuropsychiatry*, 3(5), 455-457.
- Fredricks, J. A., Blumenfeld, P., Friedel, J., & Paris, A. (2005). School engagement. In K. A. Moore & L. H. Lippman (Eds.), *What do children need to flourish? Conceptualizing and measuring indicators of positive development* (pp. 305-321). Springer.

- Gold, M. E., & Richards, H. (2012). To label or not to label: The special education question for African Americans. *Educational Foundations*, 26, 143-156.
- Green, C. D., Dvorsky, M. R., Langberg, J. M., Jones, H. A., & Floyd, A. L., Jr. (2020). The impact of social determinants of health on the efficacy of school-based interventions for adolescents with ADHD. *School Mental Health*, 12(3), 580-594.
- Groves, N. B., Kofler, M. J., Wells, E. L., Day, T. N., & Chan, E. S. (2020). An examination of relations among working memory, ADHD symptoms, and emotion regulation. *Journal of Abnormal Child Psychology*, 48, 525-537.
- Hayes, A. F., & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. *Communication Methods and Measures*, 14(1), 1-24.
- Hinshaw, S. P., Klein, R. G., & Abikoff, H. (2007). Childhood attention deficit hyperactivity disorder: Non-pharmacological treatments and their combination with medication. In P. E. Nathan & J. M. Gorman (Eds.), *A Guide to Treatments That Work* (3rd ed., pp. 3–27). Oxford University Press.
- Junod, R. E. V., DuPaul, G. J., Jitendra, A. K., Volpe, R. J., & Cleary, K. S. (2006). Classroom observations of students with and without ADHD: Differences across types of engagement. *Journal of School Psychology*, 44(2), 87-104.
- Kang, S., & Harvey, E. A. (2020). Racial differences between Black parents' and White teachers' perceptions of attention-deficit/hyperactivity disorder behavior. *Journal of Abnormal Child Psychology*, 48, 661-672.

- Konold, T., Cornell, D., Shukla, K. *et al.* (2017). Racial/Ethnic Differences in Perceptions of School Climate and Its Association with Student Engagement and Peer Aggression. *Journal of Youth and Adolescence*, **46**, 1289–1303.
<https://doi.org/10.1007/s10964-016-0576-1>
- Langberg, J. M., Dvorsky, M. R., & Evans, S. W. (2013). What specific facets of executive function are associated with academic functioning in youth with attention-deficit/hyperactivity disorder? *Journal of Abnormal Child Psychology*, *41*(7), 1145-1159.
- Lax, Y., Brown, S. N., Silver, M., & Brown, N. M. (2021). Associations between participation in after-school activities, attention-deficit/hyperactivity disorder severity, and school functioning. *Journal of Developmental and Behavioral Pediatrics*, *42*(4), 257-263.
- Li, J., & Xue, E. (2023). Dynamic interaction between student learning behaviour and learning environment: Meta-analysis of student engagement and its influencing factors. *Behavioral Sciences*, *13*(1), 59. <https://doi.org/10.3390/bs13010059>
- Li, Y., Yan, X., Li, Q., et al. (2023). Prevalence and trends in diagnosed ADHD among US children and adolescents, 2017-2022. *JAMA Network Open*, *6*(10), e2336872.
<https://doi.org/10.1001/jamanetworkopen.2023.36872>
- Loe, I. M., & Feldman, H. M. (2014). Academic and educational outcomes of children with ADHD. *Children's Hospital of Pittsburgh, University of Pittsburgh School of Medicine*.
- Mandell, D. S., Davis, J. K., Bevans, K., & Guevara, J. P. (2008). Ethnic disparities in special education labeling among children with attention-deficit/hyperactivity disorder. *Journal of Emotional and Behavioral Disorders*, *16*(1), 42-51.

- Miller, M., & Hinshaw, S. (2010). Does childhood executive function predict adolescent functional outcomes in girls with ADHD? *Journal of Abnormal Child Psychology*, 38(3), 315-326.
- Miller, T. W., Nigg, J. T., & Miller, R. L. (2009). Attention deficit hyperactivity disorder in African American children: What can be concluded from the past ten years? *Clinical Psychology Review*, 29(1), 77-86.
- Mohr-Jensen, C., & Steinhausen, H. C. (2016). A meta-analysis and systematic review of the risks associated with childhood attention-deficit hyperactivity disorder on long-term outcomes of arrests, convictions, and incarcerations. *Clinical Psychology Review*, 48, 32–42.
- Moody, M. (2016). From under-diagnoses to over-representation: Black children, ADHD, and the school-to-prison pipeline. *Journal of African American Studies*, 20, 152-163.
- Moreira, P. A., Bilimória, H., Pedrosa, C., de Fátima Pires, M., de Jesus Cepa, M., de Deus Mestre, M., ... & Serra, N. (2015). Engagement with school in students with special educational needs. *International Journal of Psychology and Psychological Therapy*, 15(3), 361-375.
- Morgan, P. L., Staff, J., Hillemeier, M. M., Farkas, G., & Maczuga, S. (2013). Racial and ethnic disparities in ADHD diagnosis from kindergarten to eighth grade. *Pediatrics*, 132(1), 85-93.
- Nguyen, M. N., Watanabe-Galloway, S., Hill, J. L., Siahpush, M., Tibbits, M. K., & Wichman, C. (2019). Ecological model of school engagement and attention-deficit/hyperactivity disorder in school-aged children. *European Child & Adolescent Psychiatry*, 28, 795-805.

- Rushton, S., Giallo, R., & Efron, D. (2020). ADHD and emotional engagement with school in the primary years: Investigating the role of student–teacher relationships. *British Journal of Educational Psychology*, 90, 193-209.
- Scahill, L., & Schwab-Stone, M. (2000). Epidemiology of ADHD in school-age children. *Child and Adolescent Psychiatric Clinics of North America*, 9(3), 541-555.
- Shippen, N., Horn, S. R., Triage, P., Chronis-Tuscano, A., & Meinzer, M. C. (2022). Understanding ADHD in Black adolescents in urban schools: A qualitative examination of factors that influence ADHD presentation, coping strategies, and access to care. *Evidence-Based Practice in Child and Adolescent Mental Health*, 7(2), 213-229.
- Storebø, O. J., Andersen, M. E., Skoog, M., Hansen, S. J., Simonsen, E., Pedersen, N., ... & Gluud, C. (2019). Social skills training for attention deficit hyperactivity disorder (ADHD) in children aged 5 to 18 years. *Cochrane Database of Systematic Reviews*(6).
- Tucker, C., & Dixon, A. (2009). Low-income African American male youth with ADHD symptoms in the United States: Recommendations for clinical mental health counselors. *Journal of Mental Health Counseling*, 31(4), 309–322.
- Visser, S. N., Deubler, E. L., Bitsko, R. H., Holbrook, J. R., & Danielson, M. L. (2016). Demographic differences among a national sample of US youth with behavioral disorders. *Clinical Pediatrics*, 55(14), 1358-1362.
- Wald, J., & Losen, D. J. (2003). Defining and redirecting a school-to-prison pipeline. *New Directions for Youth Development*, 2003(99), 9-15.
- Yang, K. G., Flores, M. W., Carson, N. J., & Cook, B. L. (2022). Racial and ethnic disparities in childhood ADHD treatment access and utilization: Results from a national study. *Psychiatric Services*, 73(12), 1338-1345.

- Zablotsky, B. (2020). Racial and ethnic differences in the prevalence of attention-deficit/hyperactivity disorder and learning disabilities among U.S. children aged 3–17 years. *National Center for Health Statistics*. NCHS Data Brief, no 358.
- Zendarski, N., Sciberras, E., Mensah, F., & Hiscock, H. (2017). Early high school engagement in students with attention/deficit hyperactivity disorder. *British Journal of Educational Psychology*, 87(2), 127-145.