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EFFECTS OF PEER RELATIONSHIPS AND ATTITUDES TOWARDS SCHOOL ON  
ACADEMIC ACHIEVEMENT WITHIN AN ATTENTION-DEFICIT/HYPERACTIVITY  
POPULATION

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## ABSTRACT

**Objective:** ADHD is often associated with poor peer relationship quality, negative attitudes towards school, and lower academic achievement. Poor peer relationship quality has been associated with lower academic achievement, but this relationship has not been exclusively studied within an ADHD population. The purpose of this study will be to examine the association of peer relationships with academic achievement and determine if attitudes towards school has an influence on this relationship within an ADHD population. **Methods:** Children with and without ADHD completed assessments of Math, Spelling, and Reading achievement and self-reported their attitudes towards school. Teachers completed questionnaires regarding their students' peer relationship quality. **Results:** Children with ADHD performed worse on academic achievement assessments, reported more negative attitudes towards school, and had lower peer relationship quality based on teacher report. Peer relationship quality did not directly predict academic achievement. However, attitudes towards school partially explained the relationship between ADHD status and Math achievement. Peer relationship quality also partially explained the relationship between ADHD status and attitudes towards school. **Conclusion:** These findings suggest that lower academic achievement in children with ADHD is not solely the result of cognitive deficits. Lower academic achievement is attributed to social components of the disorder, specifically poor peer relationship quality and attitudes towards school.

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## Introduction

### *Attention-Deficit/Hyperactivity Disorder*

Attention-Deficit/Hyperactivity Disorder (ADHD) is a psychiatric disorder commonly diagnosed in children that often lasts into adulthood. This disorder frequently co-occurs with other psychological disorders and can have a profound impact on normal psychological development and on multiple domains of daily functioning throughout childhood. ADHD is marked by inattentiveness, hyperactivity and impulsivity, or a combination of these three characteristics (American Psychiatric Association [APA], 2013). A child must exhibit symptoms for a period of at least 6 months in at least two different settings. Symptoms of ADHD exist on a continuum with the normal population experiencing some of these symptoms to an extent. Symptoms must be debilitating to the child's overall functioning based on his developmental level to qualify for an ADHD diagnosis (APA, 2013).

ADHD is divided into three presentations: predominately inattentive, predominately hyperactive/impulsive, and combined (APA, 2013). While ADHD is considered a single disorder, the presentations are used primarily to explain the different behavioral manifestations of the disorder among patients. The predominately inattentive presentation is characterized by symptoms such as high distractibility, inability to stay organized, and difficulty remaining focused on tasks (APA, 2013). The predominately hyperactive/impulsive presentation is characterized by symptoms such as talking excessively, fidgeting constantly, and interrupting conversation (APA, 2013). The *Diagnostic and Statistical Manual of Mental Disorders-V* requires that a child exhibit at least six of the symptoms characterized by each presentation in order to be diagnosed with one presentation over the others (APA, 2013). Fewer criteria are required to be met for diagnosis of an adolescent or adult. If the criteria are met for both the inattentive presentation and the hyperactive/impulsive presentation, then a diagnosis of the combined presentation is given (APA, 2013). Compared to boys, girls are more than twice as likely to be

diagnosed with the inattentive presentation (Biederman et al., 2002) which is likely explained by less exhibited externalizing behavior problems in girls (Gaub & Carlson, 1997).

Symptoms of ADHD are typically noticed by either teachers or caregivers based on behavior exhibited in the classroom, at home, or in both settings. Teachers often report academic underachievement, disruptive classroom behavior, inattentiveness, and poor social relationships in school (Homer et al., 2002). Teachers especially notice hyperactivity and impulsivity as they create the most classroom disruption (Homer et al., 2002).

ADHD also co-occurs with a wide array of other psychological disorders. ADHD has been found to be comorbid with both internalizing disorders such anxiety and mood disorders and externalizing disorders such as Conduct Disorder and Oppositional Defiant Disorder (Biederman, Newcorn, & Sprich, 1991; Jensen, Martin, & Cantwell, 1997). Comorbidity rates with learning disabilities can range anywhere between 10-92% (Biederman et al., 1991).

Overall, symptoms of ADHD are evident in multiple domains of daily functioning in children diagnosed with this disorder. Children with ADHD suffer not only from behavioral deficits but from social and academic deficits as well. Therefore, ADHD is a multifaceted disorder that can hinder proper childhood development.

### *Prevalence*

ADHD is the most common neurobehavioral disorder to be diagnosed in children (Homer et al., 2000). Studies have shown that 4-12% of the school-aged population (Homer et al., 2000), or 1 in 20 children are affected by this disorder (Faraone, Sergeant, Gillberg, & Biederman, 2003). Recent research has shown that prevalence rates in the United States are comparable to rates worldwide with 6-12% of children diagnosed with ADHD (Biederman & Faraone, 2005). Boys are more likely to be diagnosed with ADHD as compared to girls with a ratio of 2:1 (Polanczyk et al., 2007). More boys are referred to treatment than girls as demonstrated by a higher ratio of boys to girls diagnosed with ADHD in clinical

samples (Biederman & Faraone, 2005) and more severe exhibited symptoms and greater overall impairment in boys (Gaub & Carlson, 1997).

### *Long-Term Outcomes*

Research indicates that about 80% of children with ADHD exhibit symptoms into adulthood (Faraone et al., 2003), and an estimated 4.4% of the adult population has ADHD (Kessler et al., 2006). Symptoms of ADHD in childhood such as inattentiveness, disorganization, impulsivity, and hyperactivity remain largely persistent and continue to influence psychological dysfunction into adulthood (Wilens, Biederman, & Spencer, 2002).

Problems associated with ADHD in childhood often translate into similar difficulties during adulthood. Both academic achievement deficits and social dysfunction have proven to be persistent across the lifespan (Bagwell, Molina, Pelham, & Hoza, 2001; Greene, Biederman, Faraone, Sienna, & Garcia-Jetton, 1997; Nijmeijer et al., 2008). ADHD in adults is associated with higher rates of unemployment (Kessler et al., 2006) and lower occupational status which has been linked to academic maladjustment during childhood (Parker & Asher, 1987). Similar to childhood ADHD, comorbidity remains high through adulthood with Conduct Disorder, Depression, and Bipolar Disorder being some of the most common comorbidities (Wilens et al., 2002). Moreover, women with adult ADHD are more likely to have comorbid mood and anxiety disorders whereas men are more likely to have antisocial disorders and substance abuse problems (Biederman et al., 1994). Additionally, social dysfunction is persistent (Greene et al., 1997) and has been associated with increased substance abuse, internalizing disorders, and Conduct Disorder (Greene et al., 1997).

### *Academic Achievement*

ADHD may impair academic achievement in children. Children with ADHD are often characterized as academic underachievers and receive poorer grades in school (Merrell et al., 2001). Children with ADHD are also more likely to repeat a grade at school and use additional educational services to supplement traditional schooling such as special education classes, tutoring, and after-school

programs (Biederman et al., 1996; Barry, Lyman, & Klingler, 2002; Loe & Feldman, 2007). Trends of lower academic achievement are also evident in laboratory settings based on impaired performance on standardized achievement tests in both reading and math (Barry et al., 2002; Biederman et al., 2002; Biederman et al., 2004; Clark, Prior, & Kinsella, 2002; Mariani & Barkley, 1994; Rapport, Scanlan, & Denney, 1999).

Children with ADHD demonstrate academic underachievement at a very young age. Preschoolers with ADHD symptoms demonstrate overall lower academic achievement (DuPaul, McGoey, Eckert, & VanBrackle, 2001) and have significant skill acquisition lags in both reading and arithmetic (Mariani & Barkley, 1994). Academic underachievement was previously believed to be associated with environmental factors associated with formal schooling (Mariani & Barkley, 1994). Findings of lower academic achievement in children prior to entering elementary school show that academic underachievement is an inherent part of ADHD and not a result of other secondary factors (Mariani & Barkley, 1994).

ADHD is associated with academic difficulties that cannot be solely attributed to the presence of comorbid disorders. No group differences in academic achievement have been found between children with ADHD and other comorbid disorders and children with ADHD alone (Barry et al., 2002; Biederman et al., 1996). More specifically, externalizing disorders with comorbid ADHD are predictive of academic underachievement whereas externalizing disorders on their own are not (Clark et al., 2002; Rapport, Scanlan, & Denney, 1999).

Academic underachievement in children with ADHD can be explained by both cognitive and behavioral deficits associated with the disorder. Rapport, Scanlan, and Denney (1999) developed a Dual Pathway Model that evaluated the mediating effects of behavioral and cognitive variables on the relationship between ADHD, IQ, and academic achievement. This model suggests that both classroom behavior and memory processes are mediators of ADHD and academic achievement (Rapport et al., 1999). To further support this idea, Clark, Prior, and Kinsella (2002) attributed reading difficulties in

children with ADHD to cognitive deficits on the executive level based on associations between reading level and scores on executive function tests. These cognitive deficits were found to likely contribute to the relationship between behavioral symptoms and lower reading abilities in children with ADHD (Clark, Prior, & Kinsella, 2002). Children diagnosed with the Predominately Inattentive or Combined presentations of ADHD are more likely to suffer from cognitive deficits (Schmitz et al., 2002) and demonstrate increased academic impairment (Gaub & Carlson, 1997; Merrell & Tymms, 2001). In contrast to Predominately Inattentive and Combined presentation children, Hyperactive/Impulsive children do not show any significant differences in learning or academic achievement as compared to children without ADHD (Gaub & Carlson, 1997; Merrell & Tymms, 2001). Thus, lower academic achievement in children with ADHD must be attributed to a combination of both cognitive and behavioral deficits.

The number and severity of externalizing behavioral symptoms and cognitive deficits can exacerbate the extent of lower academic achievement in children with ADHD. Increased number of ADHD behavioral symptoms is associated with lower academic achievement (Barry et al., 2002; Merrell & Tymms, 2001). Behavioral severity is suggested to be responsible for a significant amount of the discrepancy between predicted academic performance based on IQ and actual academic performance in children with ADHD (Barry et al., 2002). Children who exhibit more severe behavioral symptoms are likely to suffer from increased academic impairment (Barry et al., 2002). Coupled with ADHD, executive function deficits (EFD) might also further exacerbate academic underachievement. Children with ADHD and comorbid EFD performed worse in reading and arithmetic academic outcomes as compared to ADHD children without EFD (Biederman et al., 2004). Children with EFD were more also more likely to be diagnosed with a learning disorder and to repeat a grade (Biederman et al., 2004). As a result, children with ADHD and co-occurring EFD and severe behavioral deficits are at a further disadvantage regarding academic performance.

### *Peer Relationships*

Children with ADHD often have poorer social functioning than children without ADHD which results in difficulty forming and maintaining relationships with their peers (Mikami & Lorenzi, 2011). These children are often disliked by their non-ADHD peers, which can lead to rejection, social isolation, and unpopularity (Hinshaw, Zupan, Simmel, Nigg, & Melnick, 1997; Hoza et al., 2005). They are also less likely to receive positive sociometric nominations from non-ADHD peers (Hoza et al., 2005; Mikami & Lorenzi, 2011). Mikami and Lorenzi (2011) found that children with ADHD were not as positively rated by children without ADHD after a first-time interaction within a lab-based playgroup for a short period of time. Therefore, difficulties with peer interaction seem to take place in multiple settings regardless of the amount of time spent with other children (Hoza, 2007). As a result of these trends in social relationships, children with ADHD commonly do not have many friends or any friends at all (Blachman & Hinshaw, 2002; Hoza et al., 2005).

Children with ADHD often demonstrate aggressive and hyperactive/impulsive behaviors within their social interactions which often lead to further peer rejection and conflict (Hinshaw et al., 1997; Melnick & Hinshaw, 2000; Mikami & Lorenzi, 2011). Intrusive externalizing behaviors such as interrupting their peers and inappropriately starting a conversation out of context often lead to peer rejection (Nijmeijer et al., 2008). Aggressive externalizing behaviors and conduct problems are significantly related to negative sociometric nominations for boys with ADHD which demonstrates that more overt and observable antisocial behavior is more likely to influence how these children are rated by their peers (Hinshaw et al., 1997). Girls with ADHD also demonstrate increased aggression within their peer relationships but are more likely to engage in relational aggression in addition to overt aggression (Blachman & Hinshaw, 2002; Mikami, Lee, Hinshaw, & Mullin, 2008). Relational aggression refers to actions such as excluding peers and spreading rumors with the intention of emotionally hurting someone without causing any physical harm. Thus, both boys and girls with ADHD often exhibit aggression within their peer relationships which contributes to their social dysfunction.

Research has suggested that children with ADHD may not realize their social incompetence regarding their peer relationships. Children with ADHD cannot accurately assess their own social dysfunction based on modest relationships between child self-report and peer reports of social competence (Ostrander, Crystal, & August, 2006). However, as children enter late childhood and adolescence, their self-appraisals begin to more accurately reflect how their peers rate them in terms of social competence (Ostrander et al., 2006). Self-appraisals of aggression within peer relationships are also more accurate upon entering adolescence (Mikami et al., 2008). Specifically, self-report of overt aggression in girls with ADHD was found to be predictive of aggressive responses to hypothetical social situations, which indicates that the behavior of adolescent girls with ADHD is consistent with their own self-assessments (Mikami et al., 2008).

Emotion regulation deficits have been attributed to the underlying relationship between ADHD and poor peer relationships (Melnick & Hinshaw, 2000). Peer interactions of children with ADHD are often characterized by increased emotional reactivity (Barkley, 1997). Emotion regulation, or the ability to control one's emotions, requires both flexible attention and behavioral inhibition, which are skills that children with ADHD have difficulty mastering (Melnick & Hinshaw, 2000). Barkley (1997) attributes deficits in these skills needed for emotion regulation to difficulties in executive functioning. Decreased emotion regulation is related to social dysfunction through its relationship to increased symptoms of impulsivity and hyperactivity, negative emotionality, and aggression (Melnick & Hinshaw, 2000). Interestingly, emotion regulation has been found to be contingent on the presence of aggression and not on the presence of ADHD symptoms alone (Melnick & Hinshaw, 2000).

Inattention has also been shown to contribute to social deficits within peer relationships (Andrade, Brodeur, Waschbusch, Stewart, & McGee, 2009; Pope, Bierman, & Mumma, 1991). Pope, Bierman, and Mumma (1991) suggest that inattentive children might not acquire social skills as quickly as other children and are developmentally behind in terms of appropriate social behavior. Specifically, deficits in sustained and selective attention contribute to social problems (Andrade et al., 2009).

Difficulties with sustained attention inhibit children with ADHD from focusing on extended conversation and interaction with their peers, which could be perceived as a lack of interest by other children (Andrade et al., 2009). Children with ADHD who have difficulty with selective attention might be less likely to attune to relevant social cues causing inappropriate social responses (Andrade et al., 2009). Thus, children with ADHD have difficulty adjusting their behavior for appropriate social interaction (Nijmeijer et al., 2008).

Children with ADHD often suffer from peer stigmatization within their social relationships (Harris, Milich, Corbitt, Hoover, & Brady, 1992; O'Driscoll, Heary, Hennessey, & McKeague, 2012). Children who are labeled with ADHD are highly stigmatized regardless of the severity of symptoms presented (Harris et al., 1992). Within dyadic interactions, children who were forewarned that their partner had ADHD were more likely to rate the child with ADHD more negatively even if that child did not exhibit significant ADHD symptoms (Harris et al., 1992). Providing a stigmatizing label can lead to a self-fulfilling prophecy of peer rejection and overall stigmatization (Harris et al., 1992). This peer stigmatization of ADHD increases as children reach adolescence (O'Driscoll et al., 2012). Adolescents are more likely to hold their peers responsible for their ADHD and to report wanting to limit social interaction with these peers (O'Driscoll et al., 2012). Therefore, children with ADHD are likely to be stigmatized and rejected throughout their development.

#### *Influence of Peer Relationships on Academic Achievement*

Peer relationships can have a significant impact on academic achievement in all children, including those children with ADHD. Because schools and classrooms can be considered social settings, poor peer relationships might negatively influence academic achievement (Parker & Asher, 1987; Ryan, 2000). Students are highly influenced by their peers and tend to associate with other students that hold similar beliefs regarding academic performance and involvement (Berndt & Keefe, 1995; Ryan, 2000). Peer influence has shown to be predictive of academic achievement as reflected in students' grades (Ide, Parkerson, Haertel, & Walber, 1981). Specifically, declines in students' grades are often associated with

declines in their friends' grades (Berndt & Keefe, 1995). The quality and number of reciprocated friendships also contributes to academic achievement; more positive peer relationships are associated with increased academic performance (Cauce, 1986). However, further investigation into this relationship within an ADHD population is needed.

Dropout rates among adolescents, in addition to academic performance, are often used to assess academic maladjustment because they suggest both poor peer relationships and low academic achievement (Kupersmidt, 1983; Ollendick, Weist, Borden, & Greene, 1992; Parker & Asher, 1987). Moreover, adolescents with ADHD are more likely to drop out of school (Kent et al., 2010; Parker & Asher, 1987). Again, peer relationships have an impact on academic achievement and can possibly exacerbate dropout rates in adolescents with ADHD.

#### *Attitudes towards School*

Children's overall attitudes towards school can have an impact on academic achievement and can be influenced by multiple characteristics of learning in a school setting. Attitudes towards school can be assessed through engagement in a school setting (Appleton, Christenson, & Furlong, 2008; Simons-Morton & Chen, 2009). Specifically, Simons-Morton and Chen (2009) divided the concept of school engagement into three dimensions: motivational, behavioral, and emotional. The motivational component includes wanting to perform well in school. The behavioral component refers to the overall effort put forth by the students through class participation and involvement in school activities. The emotional component refers to students' feelings towards their school and peers. All of these components can be used to assess overall attitudes towards school, especially within an ADHD population.

Motivation to perform well in school can vary between students with and without ADHD. Lack of motivation in children with ADHD is seen through their preference for easy work and their low threshold for discouragement when work becomes too difficult (Carlson, Booth, Shin, & Canu, 2002). These children also have low self-appraisals of their academic expectations and competencies, which are often reflected in their low academic achievement (Carlson et al., 2002; Ramey, Lanzi, Phillips, &

Ramey, 1998). Thus, low motivation in children with ADHD is often characterized by an overall disliking of learning and a negative attitude towards school (Carlson et al., 2002). However, motivation can additionally be influenced by the people students encounter at home, in school, and throughout the community as they assess the importance of performing well in school (Ramey et al., 1998). Children with ADHD are driven to perform well in school through external feedback from teachers and peers rather than through their own internal motivations (Carlson et al., 2002). Therefore, support from peers could increase self-competency resulting in increased motivation to perform well in school (You, 2011).

The behavioral engagement aspect of attitudes towards school refers to involvement and participation in school activities (Simons-Morton & Chen, 2009). Berndt and Keefe (1995) found that teacher ratings of student involvement were predictive of the involvement of students' friends. Students who described their peer relationships more positively also reported more school involvement whereas students who did not view their peer relationships as positively reported less involvement (Berndt & Keefe, 1995). Research on these trends in an ADHD population is currently lacking. However, literature shows that children with ADHD are less involved in school and have fewer positive peer relationships (Berndt & Keefe, 1995; Blachman & Hinshaw, 2002; Hoza et al., 2005)

The emotional aspect of attitudes towards school refers to how children feel about school and their peers. Ramey, Lanzi, Phillips, and Ramey (1998) found that children who reported less positive attitudes towards school were five times more likely to report that they did not have positive peer relationships with other students at school. Thus, school ratings and experiences are strongly influenced by positive peer relationships (Berndt & Keefe, 1995; You, 2011). These trends have also been found within populations of special needs children, including those with ADHD (McCoy & Banks, 2012). Compared to other specific special needs diagnoses, children with ADHD were the largest group to be significantly more likely to report that they never like school (McCoy & Banks, 2012). Therefore, children with ADHD are more likely to have negative attitudes towards school.

In summary, understanding the relationship between peer relationships and academic achievement is important for the future development of children with ADHD. Research has established that poor peer relationships significantly predict lower academic achievement, but this relationship has not been extensively studied within an ADHD population. Further, research lacks in the examination of the effects of attitudes towards school within this relationship. The goal of this research study will be to examine if attitudes towards school can explain why peer relationships affect academic achievement within an ADHD population.

*Hypothesis 1:* Children with ADHD will perform more poorly on Math, Spelling, and Reading, will have lower teacher report of peer relationships, and will have more negative self-report of attitudes towards school.

*Hypothesis 2:* The hypothesized model of this study can be found in Figure 1.

2a. ADHD status will not predict academic achievement over and above attitudes towards school. Specifically, the relationship between ADHD status and academic achievement for Math, Spelling, and Reading is explained by attitudes towards school.

2b. ADHD status will not predict academic achievement over and above peer relationships. Specifically, the relationship between ADHD status and academic achievement for Math, Spelling, and Reading is explained by peer relationships.

2c. ADHD status will not predict attitudes towards school over and above peer relationships. Specifically, the relationship between ADHD status and attitudes towards school is explained by poor peer relationships.

2d. Peer relationships will not predict academic achievement over and above attitudes towards school. Specifically, the relationship between peer relationships and academic achievement is explained by attitudes towards school.

## Methods

### *Participants*

This study consisted of 221 children between the ages of 8 and 12 both with and without a history of attention problems. 155 children were given ADHD status while 66 children were classified as control participants. The sample consisted of 124 boys and 97 girls. Within the ADHD group, there were 96 boys and 59 girls; within the control group, 28 boys and 38 girls. The approximate ethnic distribution of the sample was 76% Caucasian/Non-Hispanic, 4% Caucasian Hispanic, 8% African American/Non-Hispanic, 1% African American/Hispanic, 1% Other Hispanic, 1% Asian, and 8% mixed race/ethnicity. These children were recruited from State College, Pennsylvania; Harrisburg, Pennsylvania; and the surrounding areas through printed advertisements and a research study volunteer database established by the Pennsylvania State University.

### *Screening/Data Collection Procedure*

Eligibility to participate was determined by a screening process throughout three phases of the study. In the first phase of the study, parents completed a phone interview to provide basic demographic and health information about their children. Children were deemed ineligible to participate if they had been previously diagnosed with a pervasive developmental disorder such as Autism, a neurological disorder, an intellectual disability, a learning disability, or a sensorimotor deficit. This procedure avoided including children with pre-existing cognitive deficits that could be attributed to the above disorders rather than ADHD itself. Children were also required to speak English as their first language. Additionally, children taking medication for attention problems were asked to not take the medication 24-48 hours prior to the first laboratory visit to allow for an accurate measurement of how ADHD affects performance on cognitive tasks. Lastly, only one child per family could participate in the study; children were deemed ineligible if a sibling had previously participated.

The second phase of the study consisted of a set of questionnaires sent to both the parent and teacher of the participating child that assessed the child's thoughts, feelings, and behaviors. These questionnaires included the Behavior Assessment Scale for Children-Second Edition (BASC-2), the Social Skills Rating System (SSRS), the Conner's Rating Scale-Revised (CRS-R), and the ADHD Rating Scale-IV.

The BASC-2 contains parent-specific and teacher-specific forms that measure observable behaviors in school and at home or in community settings (Reynolds & Kamphaus, 2004). The parent form of the questionnaire consists of 160 items that are measured on a 4-point Likert scale from "Never" to "Almost Always" (Reynolds & Kamphaus, 2004). The teacher form consists of 139 items that are measured on the same scale. The SSRS also contains parent-specific and teacher-specific forms that measure behavior and interpersonal skills on a 3-point Likert scale from "Never" to "Very Often" (Gresham & Elliot, 1990). The parent form contains 38 items while the teacher form contains 39 items. At this phase in the study, only teachers completed the SSRS; parents completed the parent version during their first laboratory visit.

The ADHD Rating Scale-IV measures the symptoms of ADHD based on the diagnostic criteria set forth in the *DSM-IV Text Revision* (DuPaul, Power, Anastopoulos, & Reid, 1998). The questionnaire consists of 18 items measured on a 4-point Likert scale from "Never or Rarely" to "Very Often" (DuPaul et al., 1998). Half of the items measure symptoms of inattention while the other half measure symptoms of hyperactivity/impulsivity (DuPaul et al., 1998). The Conners' Rating Scale-Revised also assesses ADHD and comorbid disorders based on symptoms set forth in the *DSM-IV Text Revision* (Conners, 2000). Parents completed the long-form version consisting of 80 items measured on a 4-point Likert scale ranging from "Not True At All" to "Very Much True" (Conners, 2000). Teachers completed the short-form version consisting of 28 items measured on the same scale (Conners, 2000).

For a child to be assigned ADHD status, both the parent and the teacher must endorse at least three symptoms of inattention, at least three symptoms of hyperactivity/impulsivity, OR four combined

symptoms of inattention and hyperactivity/impulsivity on the ADHD Rating Scale-IV. These children must also be above the 85<sup>th</sup> percentile for the inattention and hyperactivity/impulsivity subscales on both the BASC-2 and the CRS-R.

For a child to be assigned to the control group, parent and teacher report on the ADHD Rating Scale-IV must consist of less than three symptoms of inattention, less than four symptoms of hyperactivity/impulsivity, OR less than three combined symptoms of inattention and hyperactivity/impulsivity. These children must also be below the 80<sup>th</sup> percentile for the inattention and hyperactivity/impulsivity subscales on both the BASC-2 and the CRS-R.

After children were assigned ADHD or control status, they were brought into the laboratory for two, three-hour visits. During these visits, children completed a battery of neuropsychological assessments consisting of tasks from the Wechsler Intelligence Scale for Children-IV (WISC-IV); tasks from the Wechsler Individual Achievement Test-Third Edition (WIAT-III); and tasks from the Wide Range Assessment of Memory and Learning-Second Edition (WRAML-II). Children also completed the Children's Depression Inventory (CDI) and the Multidimensional Anxiety Scale for Children (MASC) to self-assess their depression and anxiety symptoms.

While the children completed the neurological battery of tasks, the parents completed the Diagnostic Interview Schedule for Children-Version IV (DISC-IV). The DISC-IV is clinical computerized interview that assesses the presence of 34 psychiatric disorders commonly diagnosed in children and adolescents (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). Parents reported their children's thoughts, feelings, and behaviors in the past month, the past year, or the child's entire life to identify any possible psychological diagnoses (Shaffer et al., 2000). Results of the DISC determined final ADHD status classification for the participating children. Parents also completed the Behavior Rating Index of Executive Function (BRIEF), the Parent SSRS, and other questionnaires on their children's developmental and treatment histories. Eligibility to complete a second laboratory visit was contingent upon the child's Full-Scale Estimated IQ which had to be greater than 80 and less than 110.

### *Consent and Compensation*

Before any data was collected for this study, consent was obtained from parents for their children to participate. Parents also provided consent to their children's teachers to complete the questionnaires regarding the participating children. At the beginning of the first laboratory visit, child verbal assent was obtained and parents signed consent forms prior to beginning any assessments. Teachers were compensated with \$10 gift cards for completing the questionnaires during the screening procedure. Parents who completed the questionnaires but were deemed ineligible to participate also received \$10 gift cards. Parents and children who completed the first laboratory visit in State College received \$30 gift cards while participants in Harrisburg received \$50. If both laboratory visits were completed, participants received \$100 gift cards.

### *Academic Achievement*

Academic achievement was measured through the Word Reading, Numerical Operations, and Spelling subtests of the WIAT-II and the WIAT-III. These tasks assessed reading, math, and spelling skills respectively (Wechsler, 2009). Scaled scores from either the WIAT-II or the WIAT-III were collapsed into one variable for each subtest to allow for a more comprehensive variable of academic achievement.

### *Peer Relationships*

The Teacher Peer Relations Scale is a 10-item questionnaire completed by teachers that assesses quality of peer relationships through measured social skills, problem behaviors, and academic competence (Gresham and Elliott, 1990). The first five items measure observable student social behavior on a 4-point frequency scale from "Never" to "Very Often" (Gresham and Elliott, 1990). The sixth item assesses the proportion of students that like the evaluated student on a 5-point scale from "Very Few" to "Almost All" (Gresham and Elliott, 1990). The last four items measure the likelihood that peers of the assessed student would like to be near him. These items are measured on a 4-point scale ranging from "None" to "Most" (Gresham and Elliott, 1990).

*Attitudes towards School*

Children's attitudes towards school were measured through self-report using the Children's Depression Inventory (CDI). The questionnaire contains 28 items generated to measure children's feelings towards school and other settings in which the children are frequently exposed (Kovacs, 1992). Each item consists of three statements describing three general feelings or attitudes towards the situation measured in each item. These statements are then measured on a 3-point numerical scale.

In this study, a summary score of three items from the CDI were combined to measure attitudes towards school ( $\alpha = .663$ ). The measure included item 15 (I have to push myself all the time to do my schoolwork; I have to push myself many times to do my schoolwork; Doing schoolwork is not a big problem), item 21 (I never have fun at school; I have fun at school only once in a while; I have fun at school many times), and item 23 (My schoolwork is alright; My schoolwork is not as good as before; I do very badly in subjects I used to be good in). The combined score of these items indicate attitudes towards school with higher scores representing more positive attitudes and lower scores representing less positive attitudes. For consistent scoring purposes, item 23 was reversed scored. The three items specifically assessed motivation in school, schoolwork performance, and fun in school.

## Results

### *Test of Hypothesis 1*

Measures of academic achievement, peer relationships, and attitudes towards school for ADHD and control participants were submitted to a one-way participant Analysis of Variance (ANOVA). All means and standard deviations for ANOVA analyses can be found in Table 1. Children with ADHD had lower academic achievement than children without ADHD as indicated by performance on the Numerical Operations ( $F(1, 219) = 10.359, p = .001, \eta_p^2 = .045$ ) and the Spelling ( $F(1, 219) = 5.197, p = .024, \eta_p^2 = .023$ ) subtests of the WIAT. However, there were no significant group differences of academic achievement between ADHD and control participants based on performance on the Word Reading subtest ( $F(1, 219) = 1.816, p = .179, \eta_p^2 = .008$ ). Teachers rated children with ADHD on the TPRS as having greater peer relationship impairment than children without ADHD ( $F(1, 219) = 108.608, p < .001, \eta_p^2 = .332$ ). Children with ADHD also self-reported more negative attitudes towards school ( $F(1, 206) = 20.411, p < .001, \eta_p^2 = .090$ ) based on their responses on the CDI.

### *Test of Hypothesis 2*

All correlation values can be found in Table 2. Peer relationships was positively correlated with attitudes towards school ( $r = .301, p < .001$ ) but was not predictive of academic achievement for Numerical Operations ( $r = .124, p = .066$ ), Word Reading ( $r = .030, p = .662$ ), or Spelling ( $r = .082, p = .225$ ). Attitudes towards school was positively correlated with Numerical Operations ( $r = .267, p < .001$ ) but not Spelling ( $r = .127, p = .067$ ) or Word Reading ( $r = .120, p = .084$ ) subtests of the WIAT.

Regression analyses results can be found in Table 3 and the study's model can be found in Figure 2. Math achievement was used as the dependent variable because it was the only measure of achievement that was correlated with either attitudes towards school or peer relationships.

2a. ADHD status predicted academic achievement over and above attitudes towards school for the Numerical Operations ( $\Delta r^2 = .027, p < .001$ ) subtest of the WIAT. More specifically, the presence of ADHD accounted for an additional 2.7% variance in academic achievement measured by Numerical Operations over and above variance accounted for by attitudes towards school. Specifically, the relationship between ADHD status and Math achievement is partially explained by attitudes towards school. Attitudes towards school was not correlated with Spelling or Reading achievement.

2b. Peer relationships were not predictive of academic achievement in any domain (all  $r$ 's  $< .12$ , see Table 2). Peer relationships does not explain the relationship between ADHD and academic achievement.

2c. ADHD status predicted attitudes towards school over and above peer relationships ( $\Delta r^2 = .023, p < .001$ ). ADHD accounted for an additional 2.3% variance in attitudes towards school above and beyond variance accounted for by peer relationships. Specifically, the relationship between ADHD status and attitudes towards school is partially explained by poor peer relationships.

2d. Peer relationships were not associated with academic achievement in any domain (all  $r < .012$ ), see Table 2. Attitudes towards school does not explain the relationship between peer relationships and academic achievement.

## Discussion

### *Summary*

The purpose of this study was to examine the relationship between peer relationships and academic achievement within an ADHD population. More specifically, the study aimed to determine if attitudes towards school can explain why peer relationships might influence academic achievement. Preliminary analyses indicated that children with ADHD have greater peer relationship impairment, more negative attitudes towards school, and lower academic achievement in Math and Spelling achievement. Results also showed that positive peer relationships are associated with more positive attitudes towards school and that positive attitudes towards school were found to be associated with higher Math (but not Reading or Spelling) achievement. However, while peer relationships were predictive of attitudes towards school, they were not directly predictive of academic achievement in any domain.

### *Hypothesis 1*

The study expected to find group differences for academic achievement, peer relationships, and attitudes towards school between children with and without ADHD. Previous research has found that children with ADHD demonstrate lower academic achievement in all domains, but this study found that children with ADHD demonstrated lower academic achievement only in Math and Spelling (Barry et al., 2002; Clark, Prior, & Kinsella, 2002; Mariani & Barkley, 1994; Rapport, Scanlan, & Denney, 1999). Participants of the study were limited to those with an FSIQ greater than 80 but less than 110 which could have contributed to the lack of group differences in all areas of academic achievement. The study aimed to compare children with and without ADHD who were similar in terms of their intelligence level, so they were matched in terms of FSIQ. Perhaps if the FSIQ range had been broadened, group differences for all areas of academic achievement would have been found instead of just Math and Spelling.

Findings that children with ADHD have greater peer relationship impairment are consistent with previous research (Blachman & Hinshaw, 2002; Hinshaw, Zupan, Simmel, Nigg, & Melnick, 1997; Hoza et al., 2005; Mikami & Lorenzi, 2011). The present study found that children with ADHD are less likely to be well-liked by their peers and demonstrate overall social skill deficiencies as measured by the TPRS. While research assessing the relationship between ADHD and attitudes towards school is currently lacking, this study's findings that children with ADHD have more negative attitudes towards school is consistent with what little research that has been conducted (McCoy & Banks, 2012). Findings in this present study indicate that children with ADHD report lower motivation in school, lower schoolwork performance, and less fun in school in comparison to children without ADHD.

### *Hypothesis 2*

It was predicted that associations between peer relationships, attitudes towards school, and academic achievement would be found in this study. However, significant relationships were only found between peer relationships and attitudes towards school and between attitudes towards school and academic achievement as measured by the Numerical Operations subtest of the WIAT. Surprisingly, there was no direct relationship between peer relationships and Math achievement. However, previous research has indicated that academic achievement is influenced by peer relationships, but this study did not replicate such findings (Berndt & Keefe, 1995; Cauce, 1986; Ide, Parkerson, Haertel, & Walber, 1981; Parker & Asher, 1987; Ryan, 2000).

The positive relationship between peer relationships and attitudes towards school is consistent with previous research that suggests that children who have less positive peer relationships are less likely to have positive attitudes towards school (Berndt & Keefe, 1995; Ramey, Lanzi, Phillips, and Ramey, 1998). This study's finding that attitudes towards school are predictive of academic achievement is also consistent with previous research; however, this study only found predictions of Math achievement (Carlson et al., 2002; Ramey, Lanzi, Phillips, & Ramey, 1998). Because peers can influence a student's motivation and attitudes towards school, those attitudes are then reflected in their academic performance.

The study found that the presence of ADHD predicted academic achievement over and above the influence of attitudes towards school on its own. There was a direct relationship between ADHD and Math achievement as well as significant relationships between ADHD and attitudes towards school and attitudes towards school and Math achievement. Hierarchical regression analysis showed that attitudes towards school partially explains the relationship between ADHD and Math achievement because ADHD continued to predict Numerical Operations when attitudes towards school was in the model. This finding demonstrates that attitudes towards school in combination with the presence of ADHD can better account for the prediction of Math achievement than attitudes towards school on its own. These results can explain why there are group differences in Math achievement between children with and without ADHD. While group differences were initially found for Spelling, a hierarchical regression was not examined because Spelling achievement was not found to be associated with attitudes towards school in earlier analyses.

Results of the study indicate that the presence of ADHD predicts attitudes towards school over and above the influence of peer relationships on its own. There was a direct relationship between ADHD and attitudes towards school as well as significant relationships between ADHD and peer relationships and peer relationships and attitudes towards school. Hierarchical regression analysis showed that peer relationships partially explain the relationship between ADHD and attitudes towards school because ADHD continued to predict attitudes towards school over and above peer relationships. This finding demonstrates that peer relationships in combination with the presence of ADHD can better account for the prediction of attitudes towards school than peer relationships on its own. These results can explain why there are group differences in attitudes towards school between children with and without ADHD.

Research that examines these relationships within an ADHD population is currently lacking and needs to be replicated in order to confirm the results of this study.

### *Implications*

The results of this study indicate the multifaceted nature of ADHD and how symptoms of inattention and hyperactivity affect many domains of daily functioning. This study indicates that academic underachievement in children with ADHD is not solely a result of cognitive difficulties associated with the disorder. Rather, this study demonstrates that symptoms of ADHD affect other components of life, such as peer relationships and attitudes towards school, which can also have an impact on academic achievement. Behavior therapies targeted towards children with ADHD should be approached with the idea in mind that helping children improve their peer relationships can have a positive impact on attitudes towards school and academic achievement.

Therefore, the results of this study indicate that academic achievement can be improved beyond typical interventions that aim to improve study habits and cognition. Instead, a social approach that improves peer relationship quality can also increase academic achievement concurrently.

#### *Limitations*

Participants in this study were predominately Caucasian boys from the Harrisburg and State College areas where the percentage of inhabitants that identify themselves as Caucasian is 83.2% and 30.7% respectively (US Census Bureau, 2012). The sample of participants in this study was predominately Caucasian at approximately 76%. Lack of a diverse sample could limit the generalizability of the results found in this study. This study has demonstrated that peer relationships influence attitudes towards school and academic achievement within a mostly Caucasian ADHD population, but the same cannot be said for ethnic minority children due to a lack of a heterogeneous sample.

Attitudes towards school were measured through child self-report using a summary score of three items on the CDI that measured motivation in school, schoolwork performance, and fun in school. Reliability analysis did not demonstrate strong internal consistency but was deemed strong enough to measure attitudes towards school for the purpose of this study. Removal of the inconsistent item was not feasible since the measure only consisted of three total items from the CDI. Using a measure that consisted of such few items with only moderate reliability may have limited the study's ability to obtain

accurate measures of attitudes toward school. A measure that consisted of more items or that was specifically designed to measure attitudes towards school could have produced more accurate self-reported attitudes and resulted in strengthened relationships found in the study.

Academic achievement was measured within a laboratory setting using valid achievement assessments. However, this study attempts to apply the study's model to academic achievement within a school setting. It is possible that academic achievement assessed in the laboratory might not necessarily reflect a student's academic achievement in school when compared to a student's grades. Therefore, application of this model to real world school settings might be limited.

Peer relationships and ADHD status were operationalized through parent and teacher report. A small percentage of covariance was found between peer relationships and ADHD status when assessing the predictability of attitudes towards school and academic achievement using those two variables. This covariance can be attributed to the fact that teachers assessed participating children on both their peer relationships and their ADHD symptoms. In order to avoid covariance, separate individuals would need to assess the participant for each variable. While this method was used to its fullest extent in this study, the covariance was unavoidable because ADHD status is primarily assessed in a school setting and at home where only teachers and parents are typically the only adults consistently present.

Lack of group differences between ADHD and control participants in all areas of academic achievement can be a result of matching the sample of children with and without ADHD in terms of FSIQ. Controlling for FSIQ allowed for the comparison of similar children who essentially differed only in terms of their ADHD status, but this control prevented replication of Reading group differences found in previous studies (Barry et al., 2002; Clark, Prior, & Kinsella, 2002; Mariani & Barkley, 1994; Rapport, Scanlan, & Denney, 1999). Thus, increasing the FSIQ range might have increased the chances of group differences between all areas of academic achievement and allow for replication of results similar to previous studies.

*Future Research*

Further research into this model should be conducted since this relationship has never before been studied specifically in children with ADHD; replicated results are needed to confirm the relationships found in this study. More specifically, future studies should strive to obtain a heterogeneous sample in order to apply the model of this study to a more diverse population of children. Future studies should also use measures with increased internal reliability or measures that are designed to specifically assess children's attitudes towards school such as the School Attitude Assessment Survey—Revised (McCoach & Siegle, 2003). Future research should replicate the model of this study using students' grades as a measure of academic achievement to assess how the results might change the applicability of the model by using real world measures of academic achievement rather than laboratory based tests. Research has previously shown that difficulties with peer relationships and academic achievement can continue into adulthood, but the stability of attitudes towards school over time should be further investigated (Greene, Biederman, Faraone, Sienna, & Garcia-Jetton, 1997; Bagwell, Molina, Pelham, & Hoza, 2001; Nijmeijer et al., 2008). Do attitudes towards school change over time and do they continue to explain the relationship between peer relationship quality and academic achievement? Can this model be applied to the workplace for adults with ADHD? Future research should also investigate how the results of this model differ between the various presentations of ADHD. Do the results of this model differ between primarily inattentive, primarily hyperactive, or combined presentations? Further research conducted to understand these relationships can greatly impact the academic experience of children with ADHD which can have an effect on the rest of their development as children and adolescents.

### *Conclusion*

Overall, this study expands upon previous literature and findings regarding Attention-Deficit/Hyperactivity Disorder. The study expands upon peer relationships and attitudes towards school as factors that influence academic achievement in children with an ADHD diagnosis. Therefore, findings of this study can be applied to interventions that aim to increase academic achievement through the improvement of peer relationships and attitudes towards school.

## Appendix A

### Tables

Table 1. One-way Analysis of Variance on ADHD and Control Groups

Measure	ADHD (n = 155)		Control (n = 66)		F
	M	SD	M	SD	
WIAT Numerical Operations	98.35	15.74	105.23	11.14	F (1,219) = 10.359, p = .001, $\eta_p^2 = .045$
WIAT Spelling	98.54	14.22	103.17	12.83	F (1,219) = 5.197, p = .024, $\eta_p^2 = .023$
WIAT Word Reading	101.54	15.06	104.30	10.85	F (1,219) = 1.816, p = .179, $\eta_p^2 = .008$
TPRS Peer Relationships	25.61	6.03	33.68	2.71	F (1,219) = 108.608, p < .001, $\eta_p^2 = .332$
CDI Attitudes towards School	4.43	1.66	5.43	0.91	F (1,206) = 20.411, p < .001, $\eta_p^2 = .090$

**Note:** TPRS = Teacher Peer Relationships Scale, CDI = Child Depression Inventory, WIAT = Wechsler Individual Achievement Test

Table 2. Pearson Correlation of WIAT Subtests, CDI, and TPRS

Measure	1.	2.	3.	4.	5.	6.
1. ADHD	1.0					
2. WIAT WR	-.091	1.0				
3. WIAT NO	-.213***	.423***	1.0			
4. WIAT SP	-.152*	.765***	.393***	1.0		
5. CDI Attitudes	-.300***	.120	.267***	.127	1.0	
6. TPRS PR	-.576***	.030	.124	.082	.301***	1.0

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Note:** WIAT = Wechsler Individual Achievement Test, WR = Word Reading, NO = Numerical Operations, SP = Spelling, CDI Attitudes = Child Depression Inventory Attitudes towards School, TPRS PR = Teacher Peer Relationships Scale Peer Relationships

*Table 3. Regression Analysis – Attitudes towards School, ADHD, and Academic Achievement*

	<u>WIAT Numerical Operations</u>		<u>CDI Attitudes towards School</u>
	$\Delta r^2$		$\Delta r^2$
Predictor		Predictor	
Step 1		Step 1	
CDI Attitudes towards School	.071***	TPRS Peer Relationships	.091***
Step 2		Step 2	
ADHD	.027***	ADHD	.023***

\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

**Note:** WIAT = Wechsler Individual Achievement Test, CDI = Child Depression Inventory

## Appendix B

## Figures

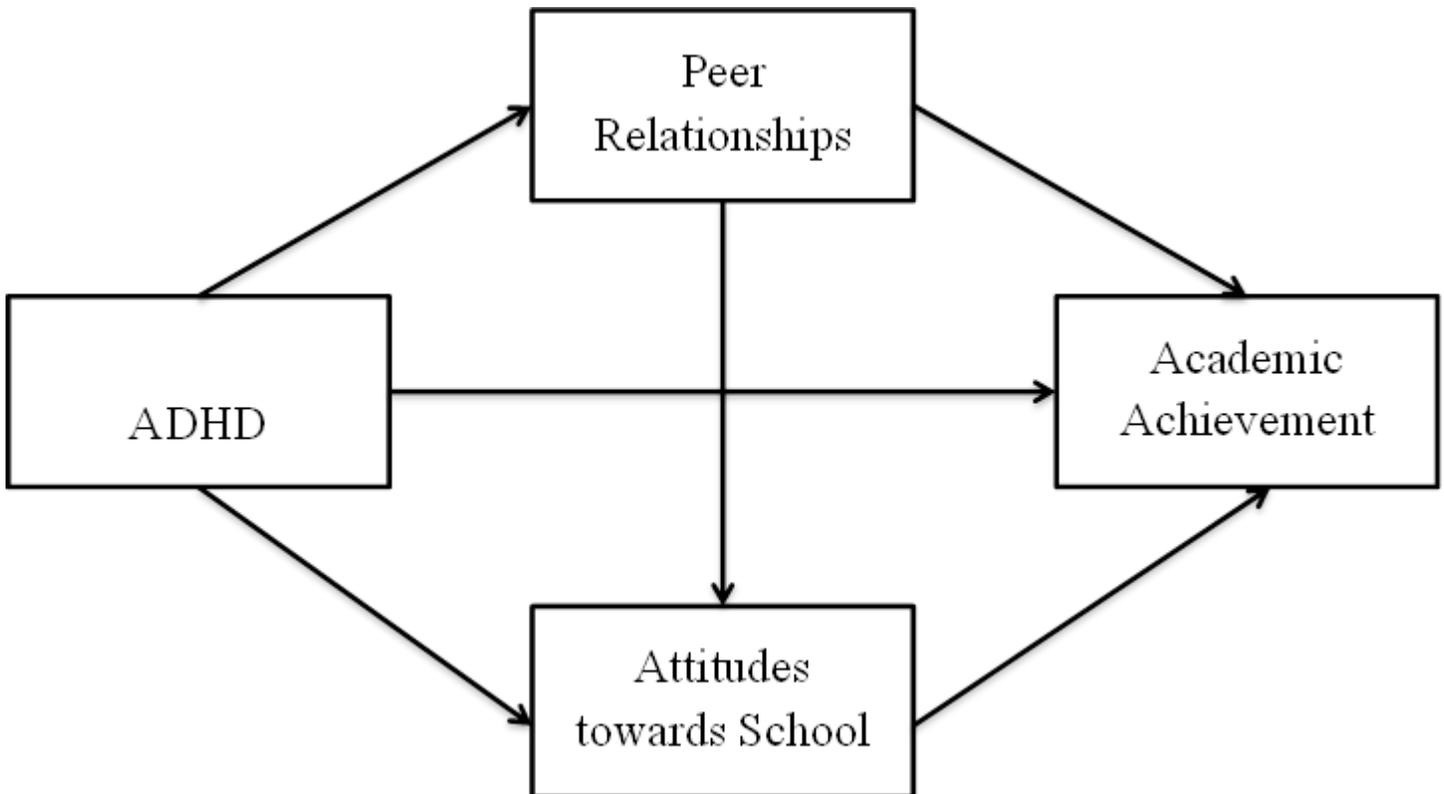
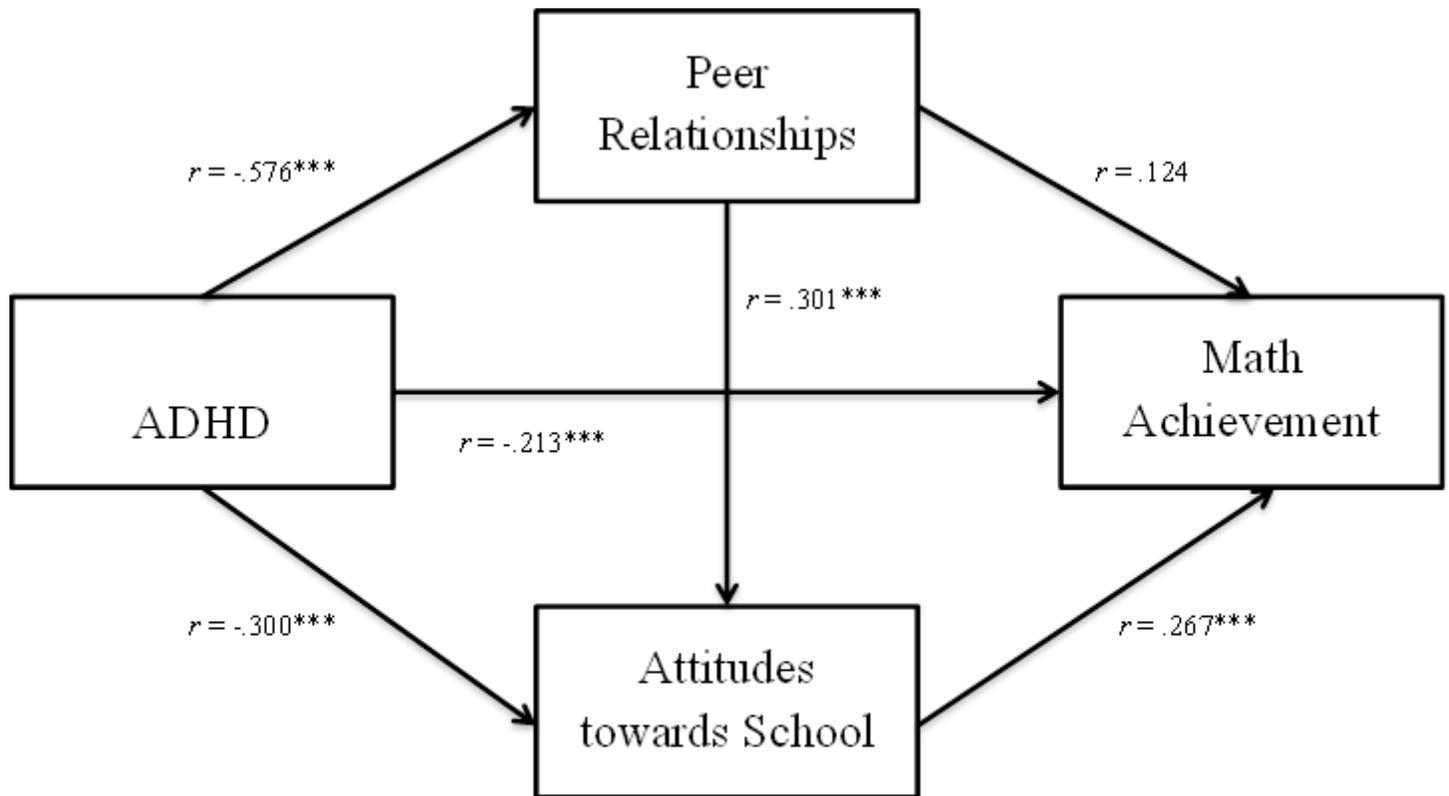
*Figure 1. Hypothesized Academic Achievement Model*

Figure 2. Resulting Academic Achievement Model



\*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$

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## ACADEMIC VITA

### Whitney E. Moore

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#### EDUCATION

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**The Pennsylvania State University | Schreyer Honors College**  
**University Park, PA**

Bachelor of Science in Psychology, Business Option  
Human Development and Family Studies Minor

#### HONORS/AWARDS

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College of Liberal Arts Student Marshal	December 2014
Bayard D. Kunkle Scholarship	August 2014
Penn State Undergraduate Research Exhibition ( <i>2nd Place in Social and Behavioral Sciences</i> )	April 2014
Evan Pugh Scholar Award ( <i>Top 0.5% of graduating class</i> )	March 2014
The Honor Society of Phi Kappa Phi	December 2013
Schreyer Honors College Academic Excellence Scholarship	September 2011 – Present
College of Liberal Arts Dean's List	September 2011 – Present
Paterno Fellowship Program	September 2011 – Present

#### CLINICAL EXPERIENCE

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**Child Attention and Learning Lab** **University Park, PA**  
*Research Assistant* September 2013 – Present

- Research assistant in Dr. Cynthia Huang-Pollock's CAL Lab that studies the cognitive mechanisms that can lead to the development of child attention, learning, and behavior problems in children, such as ADHD.
- Experienced in data entry and analysis using SPSS Statistics Software.
- Administer WISC-IV and WIAT-III subtests in addition to the DISC and lab-created computer tasks.
- Currently completing an independent honors thesis under the supervision of Dr. Huang-Pollock entitled "Mediation effects of attitudes towards school on academic achievement in children with Attention-Deficit/Hyperactivity Disorder."

**Friendship Group at Penn State** **University Park, PA**  
*Undergraduate Coach* September 2012 – May 2013

- Facilitated weekly group therapy sessions for children experiencing a variety of developmental disorders under the supervision of a graduate student in child clinical psychology as well as Dr. Janet Welsh, Ph.D.
- Created and implemented lesson plans incorporating PATHS Fast Track curriculum (Bierman, K., Greenburg, M.T., & Conduct Problems Prevention Research Group, 1996).

#### ACADEMIC EXPERIENCE

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**Penn State Department of Human Development and Family Studies** **University Park, PA**  
*Undergraduate Teaching Assistant* January 2014 – May 2014

- Selected from 300 students to hold one of seven undergraduate teaching assistant positions for a course on Infancy and Early Childhood Development.

- Recorded official class notes in addition to grading exams and independent semester projects.
- Created exam questions in addition to proctoring exams during class time.

#### *WORK EXPERIENCE*

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##### **Gymsport Athletic Center**

**Bridgeville, PA**

*Birthday Party Coordinator, Office Personnel, Coach*

May 2010 – Present

- Coordinate and lead birthday parties for children ranging from ages 2 to 12 in a fun and safe environment incorporating gymnastics equipment and organized games.
- Manage a variety of administrative duties as a member of the office personnel.
- Coach cheerleading camps and classes for preschool and school-aged children while implementing safety practices.

#### *VOLUNTEER EXPERIENCE*

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##### **State College Area School District Family Outreach Program**

**State College, PA**

*Childcare Provider*

January 2014 – May 2014

- Provided childcare services and homework help to children ranging from infancy to middle childhood whose parents participated in classes designed to help promote their children's academic success.