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Illinois State University, fladhammera@gmail.com

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DOES A POSITIVE ILLUSORY BIAS MEDIATE THE MODERATING EFFECT OF
ACHIEVEMENT ORIENTATION ON RESPONSE TO EXCLUSION IN
BOYS WITH ADHD?

ALEXANDRIA G. FLADHAMMER

96 Pages

Disturbed peer relationships have commonly been found to have long-lasting adverse impacts on children, including school dropout, substance abuse, criminal offenses, psychological maladjustment, and academic problems (Mrug et al., 2012). One subgroup of children well-known to struggle with their peer relationships are children with Attention-deficit/Hyperactivity Disorder (Hoza, 2007). These children often engage in high rate, intrusive behaviors and are excluded from peer interactions (Hoza et al., 2005). The frequent rejection that these children endure highlights the need for research focused on ostracism, the exclusion or ignoring of others by individuals or groups (Williams, 2007). Thus, the purpose of the current study was to examine the effects of ostracism among children with varying levels of ADHD symptom severity.

Further, several social-cognitive factors were examined to determine how they impacted boys' reaction to ostracism, including achievement orientation and positive illusory bias.

Fourth through 9th grade boys ($N = 76$) completed several assessments and played a computer game with e-confederates who left the participating boy out of the game. Boys' responses to ostracism were assessed in a variety of ways. To determine persistence, responses to ostracism were measured by number of words written in a letter-writing task, as well as number of adjectives and adverbs used, amount of time spent crafting the letter, and number of topics

used. Boys high in ADHD symptom severity with a strong mastery orientation used more time in their second letters, whereas boys high in ADHD symptom severity with a strong performance orientation used more words in their second letters. Positive illusory bias was not linked to any persistence outcomes. Mastery and performance orientation showed differential impacts on persistence for boys following ostracism.

KEYWORDS: ADHD; Ostracism; Positive Illusory Bias; Achievement Orientation

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ACHIEVEMENT ORIENTATION ON RESPONSE TO EXCLUSION IN
BOYS WITH ADHD?

ALEXANDRIA G. FLADHAMMER

A Dissertation Submitted in Partial
Fulfillment of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

Department of Psychology

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ALEXANDRIA G. FLADHAMMER

COMMITTEE MEMBERS:

Steven Landau, Chair

Matthew Hesson-McInnis

Leandra Parris

Eric Wesselmann

John Pryor

Beth Hatt

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CHAPTER I: INTRODUCTION

It has long been known that children with Attention-deficit/Hyperactivity Disorder (ADHD) experience significant difficulties with peer relations (Tseng, Kawabata, Gau, & Crick, 2014). Further, these children experience repeated failures (e.g., rejection and exclusion) in the social domain that tend to influence subsequent peer interactions. In fact, children with ADHD are the most likely to be considered “rejected” by their general education classmates and, therefore, more excluded (i.e., ostracized) from social events than typically-developing children. These negative peer interactions have serious long-term consequences, including substance abuse, delinquency, depression, anxiety, and general impairment (Mrug et al., 2012). Whereas some researchers have focused on direct interventions to improve peer relations, the causal factors of peer problems among those with ADHD have yet to be determined.

A number of individual differences among children with symptoms of ADHD have been identified. One such individual difference that may impact the peer relationships of children with ADHD involves their achievement orientation. Achievement orientation refers to the goals of behavior and includes two types of goals: mastery goals and performance goals (Dweck & Leggett, 1988). Mastery goals are goals in which a child’s intent is to learn a skill, whereas performance goals focus on proving one’s ability. Typically, the literature on achievement orientation has focused on persistence; those with learning goals tend to try harder and persist longer when challenged than those with performance goals. Further, children with a performance goal orientation tend to express more negative affect when challenged. These children will engage in task-irrelevant verbalizations, such as boasting about talents or attempting to change the rules of a task (Dweck & Leggett, 1988). Surprisingly, opposite responses have been found for children with ADHD (Milich, 1994; Milich & Okazaki, 1991). That is, children with ADHD

and a mastery orientation seem to behave in a manner similar to typically-developing children who have a performance orientation. Similarly, children with ADHD and a performance orientation tend to behave in a manner similar to typically-developing children who have a mastery orientation. The ADHD-related pattern requires further examination.

A second individual difference that may impact the peer relationships of children with ADHD is a positive illusory bias (PIB). A PIB is a tendency to exaggerate how well one thinks they will do, or has done, before joining a group or performing a task, relative to the veridical reports of parents, teachers, or other children (Hoza, 2007). It is hypothesized that the positive illusory bias serves a protective function; that is, pretending that you are better than you truly are helps children avoid becoming depressed about their lack of success. Further, it has been found that children exaggerate most in the domain in which they experience the greatest difficulty (e.g., academic vs. social). This study will examine the possible mediating effect of a positive illusory bias on the moderating affect of achievement orientation on the responses to ostracism of boys with varying levels of ADHD symptoms.

It is also possible that these two individual differences interact to affect the way that children with ADHD function. Thus, a child with a positive illusory bias and a mastery orientation may respond differently to ostracism than a child with a positive illusory bias and a performance orientation. This study examined the effects of each social-cognitive variable independently and together to elucidate the moderating and mediating effects on response to social exclusion. This information added to theory by determining the influential variables for response to ostracism. As a result, researchers have a better understanding of those peer problems, as well as more information about how to intervene.

Boys were brought to a lab and played a computer game with e-confederates left the participating boy out of the game. Then, boys' responses to ostracism were assessed in a variety of ways. First, to determine effort/persistence, responses to ostracism were measured by number of words written in a letter-writing task, as well as number of adjectives and adverbs used, amount of time spent crafting the letter, and number of topics used. This study examined the role of social-cognitive variables, specifically achievement orientation and positive illusory bias, on responses to ostracism of boys with varying levels of ADHD symptoms.

CHAPTER II: REVIEW OF THE LITERATURE

Peer Relations

It has long been known that the single best predictor of a child's later psychiatric difficulty is early peer rejection (Cowen, Pederson, Babigian, Izzo, & Trost, 1973). Although there are other factors that may predict psychiatric problems (such as heritability), the association with other factors pales in comparison to peer rejection. Cowen et al. (1973) used data from two major sources to examine future psychiatric problems. The Primary Mental Health Project was created with the intent of detecting and preventing school problems; this project provided early school data. In addition, the Monroe County, NY psychiatric register provided information about people with more severe psychiatric problems later in life. Cowen et al. (1973) linked the two sources to search for early warning signs of later psychiatric problems. The researchers examined a number of factors, including school nurse referrals, report card grades, measures of anxiety, and a measure regarding which classmates were liked and disliked.

Researchers were interested in factors that could be found before a child was flagged as vulnerable. The only early predictor of children who appeared in the psychiatric register later on was rejection by 3rd-grade peers (Cowen et al., 1973). That is, in the task of nominating classmates for roles in a fictitious class play, children who appeared later in the psychiatric registry had been nominated for the role of someone who was not liked. This single act of peer rejection was the only correlate that identified which children had later psychiatric breakdowns (Cowen et al., 1973).

Disturbed peer relations have been linked to many negative outcomes, such as school dropout, substance abuse, criminal offenses, psychological maladjustment, and academic problems (Mrug et al., 2012). Difficulties in peer relationships are often linked to severe and

long-term psychological, social, and health problems, including depression, obesity, unemployment, and divorce (Wolke, Copeland, Angold, & Costello, 2013). Within schools, disturbed peer relations have become an increasing concern. According to the National Center for Education Statistics, 21% of students ages 12-18 reported being bullied at school in 2015 (NCES, 2017). Five percent of students ages 12-18 reported being excluded by peers from activities on purpose. Additionally, 5% of students ages 12-18 reported avoiding at least one school activity or class, or at least one place inside the school during the previous year because they thought someone might harm them (NCES, 2017). Thus, disturbed peer relations are predictive of problems in both current and future functioning.

Research on the peer relationships of children often uses classmate nominations to determine social status. Peer nominations are used to determine which classmates are liked most and liked least, as well as those who are likely to be teased and who are likely to be left out (van den Berg & Cillessen, 2013). The categories derived from peer nomination procedures include both popular (high in “like most,” low in “like least”) and rejected (low in “like most,” high in “like least”). There are, however, more complex categories also derived: neglected (low in both “like most” and “like least”), average (mid-range for both), and controversial (high in both; Rubin, Bukowski, & Parker, 2006). Popular children tend to be those who are socially skilled and able to negotiate through conflict (Rubin et al., 2006). Rejected children, on the other hand, tend to be disruptive and aggressive when interacting with other children. In fact, the most commonly cited behavioral correlate of peer rejection is aggression (Rubin et al., 2006). Controversial children are those who are high in both acceptance and rejection. Indeed, these children engage in behaviors similar to both popular and rejected children (Rubin et al., 2006).

Whereas these children may engage in some appropriate social behaviors (e.g., waiting for their turn to play), they also engage in inappropriate social behaviors (e.g., interrupting others).

All children with mental health, behavioral problems, or both also tend to experience disturbed peer relationships. Central to the notion of having a disorder is the recognition that problems in the peer group are emblematic of a disordered state. Both Internalizing disorders (e.g., depression) and Externalizing disorders (e.g., Conduct Disorder) involve interpersonal problems. One of the critical diagnostic criteria of both depression and anxiety is impaired peer relationships, and diagnostic criteria for Conduct Disorder emphasize violating the rights of others (APA, 2013). Thus, peer problems may be the most salient indicator of a child's disordered functioning.

One such disordered group with conspicuously disturbed peer relationships involves children with Attention-deficit/Hyperactivity Disorder (ADHD). These children have a tendency to engage in high-rate, intrusive behaviors, engage in poor communication and reciprocity, as well as biased social-cognitive performance, and poor emotional regulation (Hoza et al., 2005). These problems, among others, exacerbate the peer problems that children with ADHD experience.

ADHD and Peer Problems. According to the *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5; American Psychiatric Association [APA], 2013)*, ADHD is a neurodevelopmental disorder characterized by patterns of behavior across multiple settings that impact performance in social and educational settings (APA, 2013). Primary symptoms of ADHD fall within the two independent dimensions of inattention and hyperactivity/impulsivity. Based on *DSM-5*, there are three presentations of ADHD: Predominantly Inattentive presentation, Predominantly Hyperactive-Impulsive presentation, and Combined presentation

(APA, 2013). According to the Centers for Disease Control and Prevention (CDC), 11% of children between the ages of 4 and 17 years old have been diagnosed with ADHD (Visser et al., 2013). Although the primary focus for treatment of children with ADHD has been on their disruptive behavior, some argue that it is more important to address the impairments in daily functioning and adaptive skills (Pelham & Fabiano, 2008; Pelham, Fabiano, & Massetti, 2005). In fact, most children with ADHD are referred because of their impaired functioning rather than their primary symptoms of inattentive and hyperactive/impulsive behaviors. Peer problems are a notorious area of impairment among children with ADHD.

These peer difficulties have been consistently found by researchers and across multiple methods of study. Children with ADHD are rated lower on social preference, are less liked, and are more often rejected (Hoza et al., 2005). For example, Normand, Schneider, Lee, Maisonneuve, Kuehn, and Robaey (2010) examined how children with ADHD manage their real-life friendships. These ADHD participants invited their best friends to join them in the study. Normand and colleagues found that children with ADHD made more insensitive and self-centered suggestions than their best friends during game-playing. Further, these children were often more dominant than their friends and reported being less satisfied with their friendships. Finally, in a competitive game, children with ADHD used both more legal and illegal maneuvers, violating game rules, that were not well-received by their playmates (Normand et al., 2010).

When children with ADHD are not yet included in a social activity, their game entry strategies (i.e., how they go about joining) differ significantly from those of typically-developing children. Ronk, Hund, and Landau (2011) found that, whereas children with ADHD did not differ from typically-developing peers in the number of competent entry strategies attempted,

those with ADHD also engaged in significantly more incompetent entry strategies. Specifically, children with ADHD relied more heavily on strategies such as disruptive attention-getting (i.e., rude verbal or non-verbal behavior) than typically-developing boys. Further, those with ADHD talked more about themselves during the first entry attempt and engaged in more off-topic conversation (Ronk et al., 2011). In addition, participants with ADHD became less well-liked as other children spent more time with them.

Similarly, Hodgens, Cole, and Boldizar (2010) conducted behavioral observations of children in a classroom and found that children with the Combined presentation of ADHD had the highest level of rejection when initiating play. This observation is particularly problematic because children with ADHD were found to be twice as likely as their peers to be described as being left out of play, regardless of which ADHD presentation they had (Hodgens et al., 2010).

Much of the focus on peer problems in ADHD has been on the problematic social behavior of these children (Hoza, 2007). For example, children with ADHD display higher rates of intense behaviors that seem inappropriate for the situation or seem socially unskilled (Gardner & Gerdes, 2015). Further, these children engage in more dominating and negative behaviors (e.g., giving commands; Gardner & Gerdes, 2015). Children with ADHD are also viewed by peers as being noisy and rude, bothering others, and getting mad when they do not get their way (Hodgens et al., 2010). Most of these studies have focused on behaviors that others may view as inept, annoying, and disruptive, but few have examined the impact of their social-cognitive processes on the social problems experienced by those with ADHD. Thus, one purpose of this study was to examine some of the social-cognitive processes that impact the social relations of children with symptoms of ADHD.

The repeated peer problems experienced among children with ADHD are likely due to a number of factors. Mikami and Normand (2015) proposed a model for peer problems that incorporates peer group influences, including social devaluation, exclusionary behavior, and reputational bias. They propose that interventions for children with ADHD should focus not only on behavior deficits (e.g., lack of prosocial skills, disruptive behaviors) but also those peer group influences (Mikami & Normand, 2015). Stenseng, Belsky, Skalicka, and Wichstrøm (2016) also found a reciprocal relationship between ADHD status and peer rejection across childhood, suggesting that contextual factors could worsen the symptoms of ADHD. Peer relationships are an integral part of all child development, but may be particularly important for those children who are lacking in self-regulation skills (Stenseng et al., 2016).

Although most children with ADHD experience some peer problems, those problems are not homogenous among all with ADHD. There are gender differences regarding peer problems, as well as differences based on which presentation of ADHD is applicable. Further, gender and ADHD presentation interact to impact behavior and peer relationships. These differences are described below.

Different Presentations of ADHD. Regarding different ADHD presentations, the peer problems associated with the Predominantly Hyperactive/Impulsive and Combined presentations are qualitatively different from the problems associated with the Predominantly Inattentive presentation. By definition, children with the Predominantly Inattentive presentation have difficulty attending, are easily distracted, and are forgetful in daily activities (APA, 2013). Conversely, children with the Predominantly Hyperactive/Impulsive presentation are observed fidgeting, interrupting others, and talking excessively. Naturally, children with the Combined presentation meet some of the criteria of the other two presentations. Thus, those with the

Predominantly Hyperactive/Impulsive and Combined presentations engage in behaviors more likely to disrupt others. Children with the Combined presentation are also more likely to be actively rejected and considered more likely to start fights (McQuade & Hoza, 2008). Because of their more severe hyperactive and impulsive behaviors, classmates find them to be annoying and aversive playmates (Hoza, 2007). Tseng, Kawabata, Gau, and Crick (2014) found a transactional relationship among the symptoms of ADHD and peer impairment, in that inattention predicted later peer problems, which in turn predicted increases in both inattention and hyperactivity/impulsivity. Children with the Combined presentation are most at risk to be disliked and rejected by peers, which is likely to continue over time. The purpose of this study was to examine responses to social exclusion among boys with varying degrees of symptoms of the Combined presentation of ADHD. That is, children high in symptoms of hyperactive, impulsive, and inattentive behaviors (i.e., the Combined presentation) were the focus of this study.

Gender Differences and ADHD. Additionally, there are differences in peer difficulties among children in ADHD based on gender. Abikoff et al. (2002) found that boys with ADHD interrupted more, left their classroom seats more, and engaged in more severe rule-breaking behaviors than girls with ADHD. Compared to a comparison group of typically-developing children as well as boys with ADHD, girls with ADHD engaged in more verbal aggression. Differences in gender and subtype can interact to impact peer functioning as well. Tseng et al. (2012) examined how aggressive and prosocial behaviors relate to peer functioning in boys and girls with ADHD. Specifically, inattention was directly linked to impaired peer functioning but only for girls (Tseng et al., 2012). Girls who were more hyperactive and impulsive had more impaired peer functioning than girls who were not hyperactive and impulsive, but the same was

not found for boys. Additionally, hyperactivity in girls was directly linked to increased physical aggression; this increase in physical aggression led to greater problems in peer functioning (Tseng et al., 2012). Further, because ADHD is significantly more prevalent in boys because peer problems for boys are qualitatively different from girls' peer problems (Rose & Rudolph, 2006), only boys participated in this study.

The social difficulties of children with ADHD make them more likely to be socially excluded, or ostracized. Ostracism occurs when a person or group of people ignores or excludes another person or group of people (Williams, 2007). Whereas the term "ostracism" is not often included in research on children with ADHD, we know that these children are at greater risk for peer rejection and social exclusion. The purpose of this study was to examine the effects of ostracism among boys with varying degrees of ADHD.

Ostracism

The phenomenon of ostracism (i.e., being ignored or excluded) has been observed among all social species and has occurred throughout millennia (Williams, 2007). Whereas being ignored may seem mild to the layperson, decades of research have shown that ostracism has serious consequences similar to or more extreme than the consequences of being disliked or rejected. Ostracism will always occur whenever people come together to form groups. Recently, the literature has focused on the multiple and varied effects of ostracism (see, for example, Williams & Nida, 2011).

Several models have been proposed to explain the harm caused by ostracism. One common model regarding ostracism is the need-threat temporal model of ostracism, which breaks down ostracism into three stages: immediate, coping, and long-term (Williams & Nida, 2011). During the immediate stage in which ostracism is perceived as pain, the four fundamental

needs of belonging, self-esteem, control, and meaningful existence are threatened. The second stage is the coping stage, in which the person who is ostracized reflects on the ostracism experience, and acts in ways to repair the damage done to fundamental needs. At the third stage of long-term ostracism, the individual who lacks the resources to cope may experience depression and alienation (Williams & Nida, 2011).

Williams (2007) posits that during the immediate stage of ostracism, there are four fundamental needs that are impacted by ostracism: need to belong, self-esteem, sense of meaningful existence, and sense of control. When one or more of these needs are not met, a person suffers both psychologically and physically. In evolutionary terms, pain is important because it cues a person to attend to the situation and minimize the damage. Evidence from neuroimaging studies suggests that the pain of social exclusion feels similar to physical pain, and there is a common system for social and physical pain (Eisenberger & Lieberman, 2004; Eisenberger, Lieberman, & Williams, 2003). In further support of this overlap between social and physical pain systems, DeWall et al. (2010) found that acetaminophen reduced self-reports of social pain and lessened both the behavioral and neural responses to social exclusion. In addition to legitimate pain, people who experience ostracism report increased negative mood (Wirth, Sacco, Hugenberg, & Williams, 2010).

Further, threats to different needs are associated with different behavioral responses. Threats to belongingness and self-esteem have been linked to prosocial responses (e.g., working harder on a collective task), whereas aggression and antisocial behavior have been associated with threats to meaningful existence and control (Warburton, Williams, & Cairns, 2006). In a similar study, anger was found to be the link between ostracism and antisocial responses; children who were unfairly excluded were angrier and also more likely to engage in antisocial

behavior following the exclusion event (Chow, Tiedens, & Govan, 2008). Recent studies have focused less on prosocial behavior following ostracism, although some have suggested that prosocial behavior is necessary for reinclusion to the group. Belonging to social groups has long provided benefits for individuals, who can increase their status and access to resources.

Ostracism, on the other hand, has none of these benefits; thus, ostracism should motivate people to attempt social re-inclusion. People who have been ostracized attend to and remember social information more vividly than non-ostracized individuals (Williams, 2007). They are also more likely to conform, to work harder for the group, and to cooperate with other group members.

Despite these findings, many studies indicate that people can also respond with antisocial behaviors, perhaps with the intent of gaining back the sense of control that was lost (Williams, 2007).

Social exclusion is associated with a decline in cognitive functioning (Buelow, Okdie, Brunell, & Trost, 2015; Hawes et al., 2012). Buelow et al. (2015) examined the impact of ostracism on higher-order cognitive abilities, and found that ostracism led to decreased working memory, decision-making, and task persistence, but not basic attention. Hawes et al. (2012) found similar results with children by excluding some children from a game and then having those children complete a test of working memory. Children who were ostracized performed significantly worse on the task than children who were included in the game (Hawes et al., 2012).

For some groups of people, the effects of ostracism may last longer than initially hypothesized. Individuals high in social anxiety, for example, can take longer to recover from ostracism than their non-socially anxious peers. Participants low in social anxiety showed improvements in affect and need satisfaction within 45 minutes, whereas those high in social

anxiety needed more time (Zadro, Boland, & Richardson, 2006). Individuals with schizophrenia also seem to recover more slowly from ostracism events than individuals without schizophrenia (Perry, Henry, Sethi, & Grisham, 2011). Despite the fact that many individuals with schizophrenia experience social exclusion on a regular basis, these individuals did not appear to accept their exclusion and then withdraw; rather, they were more negatively impacted by the ostracism event (Perry et al., 2011). Specifically, those who are regularly excluded may experience more negative affect than individuals who have only been excluded once (Perry et al., 2011).

There is also evidence to suggest that people who have been previously victimized (i.e., bullied) are more affected by social exclusion than people who have not had similar experiences (Ruggieri, Bendixen, Gabriel, & Alsaker, 2013). Ruggieri et al. (2013) examined students who had either been victims of bullying or not involved in bullying events. They found that children who had been previously bullied scored significantly lower on feelings of meaningful existence following an ostracism event. Further, Perry et al. (2011) suggested that psychopathology might also be a risk factor for a slower recovery from ostracism; that is, people with psychopathology may feel the effects of ostracism for a longer period of time than people without any psychopathology. Thus, it is possible that children with certain disorders (e.g., Attention-deficit/Hyperactivity Disorder) may be more sensitive to social exclusion because they have been rejected and ostracized numerous times and that these children may also take longer to recover from ostracism. As stated previously, the purpose of this study was to examine the responses to ostracism of boys who vary in symptoms of ADHD.

One of the challenges in studying ostracism is that a researcher must observe the non-occurrence of a phenomenon (i.e., to be ostracized, a person must *not* be included). Because

ostracism is difficult to investigate in a naturalistic setting, some researchers have chosen to simulate ostracism in a laboratory setting. One way to accomplish this is to use a computer-based game that involves tossing a ball among several players, including e-confederates and a research participant. The use of a computer to ostracize both children and adults has proven effective in simulating *in vivo* ostracism (Motamedi, Bierman, & Huang-Pollock, 2016; Tobia, Riva, & Caprin, 2017; Zadro, Williams, & Richardson, 2004). After including the research participant for a few tosses, the e-confederates exclude the research participant from the game by passing the ball back and forth only to each other. This game, known as *Cyberball*, has been used worldwide to examine participants' responses to and effects of ostracism (Hartgerink, van Beest, Wicherts, & Williams, 2015).

For children with ADHD, the study of an ostracism experience is especially relevant. Ostracism deprives a child of opportunities to learn age-appropriate social behaviors. Whereas other children are able to model and practice appropriate behaviors while in the presence of other children, children with ADHD are often not included, thus missing crucial opportunities to observe and model appropriate social behaviors. These children have fewer mutual friendships than typically-developing children (Hoza, 2007). Further, they tend to have friends who also have ADHD symptoms as well as oppositional behaviors (Normand et al., 2010). Because children with ADHD tend to be disliked by peers and may have friends who engage in similar inappropriate behaviors, they will have fewer prosocial peer models (Normand et al., 2010).

Therefore, the purpose of this study was to expose boys with varying degrees of ADHD symptoms to a brief episode of social exclusion followed by a session when they were included in a game. Boys were the focus in this study, given that their peer problems are qualitatively different from girls (Rose & Rudolph, 2006). Because it is difficult to observe social exclusion

directly in the naturalistic setting, boys' ostracism experiences were created in the lab using the computer-based game *Cyberball 4.0* (Williams, Yeager, Cheung, & Choi, 2012). This study was the first known laboratory study to investigate responses to ostracism directly among children with varying characteristics of ADHD. It was expected that boys with greater symptoms of ADHD, given their history of social exclusion, would be differentially impacted by the ostracism event than typically-developing children who also participated. That is, boys with more severe ADHD symptoms were expected to demonstrate less persistence than those with less ADHD symptom severity. Further, although children with ADHD commonly have disturbed peer relations and suffer many consequences from these problems, there are individual differences among these children that may differentially predict responses to social exclusion. Thus, boy's social-cognitive functioning was also examined to determine the processes by which a child might engage in one response over another.

One example of a social-cognitive factor that may impact peer relations is social perspective taking. The literature on perspective taking indicates that this factor can impact friendship quality. Smith and Rose (2011) found that perspective taking among girls was more common than among boys and was linked to greater friendship quality. The trade-off was that perspective taking was also linked to emotional cost through greater empathic distress. Further, perspective taking has been found to be consistently lower among boys than girls, despite a slight increase in boys' perspective taking during adolescence (Van der Graaf, Branje, De Wied, Hawk, Van Lier, & Meeus, 2014). Marton, Wiener, Rogers, Moore, and Tannock (2009) examined empathy and social perspective taking among children with ADHD. Children with ADHD used less social perspective taking than children without ADHD when defining a problem, identifying feelings, and evaluating outcomes. Marton et al. (2009) also accounted for intelligence, language

ability, and oppositional and conduct factors. Even so, significant differences between those with and without ADHD remained. Further, boys with ADHD engaged in less social perspective taking and displayed less empathy than girls (Marton et al., 2009).

Another social-cognitive factor that could impact peer relations is a person's achievement orientation following failure. Achievement orientation relates to social or academic goals one has, and can be broken down into mastery versus performance orientations (Dweck & Leggett, 1988). For example, in the academic setting, someone who approaches a task with the goal of learning new material is said to have a mastery orientation. Alternatively, a person who approaches a task with the intent of looking good or proving to others his or her ability is said to have a performance orientation (Dweck & Leggett, 1988). A person whose intent is to look good may engage in different behaviors than a person whose intent is to learn something, thus leading to different approaches to peer interactions. In addition, these orientations relate to different ways of responding to negative feedback or failure. Even though there are numerous social-cognitive functioning variables that can contribute to a child's behavior (e.g., empathy, perspective-taking), the individual difference variable of interest in this study was boys' achievement orientation (Dweck & Leggett, 1988). This model explains individual differences in responding to success and failure.

Achievement Orientation

Achievement orientation refers to the goals of behavior, and was first classified into two types: mastery goals and performance goals (Dweck & Leggett, 1988). A person who approaches a task with the goal of mastering new material is said to have a learning or mastery goal. Someone who is mastery-oriented also believes that he or she has control and is personally responsible for success and/or failure. Alternatively, a person who approaches a task with the

intent of looking good or proving his or her ability is said to have a performance goal (Dweck & Leggett, 1988). This person can also be said to have a helpless orientation, as he or she may perceive little control over success and/or failures. There are distinct differences in how children with mastery versus performance orientations respond to perceived failure. Among typically-developing children with a mastery orientation, one's response to failure often involves increased persistence and effort. For typically-developing children with a performance or helpless orientation, the response to failure often involves decreased persistence or quitting the task (Dweck & Leggett, 1988). Milich (1994) also reported that children with performance orientations report more frustration and negative affect than those with mastery orientations. Further variables examined in relation to achievement orientation include control, self-esteem, and attributions (Milich, 1994).

Mastery orientation has been found to be connected to an individual's self-regulation and task performance (Cellar et al., 2011). In fact, a mastery orientation is linked to greater self-monitoring, self-evaluation, self-efficacy, and positive self-reactions (e.g., task interest, self-rated intrinsic motivation, etc.). Further, a positive connection between one's mastery orientation and task performance has been found (Cellar et al., 2011). Dweck and Leggett (1988) reported that mastery orientation is preferable because challenges are inherent in every aspect of life; children need to persist in the face of challenge and failure. Thus, a performance orientation could be considered problematic. Diener and Dweck (1980) found that helpless (i.e., performance-oriented) children reported more negative self-cognitions, and more likely attributed their failures to personal inadequacy. Further, children with a performance orientation reported more negative affect, including an aversion to the task as well as anxiety and boredom (Diener & Dweck, 1980).

If greater self-regulation is indeed connected to a mastery orientation, it is likely that fewer children with ADHD would endorse a mastery orientation. Relevant to this study, Barkley (1997) proposed a deficit in self-regulation in his unifying theory of ADHD. Self-regulation of affect/motivation/arousal includes additional social-cognitive pieces such as emotional self-control and perspective-taking. A difficulty in self-regulation suggests that these children may have a more difficult time coping with social failure and controlling their response to ostracism. Anecdotally, children with ADHD are known to become upset easily and to quit games prematurely. In the lab, when instructed explicitly to hide or control their emotions, children with ADHD were unable to comply (Walcott & Landau, 2004). Children were brought in and asked to complete a puzzle task faster than another boy (supposedly in another room). Unbeknownst to the participants, the puzzle had missing pieces and thus was unable to be completed. Children with ADHD expressed greater emotional reactivity. Even with explicit instruction to regulate their behavior, participants with ADHD were unable to mask being upset (Walcott & Landau, 2004).

In addition to examining connections between achievement orientation and behavior, researchers have studied more internal factors (e.g., rumination). Grant and Dweck (2003) examined achievement orientation regarding intrinsic motivation, behavioral coping, attributions, loss of self-worth, rumination, and chronic coping style. University students completed a goal questionnaire, a 5-minute word completion filler task, and received one of two scenarios (each about failure in the college classroom). Participants then indicated what they would think, how they would feel, and how they would behave by rating their degree of agreement with various statements that mapped onto the dependent variables of intrinsic motivation and behavioral coping. Results indicated that mastery goals predicted planning activities (e.g., behavioral

coping), whereas performance goals predicted reduced time and energy (i.e., students indicated that they would devote less time to future attempts). Mastery goals also predicted active, engaged responding, whereas performance goals predicted self-denigration and withdrawal (Grant & Dweck, 2003). Performance goals appeared to be associated with a lack of persistence and effort. Alternatively, mastery goals were associated with more effort and positive coping skills. These findings suggest that mastery goals may be more conducive to problem-solving and success than performance goals.

Interestingly, Dweck and Leggett's (1988) model of achievement orientation has shown mixed results when applied to children with ADHD. In fact, several researchers have suggested that children with ADHD are prone to endorse a performance orientation (Milich & Okazaki, 1991; Reid & Borkowski, 1987). These results may be due to the extensive history of social failures experienced by children with ADHD. Milich (1994) found that children with ADHD responded differently to failure than typically-developing children. This difference was linked to differences in achievement orientation and locus of control. Typically-developing boys with a performance orientation indicated that they were externally-oriented (i.e., felt that outcomes were beyond their control), whereas boys without ADHD who evinced a mastery approach indicated that they were effort-oriented (i.e., felt that they have control over outcomes). Conversely, boys with ADHD who reported they take a mastery approach were more externally-oriented, whereas boys with ADHD and a performance orientation indicated that they were effort oriented, gave up sooner, and appeared helpless.

This pattern of findings runs counter to the predictions for Dweck and Leggett's (1988) model of achievement orientation. Milich (1994) first suggested this difference in achievement orientation might serve a self-protective function, in that deflecting blame for failures may be

beneficial for children who experience many failures (as children with ADHD typically do). That is, a child who consistently blames himself or herself for failures could be a very unhappy child. To feel better about himself or herself, this child may indicate that he or she feels in control of the situation (i.e., effort-oriented) and yet still not genuinely feel that way, thus acting in a helpless manner. Thus, it is possible that boys with ADHD and a performance (helpless) orientation may self-report that they are effort-oriented.

Consistent results were found by Milich and Okazaki (1991) who examined helplessness among boys with ADHD. Boys with ADHD and typically-developing boys were given soluble and insoluble puzzles to complete. Participants with ADHD gave up more frequently and completed fewer puzzles; this effect increased following the unsolvable condition. That is, after attempting insoluble puzzles, boys with ADHD were significantly less likely to attempt or complete the subsequent soluble puzzles (Milich & Okazaki, 1991). Further, the achievement orientation of typically-developing boys aligned with Dweck and Leggett's (1988) model, whereas the achievement orientation of the boys with ADHD was contrary to theoretically proposed expectations. Hoza, Waschbusch, Owens, Pelham, and Kipp (2001) provided further evidence of this effect by having children complete puzzles after experiencing either success or failure. As with Milich and Okazaki (1991), Hoza et al. (2001) found that, following failure, children with ADHD solved fewer puzzles, quit working sooner, and found fewer words. Further, it was found that boys with ADHD endorsed luck as their rationale for success and lack of effort as their explanation for failure. These endorsements indicate a mix of external attributions (i.e., success due to luck) and effort attributions (e.g., failure due to less effort). According to theory, this particular combination of attributions represents a helpless orientation.

Dunn and Shapiro (1999) examined achievement orientation and attributions in children with ADHD, with a focus on gender differences. Dunn and Shapiro (1999) found that 85% of boys with ADHD endorsed a performance orientation, compared to 90% of the girls with ADHD. Thus, no apparent gender difference in achievement orientation was found between boys and girls with ADHD. Alternatively, 40% of typically-developing boys and 55% of typically-developing girls endorsed a performance orientation. Thus, children with ADHD seem more likely to endorse a performance orientation than typically-developing children. Further, children with ADHD reported a more external locus of control than typically-developing children (Dunn & Shapiro, 1999).

Leggett and Dweck (1986) examined differences in how children interpret effort based on their achievement orientation. Those who endorsed performance goals (e.g., they wanted to look good) viewed effort as an index of ability; that is, low effort resulting in success was considered indicative of high ability, whereas high effort resulting in either success or failure was indicative of low ability. Those who needed to try hard considered themselves less skilled, according to children with a performance (helpless) orientation (Leggett & Dweck, 1986). Alternatively, children who endorsed mastery goals viewed effort as a strategy to manifest ability. Thus, children with a mastery (learning) orientation tended to attribute success to their own effort, whereas those with a performance (helpless) orientation tend to believe that increased effort does not lead to success (Leggett & Dweck, 1986). Further, a study by Hoza, Pelham, Waschbusch, Kipp, and Owens (2002) did not assess achievement orientation but did examine attributions of success and failure in an academic task among children with ADHD. Hoza et al. (2002) found that children with ADHD made more luck attributions for success than typically-developing children, and this became more pronounced following failure. Typically-developing children

were more likely to attribute failure to a lack of effort, which is indicative of a mastery orientation (Hoza et al., 2001). That is, typically-developing mastery-oriented children emphasized their effort more so than good luck.

This effect is supported by evidence from Milich and Okazaki's (1991) work on learned helplessness. Specifically, self-reports from typically-developing children with a mastery orientation indicated that they felt they tried harder than typically-developing children with a performance orientation. Conversely, children with ADHD who endorsed a performance orientation reported more effort than the children with ADHD and a mastery orientation (Milich & Okazaki, 1991). Further, the mastery-oriented boys with ADHD were, in fact, most likely to quit early when provided with an insolvable puzzle (Milich & Okazaki, 1991). Again, this is opposite of what would be expected based on Dweck and Leggett's (1988) theory.

Most of the research on achievement orientation, however, has focused on academic tasks. Even so, there are a few known studies that have examined the Dweck and Leggett (1986) model of achievement orientation in explaining the social functioning of typically developing children. Rudolph, Abaied, Flynn, Sugimura, and Agoston (2011) studied the impact of social goal orientation on responses to hypothetical peer aggression. These investigators used a modified version of Dweck and Leggett's (1986) theory, which referred to mastery orientation as development goals and performance orientation as demonstration goals. Further, demonstration goals were split into demonstration-avoidance goals and demonstration-approach goals, which was supported by their factor analysis. Both child self-report and teacher report of child responses (e.g., effortful engagement) were included in this study. Children also reported the extent to which others victimized them. All measures occurred during the second grade and again during the third grade. Children with development goals (i.e., mastery orientation) reported

that they engaged in more prosocial behaviors and indicated that they had less negative self- and peer-perceptions. Alternatively, children with demonstration goals (i.e., performance orientation) reported that they had more negative peer perceptions (e.g., agreeing with statements such as “Other kids can be pretty mean”). When broken down into approach and avoidance factors, children with demonstration-approach goals reported engaging in more aggression, whereas children with demonstration-avoidance goals reported engaging in less aggression. As such, clear differences between mastery and performance orientations were found in one’s responses to peer aggression, and these may have been more nuanced than initially expected. Rudolph et al. (2011) suggested that children with higher negative emotionality, as well as those with poor inhibitory control, might have difficulty moving past their initial response to select an adaptive response. It is well-documented that many children with ADHD have poor inhibitory control, and thus may be likely to respond in similarly maladaptive ways as described by Rudolph et al. (2011).

Similarly, Landau and Greenwell-Van Lahr (1994) asked participants (i.e., boys with and without ADHD) to write a letter to the president of a “pen-pal club” to request admission. Each boy was also asked to predict the likelihood of his acceptance into the club and then received feedback that he was not accepted. Following this feedback, boys were asked to explain why they were not admitted and then wrote a second letter requesting admission. Dependent variables included self-efficacy ratings, attributions, and persistence in the face of failure. Persistence was measured via time spent on the letter, as well as number of words written. For the first letter, mastery-oriented typically-developing boys wrote the greatest number of words, whereas mastery-oriented boys with ADHD wrote the fewest number of words. On the second application to join the club, performance-oriented boys with ADHD wrote far more words than the mastery-

oriented boys with ADHD. Again, the boys with ADHD responded in a manner opposite of Dweck and Leggett's (1988) theory.

Although Dweck and Leggett's (1988) model has been found to be consistent among typically-developing children, the above study revealed a pattern of opposite results for those with ADHD. For reasons not yet understood, there is evidence that children with characteristics of ADHD may not respond as predicted and, in fact, may behave more like those with an achievement attribution opposite their own. Thus, the purpose of this study was to examine whether achievement orientation as articulated by Dweck and Leggett (1988) predicts responses to social failure (i.e., being excluded) in boys with characteristics of ADHD to determine if they are opposite of responses among typically-developing children. Further, it was hypothesized that children high in ADHD symptom severity who endorsed a mastery orientation would behave similar to children low in ADHD symptom severity who endorsed a performance orientation and vice versa. That is, the performance of children high in ADHD symptom severity plus a mastery orientation was expected to resemble the performance of a child low in ADHD symptom severity with a performance orientation. Conversely, the performance of children high in ADHD symptom severity plus a performance orientation was expected to resemble that of children low in ADHD symptom severity with a mastery orientation.

In the proposed study, boys with varying characteristics of ADHD were exposed to brief social exclusion via *Cyberball* (Williams, Yeager, Cheung, & Choi, 2012). Prior to playing *Cyberball*, participants were asked to write a letter to the other game-players so they get to know each other before playing the game. After being excluded during a game of *Cyberball*, participants were asked to write another letter to the other game-players so that the other players would be more likely include them in a subsequent game. Historically, the effects of

achievement orientation have been measured through a variety of outcomes. Researchers have examined persistence on puzzles, via number of puzzles solved, number of puzzles in which the participant quit before finishing, and average time spent on puzzles (Hoza, Pelham, Waschbusch, Kipp, & Owens, 2002; Milich & Okazaki, 1991). Another method that has been used to examine the effects of achievement orientation involves letter-writing, as used by Landau and Greenwell-Van Lahr (1994).

In the context of this study, Linguistic Inquiry and Word Count (LIWC) is a text-analysis program that has been used in numerous studies to analyze words in a writing sample (Ahmadian, Azarshahi, & Paulhus, 2016; Rand, Kraft-Todd, & Gruber, 2015; Tausczik & Pennebaker, 2010; Toma & D'Angelo, 2015). Words are categorized into dictionaries based on derived categories. The main dictionary was developed by 2-6 judges based on rating scales, a thesaurus, and standard English dictionaries (Pennebaker, Boyd, Jordan, & Blackburn, 2015). Words were then rated for their “goodness-of-fit” for each category by a group of 4-8 judges. A base rate analysis was conducted to determine the frequency of dictionary words within various sources; words that were not used at least once were eliminated from the lists. High frequency words were added to the lists by checking their correlation to dictionary words, followed by another voting by a group of 4-8 judges. The 2015 LIWC dictionary, used in this study, is a modification of the 2007 dictionary. Internal consistency of the various categories ranges from .18 to .93.

In the proposed study, persistence in boys’ letter-writing was measured by the number of words written, time spent on the writing task, percent of words that were adjectives, percent of words that were adverbs, and number of topics used. Persistence involved a difference variable, calculated by determining the change in each variable from the first letter to the second letter. It

was expected that typically-developing boys with a mastery orientation would try harder after the social exclusion, thus spending more time and writing more words; this same pattern was expected of boys with ADHD and a performance orientation. Alternatively, typically-developing boys with a performance orientation were expected to give up sooner following a failed attempt at inclusion, thus having spent less time on the letter-writing task and writing fewer words; the same response was anticipated for boys with ADHD and a mastery orientation.

Positive Illusory Bias

Although no definitive explanation has emerged to explain the theoretical divergence in achievement orientation for boys with and without ADHD, it is possible that a positive illusory bias among those high in ADHD symptom severity may aide in our understanding. This bias was first described as unrealistic optimism by Milich (1994), who found that boys with ADHD predicted significantly better performance for themselves than predicted by typically-developing boys. This effect was confounded by the fact that boys with ADHD actually gave up sooner and reported more frustration than comparison boys (Milich, 1994). Soon known as the positive illusory bias (Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007), this bias involves a tendency to exaggerate how well one will do in anticipation of performing a task or joining a group, relative to one's ultimate performance.

Hoza, Waschbusch, Pelham, Molina, and Milich (2000) examined the responses of boys with and without ADHD to social success and failure. Participants were given the task of convincing another boy (a confederate) to attend a summer camp; confederates' responses were scripted to be neutral, very agreeable, or very disagreeable to simulate success and failure in the participant's effort. In their recruiting conversations, boys with ADHD were less socially effective than comparison boys, but rated themselves more favorably than did comparisons;

further, this difference became more noticeable following failure, rather than success, to convince the confederate to come to camp. Hoza et al. (2000) concluded that a positive illusory bias was present and was more extreme following social failure. Researchers hypothesized that those children felt a need to save face with researchers following an obvious failure (Hoza et al., 2000). Further, Hoza, Pelham, Dobbs, Owens, and Pillow (2002) examined the positive illusory bias among children with ADHD and found that it exists in the areas of social competence, social acceptance, and behavioral conduct. Additionally, Hoza et al. (2002) determined that boys with ADHD tended to exaggerate their competence to the greatest degree in the domains in which they were most impaired. For the purpose of this investigation, social exclusion was selected as the domain of study because it represents an area of extreme challenge to many with ADHD (i.e., they are disliked and left out).

This bias has been found to be both positive and consistent over time (Hoza, Murray-Close, Arnold, Hinshaw, & Hechtman, 2010). In their longitudinal study, data were collected four times over a 6-year period. Participants rated their own perceptions of social acceptance and behavioral conduct; those ratings were then subtracted from teacher ratings of social acceptance and behavioral conduct to derive a bias score. Regarding social competence, children with ADHD exhibited a consistent positive bias over the 6-year period. This bias, however, did not show as large a developmental increase as was seen for comparison children. Hoza et al. (2010) suggested that ADHD children's self-perception might already be at the ceiling, allowing less room for increases. In addition, Hoza et al. (2010) found that the absolute levels of competence for children with ADHD were comparable to those of children without ADHD, indicating that the children with ADHD appeared to be "normalizing" their self-perceptions. That is, children with ADHD rated themselves as similarly skilled as their peers, rather than simple reporting they

are better than their peers. The discrepancy still exists, however, because these children are, in reality, less skilled than their peers.

More recently, Linnea, Hoza, Tomb, and Kaiser (2012) sought to link the positive illusory bias to the social behavior of children with ADHD. Linnea et al. (2012) examined the possibility that the positive illusory bias could either enhance a child's motivation to engage in social interactions or inhibit the ability of that child to recognize the need to change his or her behavior. Each participant engaged in an activity in which he or she acted as a host of a "TV Talk Show;" the participants interviewed confederates who were either very cooperative or very difficult (i.e., simulating social success and failure). Children in the comparison group and those with ADHD who were lacking a positive illusory bias displayed more positive social behaviors than children with ADHD and a pronounced positive illusory bias. Further, children with ADHD and a positive illusory bias engaged in significantly less effortful behavior than those in the control group; the ADHD and positive illusory bias group also displayed more helpless behavior than the control group (Linnea et al., 2012). Researchers concluded that the existence of a positive illusory bias might hinder the social interactions of children with ADHD: engaging in helpless and minimal effortful behavior that may limit social interactions (Linnea et al., 2012).

Several hypotheses have been proposed to explain the existence of the PIB. Owens, Goldfine, Evangelista, Hoza, and Kaiser (2007) reviewed the existing literature on the PIB. One hypothesis involves cognitive immaturity; this hypothesis implies that such a bias is appropriate in younger children but is eventually outgrown. A second hypothesis is that neurological deficits, such as a frontal lobe deficit and executive dysfunction, are to blame for this bias. The third hypothesis is the "ignorance of incompetence" hypothesis, which suggests that these children are unaware that they are overestimating their competence. Each of these hypotheses has limited

evidence for support (Owens et al., 2007). The fourth hypothesis, and one that has the most empirical support to date, involves efforts at self-protection (Owens et al., 2007).

The self-protective hypothesis suggests that when children with ADHD feel threatened by failure, they mask their feelings of incompetence and inadequacy by assuming a grandiose self-protective stance. That is, these children inflate their self-reports of competence to hide their perceived failures. This hypothesis aligns with the Hoza et al. (2002) report that boys with ADHD overestimate their competence most in the domains in which they experience greatest impairment. Further, “looking good” is indicative of a performance orientation in children.

Diener and Milich (1997) tested the self-protective hypothesis among boys with ADHD. After an initial interaction with a peer, boys with ADHD exhibited overly positive views about how much that peer liked them. Following a second interaction, some of the boys with ADHD were also given positive feedback. These boys were observed having a significant reduction in their biased self-perceptions of competence following praise (Diener & Milich, 1997). That is, their self-perceptions were more accurate than in the initial encounter, a time when participants felt less need to hide their inadequacies. Alternatively, Watabe, Owens, Serrano, and Evans (2017) exposed children with and without ADHD to a novel task, creating low, medium, and high levels of competency during which time they measured the positive illusory bias of each child. They found that that the bias changed when competence levels were equated across groups, in that all children (regardless of ADHD status) were more biased when they were less competent. They concluded that the “ignorance of incompetence” was a better hypothesis for the positive illusory bias (Watabe et al., 2017). This novel task was a language-based task that had no social component, however.

Hoza, Vaughn, Waschbusch, Murray-Close, and McCabe (2012) attempted to motivate children with ADHD to reduce their PIBs. Children were asked to rate themselves in a variety of domains; each boy's competence was also rated by one of his teachers. After completing the ratings once, children were then offered a monetary incentive to try to match the teacher ratings. As hypothesized, Hoza et al. (2012) found that the greatest reduction in biases occurred during the activity with a monetary incentive. These results suggest that a monetary incentive helped children try harder to be more accurate and agree with other informants. Children were able to reduce their biases for the academic and behavioral domains but not the social domain. The authors suggested that the social domain is perhaps an area in which children with ADHD feel most vulnerable. Hoza et al. (2012) hypothesized that children with ADHD cannot view themselves in a completely unbiased way, as opposed to the suggestion that they opt to view themselves in a more positive manner. Although this may be true for many people, this bias is more extreme among children with ADHD, and may impact their peer functioning. That is, these children tend to boast, brag, and turn off their peers.

Thus, the purpose of the current study was to link the current research regarding the PIB with the research on achievement orientation. It was hypothesized that children high in ADHD symptom severity would respond differently to game-based ostracism than typically-developing children. Further, it was hypothesized that children high in ADHD symptom severity and a performance orientation would invest greater effort into the letter-writing task in a manner similar to typically-developing children with a mastery orientation. Finally, it was hypothesized that this differential pattern of responding would be mediated by the strength of the positive illusory bias. Specifically, children high in ADHD symptom severity and a performance orientation who also had a stronger positive illusory bias were expected to persist more in letter-

writing than those who were helpless but with a weaker positive illusory bias. As previously explained, persistence was measured by the number of words, number of adjectives, number of adverbs, and time spent on the letter-writing task. Further, as the boys were provided with a list of potential topics to cover in the letter, the number of topics used was also assessed.

Summary and Hypotheses

In sum, it is clear that children high in ADHD symptom severity tend to have significant impairments in peer relations; they are more often rejected than all other peers within the general education classroom and experience ostracism more frequently than children low in ADHD symptom severity. For these children, some form of social exclusion may be a daily occurrence (Hoza et al., 2005). Even though peer problems among children with ADHD are ubiquitous, individual differences exist in the type and severity of peer problems as well as the child's social-cognitive and behavioral response to them. One such individual difference expected to impact the response to these disturbed peer relations was achievement orientation, or the perceived goals of behavior. Mastery-oriented children tend to approach tasks with the goal of mastering new material, whereas performance-oriented children approach tasks with the goal of looking good or proving their ability. Many children with ADHD endorse a performance, or helpless, orientation as opposed to a mastery orientation. Further, research indicates that the actions expected from children with ADHD of each orientation tend to be the opposite of the responses anticipated of typically-developing children. It was expected that children high in ADHD symptom severity who endorsed a performance orientation would behave in a manner similar to children low in ADHD symptom severity who endorsed a mastery orientation, and vice versa. It was anticipated that this reversed and unexpected pattern would be due to the mediating role of a positive illusory bias. Thus, the following hypotheses were proposed:

Hypothesis 1. Based on theory (i.e., Dweck & Leggett, 1988), it was expected that boys with a mastery orientation would try harder following failure, whereas boys with a performance orientation would give up sooner following failure. This pattern has not been replicated for those with ADHD. Based on previous research by Landau and Greenwell-Van Lahr (1994), it was hypothesized that boys with more pronounced characteristics of ADHD would respond differently to ostracism than typically-developing boys in the letter-writing task that involved their efforts to be accepted in the second computer game. Specifically, boys higher in ADHD symptom severity who endorsed a mastery orientation were expected to respond to ostracism in a manner similar to boys low in ADHD symptom severity who endorsed a performance orientation. In contrast, boys high in ADHD symptom severity who endorsed a performance orientation were expected to respond in a manner similar to boys low in ADHD symptom severity who endorsed a mastery orientation. That is, boys with more severe characteristics of ADHD and a mastery orientation would show less persistence, represented by writing fewer words, including adjectives and adverbs, using fewer suggested topics, and taking less time on the second letter-writing task than boys who were more symptomatic of ADHD and a helpless orientation, and typically-developing boys with a mastery orientation.

Hypothesis 2. It was hypothesized that this theoretically inconsistent pattern observed in boys who were higher in ADHD symptom characteristics would be explained by the presence and magnitude of their positive illusory bias (PIB). No known study has examined the explanatory role of positive illusory bias on ADHD boys' response to social failure in the context of achievement orientation. Thus, it was further hypothesized that boys with greater ADHD symptom severity plus a performance orientation would behave similarly to boys low in ADHD symptom severity with a mastery orientation, and this would be mediated by their positive

illusory bias. Boys with greater symptom severity of ADHD plus a performance orientation and a stronger PIB would persist more than those with a weaker PIB. Specifically, boys with greater ADHD symptom severity, a stronger positive illusory bias, and a performance orientation would write more words, including adjectives and adverbs, use more suggested topics, and take more time on the second letter-writing task than similar boys with a weaker positive illusory bias.

CHAPTER III: METHODOLOGY

Participants

Participants were 76 elementary-age boys (grades 4 through 9 from small Midwestern communities), with a mean age of 12.17, $SD = 1.61$, who varied in symptom severity of ADHD. This particular age range was selected to ensure that participants would have adequate typing skills to complete the letters due to the design of the study. Girls were excluded from this study because ADHD is more prevalent in boys, and boys are qualitatively different from girls in their peer relations (Rose & Rudolph, 2006). Boys were recruited from a variety of sources. First, principals at local schools were asked to provide informed consent letters to parents of all boys within the specified grade range. Second, boys were recruited through a local clinic by having medical doctors and physician's assistants provide consent forms to parents of male patients who were within the specified age criteria. In all cases, parents of boys were provided with an informational packet, including a cover letter and an informed consent letter. Upon receiving parent consent for clinic participants, the investigator contacted consenting parents via telephone to describe the study and schedule a time for their son to participate. Upon receiving consent for school-based participants, the investigator scheduled a time with the school to ensure that participants missed as little class time as possible.

Initially, 100 boys were recruited for this study, but due to lack of parent participation, data from only 76 participants were utilized for analyses. This is a significant limitation that will be addressed through the results and discussion, and must be underscored. Data collection was completed over a period of several years, across several different school districts and communities. These communities were primarily rural communities in which parents were less familiar with participation in research; many families expressed hesitation at involvement.

School principals welcomed researchers but warned about low return rates for permission forms. Far more than 100 permission forms were sent out; indeed, closer to 500 permission forms were sent out between the various schools and clinic settings. After boys returned their permission and consent forms, the investigators then met with boys to begin boys' self-report assessments and subsequently sent home the parent assessment forms; as a result, parent data were not completed until after each boy had participated. Although each parent returned consent forms agreeing to complete rating scales, approximately 24% of parents did not return these scales. After approximately three years of data collection, investigators had collected data from 100 boys, albeit, only 76 were complete sets (i.e., both parent and son). As the initial proposal called for 88 participants, and the majority of measures was completed by boys, it was decided to proceed with data analysis.

Design

Following approval from the university Institutional Review Board, informed written consent and permission were collected from parents and verbal assent was obtained from all child participants. Upon entering the room, each boy completed scales to determine their achievement orientation, presence and degree of positive illusory bias, a measure of social desirability, and a self-report of response to ostracism. The order of these scales was counterbalanced across participants, with exception of boys' *Need Threat* scale, which was always given after the ostracism event. Parents of school-based participants completed at home a measure of ADHD symptom severity as well as a measure of the degree of their son's positive illusory bias; parents of clinic-based participants completed these measures on-site while waiting for their children to complete the study.

Instruments

Level of ADHD Symptom Severity. After receiving parental consent, ADHD symptom severity was determined by using the diagnostic criteria from the *Diagnostic and Statistical Manual*, 4th edition (DSM-IV), through the *ADHD Rating Scale-IV: Home Version* (DuPaul, Power, Anastopoulos, & Reid, 1998).

A parent or guardian of each participant completed the *ADHD Rating Scale-IV*, an 18-item scale. Items were based on a 4-point Likert scale anchored by “0 = never or rarely,” “1 = sometimes,” “2 = often,” and “3 = very often.” This scale provides three subscores: Inattention (e.g., “fails to give close attention to details”), Hyperactivity-Impulsivity (e.g., “interrupts or intrudes on others”), and a Combined subscale (i.e., a composite of all items). Based on previous research, children with a high total score (i.e., above the 85th percentile) have been considered in the clinical range for symptom severity, whereas those with scores below the 60th percentile have been considered free of ADHD symptom severity (Ronk et al., 2011). For this study, however, ADHD was considered dimensionally and not categorically. That is, boys’ varying levels of ADHD symptom severity were considered without regard to formal diagnoses. ADHD has been found to be highly correlated with the positive illusory bias (Hoza, Pelham, Dobbs, Owens, & Pillow, 2002). Thus, recruiting participants with ADHD increased the likelihood of finding participants with a stronger positive illusory bias.

Test-retest reliability of parent ratings on this scale range from .78 - .86 (DuPaul et al., 1998). The validity of this measure has been demonstrated by successfully differentiating children with and without ADHD (Power et al., 1998). Although the *ADHD Rating Scale-IV* is based on an earlier version of the DSM, the diagnostic criteria remain the same in the 5th edition;

the sole difference with regard to the diagnosis of ADHD is that more examples for each criterion are listed in the 5th edition (APA, 2013).

Scores considered high for boys in the age range for this study would be those starting at 16.2, ranging up to 47, depending on the chosen cutoff score (DuPaul et al., 1998). In the current study, ADHD status was examined on a continuum rather than using a clinical cutoff for diagnostic severity. Additionally, it should be noted that only boys' total score was examined, rather than examining each of the presentations of ADHD (e.g., Inattentive, Hyperactive/Impulsive) individually. Internal consistency for the current sample was excellent, with an alpha coefficient of .94. In this study, scores ranged from 0 to 48, with a mean of 16.39 and $SD = 11.15$. Compared with other studies of children with ADHD, this distribution has a relatively low mean, indicating that there are fewer children high in ADHD symptom severity than found in previous studies of boys.

Social Desirability. To determine if the strength of the positive illusory bias is related to a desire to present oneself in an overly positive light, each participant completed a shortened, 37-item version of *Crandall's Social Desirability Questionnaire for Children* (Crandall, Crandall, & Katkovsky, 1965). *Crandall's Social Desirability Questionnaire for Children* is a 48-item scale consisting of true/false questions. The measure determines how likely a child will select answers that he or she feels will be pleasing to others. Split-half reliability coefficients for the full-length scale range from .69 to .90 and test-retest reliability was found to be .85 after a one-month delay (Crandall et al., 1965). Overall, it has been found that social desirability decreases with age (Crandall et al., 1965). A similar pattern was found in the current study, although the correlation was not significant.

Each participant in this study answered the full 48-item true/false scale. Scores were coded such that socially desirable answers were worth one point, whereas socially undesirable answers were worth zero points. In this study, scores ranged from 4.00 to 35.00, with a mean of 17.88 and a standard deviation of 6.62. These scores are similar to existing results found in previous studies (Crandall et al., 1965). Internal consistency for the current sample was good, with an alpha coefficient of .84.

Achievement Orientation. To determine strength of mastery and performance orientations, each boy completed a *Social Achievement Goal Questionnaire* (Rudolph, Abaied, Flynn, Sugimura, & Agoston, 2011). Most scales on achievement orientation focus on the academic domain. The Rudolph et al. (2011) scale is important because it examines achievement orientation in the social domain. This questionnaire consists of 21 items, each with a 5-point Likert scale for the boy to indicate the degree to which each statement is true of him. This scale categorizes participants into development (i.e., mastery) goals plus two different types of demonstration (i.e., performance) goals: demonstration-approach and demonstration-avoidance. Rudolph et al. (2011) conducted a factor analysis of this scale through which four factors emerged. One factor contained only one item and that factor was removed by the investigators. The second factor, Development (i.e., mastery) Goals, included items such as “I like to learn new skills for getting along with other kids.” In their study, Development Goals predicted cooperative goals and positive peer perceptions. The third factor, Demonstration-approach Goals, included items such as “I want to be friends with the ‘popular’ kids.” These goals predicted not only Control Goals but also self-reported aggression. The fourth factor, Demonstration-avoidance Goals, included items such as “I try to avoid doing things that make me look bad to other kids.” Demonstration-avoidance Goals predicted conflict reduction goals, but negative peer

perceptions. All items loaded on to their respective factors at $>.41$, whereas cross-loadings were low (average = $.06$). For the purpose of this study, the two types of demonstration (i.e., performance goals) were averaged to provide an overall estimate of boys' performance achievement orientation.

The demonstration categories of the *Social Achievement Goal Questionnaire* are theoretically synonymous with the performance orientation; thus for the sake of this study, those two categories were averaged. The scores for the development scale ranged from 13 to 32, with a mean of 24.08 and a standard deviation of 4.49. Scores for the demonstration scale (averaged) ranged from 3.50 to 26.00, with a mean of 14.53 and a standard deviation of 5.34. As this was a novel way of determining performance orientation, no comparisons can be made to previous studies. In this study, scores were normally distributed for both the performance and mastery orientations. Internal consistency for the current sample was good, with an alpha coefficient of $.84$. Development goals had a slightly lower internal consistency ($\alpha = .82$) whereas demonstration goals had a higher internal consistency ($\alpha = .88$).

Positive Illusory Bias. To determine the presence and strength of boys' positive illusory bias, the child and parent versions of the *Social Skills Improvement System Rating Scales* (SSIS; Gresham & Elliott, 2008) were completed by each participant and a parent or guardian. The SSIS is designed to assess children's social behaviors; it provides a measure of positive social behaviors, negative behaviors, and academic competence. The subscales for Social Skills on the SSIS include Communication, Cooperation, Assertion, Responsibility, Empathy, Engagement, and Self-Control. For this measure, boys responded to statements such as "I take turns when I talk to others" and "I say nice things about myself without bragging" by indicating how true that statement is of him. Parents also responded to statements, such as "Tries to make others feel

better” by indicating how true each statement is for their child. The SSIS has high concurrent validity when compared to the previous version, the *Social Skills Rating System*, ranging from $r = .51$ to $.76$ for the parent form. Further, the SSIS shows strong social skills test-retest reliability ($r = .84$ for social skills on the parent form) and internal consistency ($r = .95$ for social skills on the parent form) (Gresham & Elliott, 2008). Previously, parent-teacher agreement ranged from $.15$ to $.38$; agreement was significant on all Social Skills scales except Assertion (Gresham, Elliott, Cook, Vance, & Kettler, 2010). Convergent correlations were stronger in magnitude than divergent correlations.

For the purpose of this study, illusory bias scores were calculated based on discrepancy scores on the Social Skills subscale of the SSIS by subtracting the parent’s rating from the boy’s overall Social Skills ratings. This discrepancy (parent rating subtracted from child rating) demonstrates the extent to which children may overestimate their competence in comparison to more veridical sources (i.e., the parent). In this study, positive illusory bias scores ranged from -39.00 to 55.00 , with a mean of 8.45 and a standard deviation of 21.28 . Given that many studies of the positive illusory bias use other measures (e.g., Self Perception Profile for Children, 1985), comparisons to past studies are difficult to make. In this study, the scores were normally distributed with a large standard deviation. This shows a wide range of variability, in which some boys had large positive biases, while others had large negative biases. Internal consistency for both parent and child scales were excellent; both forms had alpha coefficients of $.95$.

Boys’ Subjective Responses to Ostracism. Each boy completed a self-report scale to assess his subjective responses to the game-based ostracism event. The purpose of this scale was to confirm that the participant was actually aware of being ostracized. Specifically, the *Need Threat* scale (Van Beest & Williams, 2006), a self-report scale designed to measure subjective

responses to ostracism, was completed by each boy immediately following the first game of *Cyberball*. This scale is regularly used following ostracism manipulations for research purposes (Zadro, Boland, & Richardson, 2004). Use of this scale provides information about which primary needs were most impacted by the ostracism event and confirms that ostracism did indeed have an effect on participants. Previously, internal consistency has ranged from $\alpha = .66$ to $.74$ (Zadro, Williams, & Richardson, 2004). This 20-item measure assesses the four primary needs outlined by Williams et al. (2000), including threat to belonging, meaningful existence, self-esteem, and control. Each item was rated on a 7-point scale, ranging from 1 (*do not agree*) to 7 (*agree*). By answering each question, boys reported the degree to which the ostracism affected them. Some statements address need for belonging, such as “I felt poorly accepted by the other participants,” whereas other statements address meaningful existence (e.g., “I felt non-existent during the Cyberball game”). Self-esteem was addressed by statements such as “During the Cyberball game, I felt good about myself.” In this study, scores ranged from 9.00 to 43.00 with a mean of 19.21 and a standard deviation of 8.18. This aligns with similar studies using *Cyberball* conducted with children (Hawes et al., 2012). This scale had good internal consistency with the current sample, with an overall alpha coefficient of .89.

Procedure

Initial Letter-Writing Task. Following administration of the *ADHD Rating Scale-IV: Home Version*, *Crandall’s Social Desirability Questionnaire for Children*, *Social Achievement Goal Questionnaire*, and the Social Skills subscale from the *Social Skills Improvement System Rating Scales* in counterbalanced order, each boy was asked to write a letter to the other game players so they would get to know him and like him, and to convince the other players to include him in the game. The other two players were e-confederates and did not read the letter.

Participants were provided with a list of suggested topics to cover in their letter. This list included approximately 10 items (e.g., favorite games, sports, or hobbies). Directions were provided verbally and in hard copy, specifically stating:

Today you will be playing two rounds of an online ball-toss game with two other players. Before you start the game, please take a few minutes to write an e-mail to the other players who are in another state. This letter will help the other boys get to know you and like you. We will send the letter via e-mail and give the other players a few minutes to read the letter before the game starts. Here is a list of suggested topics to write about if you need some ideas. The topics include your favorite games, sports, and hobbies, and are listed on the top of this page for you to look at while writing your letter. Tell them as much about yourself that you think they will like about you. Are there any questions? Please begin writing your letter; you will have five minutes to write. Remember, try to get the other players to like you so they'll want to play with you in the game.

Each boy was allowed 5 minutes to compose a letter via computer, which was then “e-mailed” to the e-confederates. The e-confederates were allowed a few minutes to “read” the letter, and then the first ball-toss game began.

First *Cyberball* Game. Following the letter-writing task, each participant played a game of *Cyberball* in which he was excluded from the game. The exclusion game was set up for a total of 40 ball-tosses and involved two e-players and the participant. Each participant was informed that when the ball was thrown to him, he should click on one of the other two players to throw the ball to that player. Although each participant initially received two ball tosses, he was then completely excluded while the two e-confederates passed the ball back and forth for the remainder of the game.

Boys' Subjective Responses to Ostracism. Following the ostracism event, each boy completed the *Need Threat* scale (Van Beest & Williams, 2006). This scale provided self-reported information about how the ostracism game affected the boy and confirmed that he was aware of his exclusion.

Second Letter-Writing Task. After completing the *Need Threat* scale, each boy was prompted to write a second letter to encourage the other players to include him in the second game. Each boy was provided with nearly identical directions plus suggested topics to assist in his inclusion attempt. Specifically, each boy was told:

We are going to play our final round of the online ball-toss game with the same two players. Before you start the game, please take a few minutes to write an e-mail to the other players. This letter will help the other boys get to know you better and like you, and help them decide that they want to play with you. We will send the letter via e-mail and give the other players a few minutes to read the letter before the game starts. Here is the list of suggested topics to write about if you need some ideas. The topics include your favorite games, sports, and hobbies, and are listed on the top of this page for you to look at while writing your letter. Tell them as much about yourself that you think they will like about you. Are there any questions? Please begin writing your letter; you will have five minutes to write. Remember, try to get the other players to like you so they'll want to play with you in the game.

As with the first letter-writing task, each boy was allowed five minutes to compose a letter via computer, which was then “e-mailed” to the e-confederates. The e-confederates were allowed a few minutes to read the letter, and then the final ball-toss game began.

Second Cyberball Game. In the second *Cyberball* game, each boy was fully included in the game. As such, all players, including the participant, received five ball-tosses during the game. Following this final activity, each boy was fully debriefed about the intent of the study. The inclusion event and subsequent debriefing allowed the investigator to explain and minimize potential ill effects of the ostracism event. Figure 1 describes the sequence of the procedure.



Figure 1. Sequence of Procedure.

Dependent Variables. For the purpose of this study, participants' task persistence was measured by several dependent variables from the two letter-writing tasks. During the letter-writing tasks, participants were timed in seconds, up to five minutes (i.e., 300 seconds) to determine how long they spent writing each letter. Further, persistence and effort in attempting to be included in the game were measured by the number of adjectives and adverbs in the letter because these words enrich communication. Based on previous research by Landau and Greenwell-Van Lahr (1994), boys who used a greater number of adjectives and adverbs were found to be more persistent in gaining peer entry. The *Linguistic Inquiry and Word Count* (LIWC; Pennebaker, Boyd, Jordan, & Blackburn, 2015) program was utilized to measure word count, as well as number of adjectives and adverbs. LIWC also determines the percentage of a writing sample that includes certain topics; this was used to calculate how many of the suggested

topics boys used when writing their letters. For data analysis, difference scores were calculated to compare all persistence variables from the second letter to the first letter.

Follow each boys' participation in the study, his emails were saved as word documents, which were then analyzed by the LIWC software. The LIWC software analyzed all the emails within seconds, creating a Microsoft Excel file with hundreds of variables based on the standard LIWC dictionary. In this study, LIWC software determined the number of words written, percent of total words that were adverbs and adjectives, and number of topics in the letter. LIWC determined the percent of words written that fell into various categories. Categories derived using LIWC for this study included family, friends, work, leisure, home, money, religion, and death. LIWC was used to determine the number of categories used during each boy's letter-writing attempt, and a difference score was calculated for each participant, comparing the second letter to the first. Difference scores were also calculated for number of words, time, adjectives, and adverbs.

CHAPTER IV: RESULTS

Preliminary Analyses and Missing Data Imputation

The current study was designed to examine the complicated relationship between severity of parent-rated ADHD symptoms, boys' positive illusory bias, social desirability bias, social achievement orientation, and persistence following exclusion. Each child participant completed forms and activities that provided data for the following measures: social skills (used to calculate positive illusory bias), social desirability, social achievement orientation, and persistence. A parent or guardian of each male participant was asked to complete two measures: an ADHD rating scale and a measure of the son's social skills (used to calculate positive illusory bias).

Persistence in letter-writing following exclusion was measured in five different ways. Time spent on each letter was measured by the examiner; each boy had up to 5 minutes (300 seconds) to prepare his letter. Linguistic Inquiry and Word Count (LIWC) software was used to determine the number of words written, percent of total words that were adverbs and adjectives, and number of topics in the letter. LIWC was used to determine the number of categories used during each boy's letter-writing attempt, and a difference score was calculated for each participant, comparing the second letter to the first. Difference scores were also calculated for words, time, adjectives, and adverbs.

Because 24 of all cases were missing parent data (i.e., 4.8% of values), a 2-group MANOVA was conducted to determine if there were significant differences between boys with and without missing data. No difference between groups was found on any of the dependent variables, Wilks' $\Lambda = .934$, $F(5, 94) = 1.33$, $p = .26$, $\eta_p^2 = .07$. Specifically, univariate partial eta squared scores for time, words, adjectives, adverbs, and topics were .03, .00, .04, .00, and .00,

respectively. Given the lack of evidence of differences between the missing and non-missing groups, planned analyses were continued.

Prior to running the hypothesized path analyses, correlational analyses were conducted to determine relations between variables. These correlations, along with means and standard deviations for each measure, appear in Table 1. Age was included to rule out any alternative explanations for findings; it did not correlate significantly with any variables. As expected, ADHD symptom severity was positively correlated with positive illusory bias. That is, boys with more parent-rated symptoms of ADHD had a tendency to overestimate their social skills compared to parent ratings of social skills. ADHD symptom severity was also positively correlated with performance orientation, meaning that boys higher in ADHD symptom severity were more focused on looking good to friends than those low in ADHD symptom severity. ADHD symptom severity was negatively correlated with social desirability bias, suggesting that boys with more symptoms of ADHD either did not care as much about presenting themselves in a socially desirable way or were unaware of how to present themselves in a socially desirable way. Finally, ADHD symptom severity was correlated with percent of adverbs, indicating that boys higher in ADHD symptom severity used more adverbs in their second letter compared to their first letter.

Table 1

Correlations Between Measures (N = 76)

Measure	1	2	3	4	5	6	7	8	9	10	11
1. Age	--										
2. ADHD	-.13	--									
3. Positive Illusory Bias	-.18	.40**	--								
4. Social Desirability	-.19	-.25*	.17	--							
5. Mastery Orientation	-.19	.05	.33**	.48**	--						
6. Performance Orientation	-.17	.28*	.08	-.10	.05	--					
7. Number of Topics	-.03	-.14	.11	.08	.03	-.04	--				
8. Time (s)	-.12	-.06	.16	.17	.33**	.02	.18	--			
9. Total Words	-.06	.01	.05	-.03	.05	.18	.33**	.42**	--		
10. Adjectives (%)	.09	.07	.13	-.01	.07	-.09	-.04	-.07	-.11	--	
11. Adverbs (%)	-.02	.21*	.04	.04	-.02	.07	-.17	-.02	.07	.08	--
Mean	16.39	8.45	17.88	24.08	14.53	-0.16	-31.86	-4.92	.42	1.78	12.17
Standard Deviation	11.15	21.28	6.62	4.49	5.34	1.38	64.53	16.02	5.98	4.66	1.61

Note. * $p < .05$, ** $p < .01$

Mastery orientation had a positive association with positive illusory bias; boys whose self-reported friendship goals involved building true, strong friendships also had a tendency to overestimate their social skills compared to parent ratings of their sons' social skills. Mastery orientation was positively correlated with social desirability as well, indicating that boys who wanted to build good friendships also cared more about presenting themselves in a socially desirable manner. Further, mastery orientation was positively correlated with an increase in time on the second letter, suggesting that boys who wanted to build good friendships took more time when writing their second letters, although none of the other persistence variables (e.g., adjectives, topics) were significantly correlated with mastery orientation. Not surprisingly, both number of topics and time were positively correlated with number of words. Thus, boys who used more topics and took more time also tended to write more words.

Hypothesis Testing

Hypothesis 1. In contrast to the theoretical work by Dweck and Leggett (1988) but based on previous work done by Milich and Okazaki (1991), it was predicted that boys higher in ADHD symptom severity who endorsed a mastery orientation (i.e., focusing on high quality friendships) would show less persistence following exclusion, represented by writing fewer words when trying to be accepted into the game, including adjectives and adverbs, using fewer suggested topics, and taking less time on the letter-writing task. In contrast, boys higher in ADHD symptom severity who endorsed a performance orientation (i.e., focusing on superficial friendships) were expected to show more persistence, by writing more words, including more adjectives and adverbs, using more topics, and taking more time on the second letter-writing task.

Hypothesis 2. Based on research by Linnea, Hoza, Tomb, and Kaiser (2012), it was further hypothesized that boys with greater ADHD symptom severity plus a stronger performance orientation would behave similarly to boys low in ADHD symptom severity with a greater mastery orientation, and this would be mediated by their positive illusory bias. Specifically, boys with greater ADHD symptom severity, a stronger positive illusory bias, and a greater performance orientation would write more words in their second letter, including adjectives and adverbs, use more suggested topics, and take more time on the letter-writing task than boys with a weaker positive illusory bias. In other words, it is the positive illusory bias that explains the effect of ADHD on persistence.

Hypotheses 1 and 2 were examined simultaneously. A path analysis of the data was completed using LISREL 9.3. Path analysis is a statistical method used to examine hypothesized relations between two or more variables (Lleras, 2005), and requires specific hypotheses about how the variables relate to one another. Indices of fit include chi-square, the Root Mean Square Error of Approximation (RMSEA), the Normed Fit Index (NFI), the Nonnormed Fit Index (NNFI), the Comparative Fix Index (CFI), and the Standardized Root Mean Square Residual (Standardized RMR). The hypothesized model is considered an acceptable fit if the RMSEA is less than or equal to .08 and a good fit if the RMSEA is less than or equal to .05. The NFI, NNFI, and CFI typically range from 0 to 1, with a good fit for those between .95 and 1.00. Standardized RMR ranges from 0 to 1, with acceptable models at or below .08 and good models at or below .05.

Missing data were handled in LISREL by excluding any participants with incomplete data, resulting in a final sample size $n = 76$. All variables were tested for skewness and kurtosis, which are shown in Table 2. Most variables showed either some skewness or some kurtosis, with

scores ranging from -3.76 to 4.40. The initial model, as outlined in the proposal, was not a good fit, $X^2(41, N = 76) = 266.09, p = .000$. For this model, RMSEA = 0.27, CFI = 0.00, and the standardized RMR = 0.32. Normed and Nonnormed Fit Indices could not be calculated due to severe collinearity. This model is shown in Figure 2.

Table 2

Skewness and Kurtosis for Complete Case Model

Variable	Skewness	Kurtosis	Chi-Square	<i>p</i>
1. ADHD	1.70	-3.76	17.04	.00
2. Positive Illusory Bias	0.37	-0.22	0.18	.91
3. Social Desirability	1.08	0.44	1.35	.51
4. Mastery Orientation	-1.64	-1.40	4.62	.10
5. Performance Orientation	0.09	-0.81	0.67	.72
6. Number of Topics	-0.71	-0.02	0.50	.78
7. Time (s)	-0.51	-0.90	1.07	.59
8. Total Words	0.02	2.44	5.95	.05
9. Adjectives (%)	3.46	2.51	18.28	.00
10. Adverbs (%)	4.40	3.42	31.08	.00

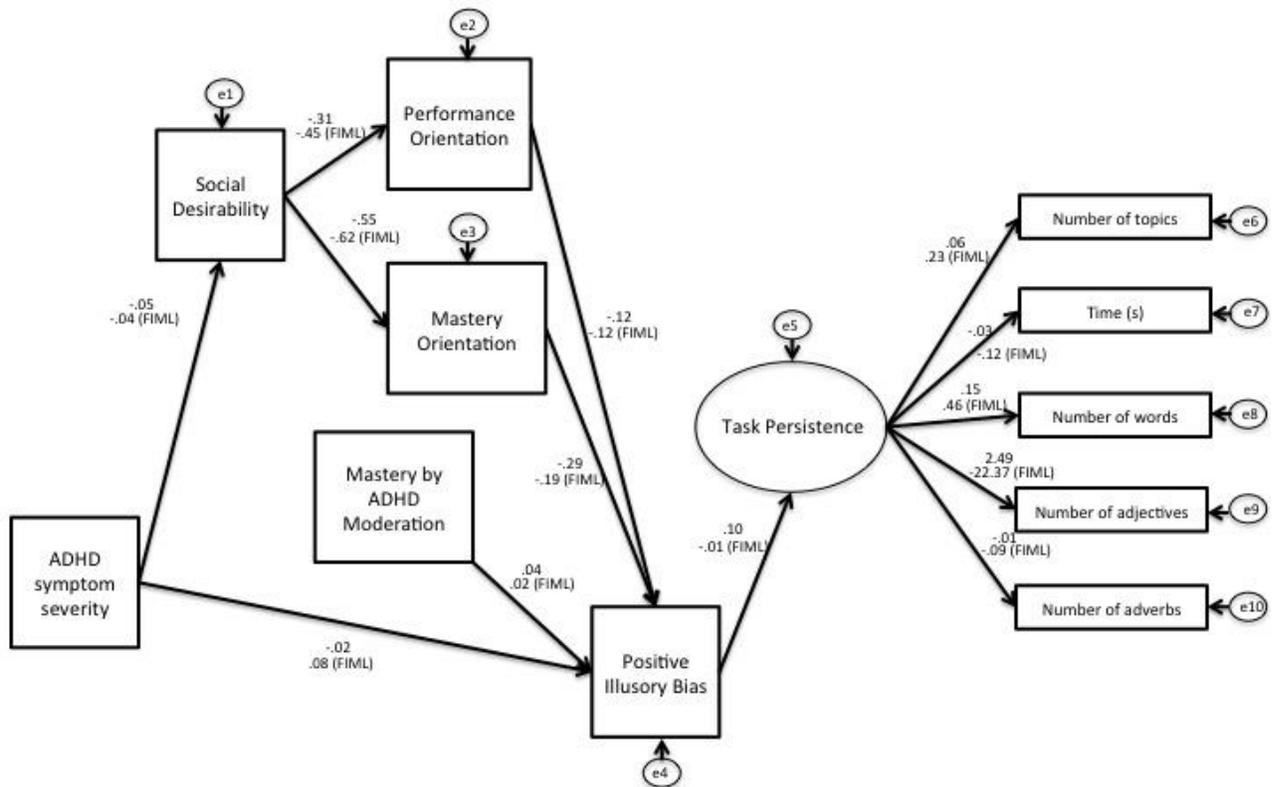


Figure 2. Initial Model.

Model modification was considered by examining *t*-values (the ratio of the parameter estimate to its estimated standard error) and eliminating those parameters with a *t*-value below 1.5. Parameters with modification indices above 5 were considered for inclusion. Determination of the final model was based on indices of fit as described earlier. The latent variable of persistence was eliminated due to a poor fit between the dependent variables included. The final model included ADHD, social desirability, positive illusory bias, mastery orientation, performance orientation, difference in time, and difference in words.

The resulting model showed a reasonably good fit, $X^2(12, N = 76) = 9.60, p = .651$. For this model, RMSEA = 0.00, NFI = 0.82, NNFI = 1.12, CFI = 1.00, and the standardized RMR = 0.07. This model is shown in Figure 3.

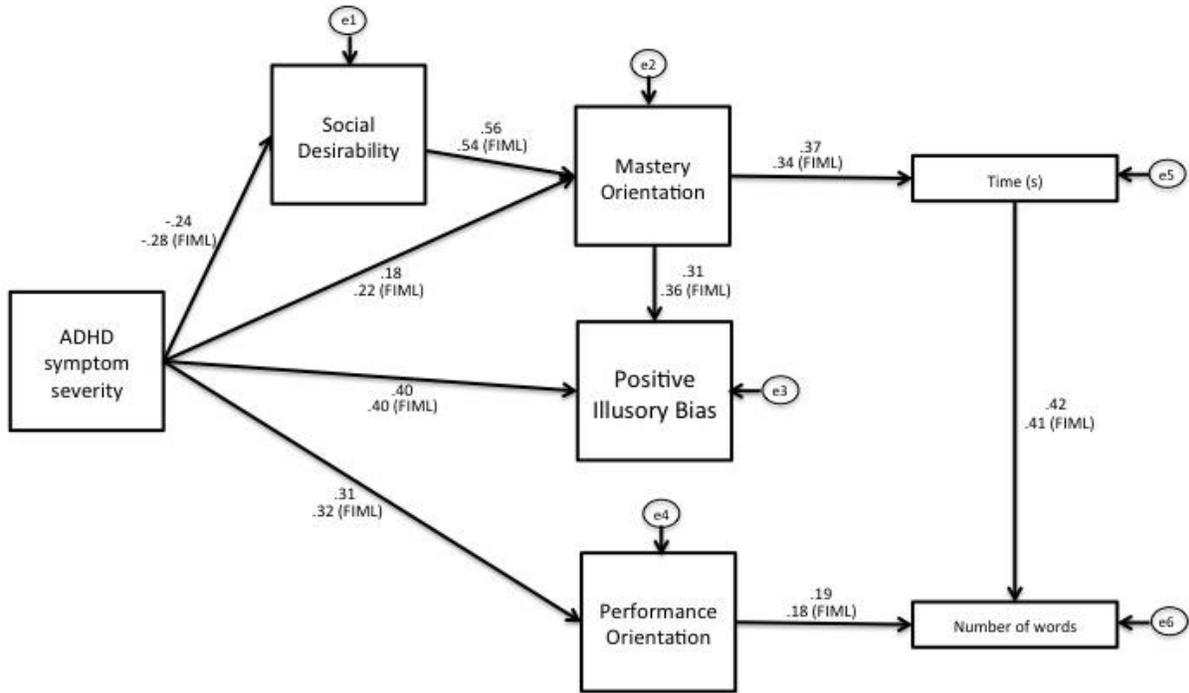


Figure 3. Final Model.

First, a latent variable was created using the combined variables for persistence, including difference scores for number of topics, time, number of words, adjectives, and adverbs.

However, these variables did not load consistently into a latent variable and were found to work better as separate variables. Throughout the model modifications, several of the variables were dropped to improve the model, leaving only time and number of words. It should be also noted that using ADHD symptom severity to moderate achievement orientation was also eliminated,

for several reasons. First, ADHD symptom severity was correlated with performance orientation, and thus could not be used as a moderator to predict any variables. Second, there was an insubstantial path between the ADHD and mastery orientation moderator variable; thus, this variable was also eliminated in further models.

Obtained findings were not expected. Boys higher in ADHD symptom severity with a stronger mastery orientation exhibited increased persistence in letter-writing following ostracism, as measured by an increase in time and word count, contrary to what was proposed. That is, boys more symptomatic of ADHD who reported wanting to develop high quality friendships used more words and more time following ostracism, which is contrary to findings by Milich and Okazaki (1991). As expected, boys high in ADHD symptom severity and a stronger performance orientation also exhibited an increase in time and word count following ostracism, which aligns well with Milich and Okazaki (1991). Thus, hypothesis 1 evinced inconsistent results.

Additionally, it was proposed that a positive illusory bias would be a mediating factor between ADHD status and achievement orientation, as well as the relationship between achievement orientation and persistence. In this study, however, a boy's positive illusory bias did not mediate nor did it have a direct effect on any of the persistence variables. Further, social desirability bias was expected to mediate the relationship between ADHD symptom severity and positive illusory bias. Specifically, boys higher in ADHD symptom severity were expected to have lower social desirability scores, which would explain their greater positive illusory biases; however, higher ADHD severity scores were negatively correlated with social desirability and there was no indirect effect on positive illusory bias; thus, hypothesis 2 was not supported.

Full information maximum likelihood (FIML) imputation of missing data was used to estimate the 24 missing values for ADHD status and positive illusory bias, such that there are no

other estimated values that for which the non-missing data were more likely to have occurred. As shown in Figures 2 and 3, the parameters calculated for complete-case data compared to FIML were extremely congruent. The fit statistics for the FIML model, as found in Table 3, lead to the same conclusions as the fit statistics for the complete-case model. Skewness and kurtosis for this model can be found in Table 4. As with the complete-case data, most variables displayed some skewness or kurtosis, with these scores ranging from -1.83 to 4.84.

Table 3

Comparison of Fit Statistics

Model	X^2	DF	RMSEA	SRMR	CFI	NFI	NNFI
Initial Model – Complete Case	86.96	33	.15	.22	.00	-	-
Initial Model - FIML	105.14	33	.15	.20	.00	-	-
Final Model – Complete Case	9.60	12	.00	.07	1.00	.82	1.12
Final Model – FIML	5.50	12	.00	.04	1.00	.93	1.21

Table 4

Skewness and Kurtosis for FIML Model

Variable	Skewness	Kurtosis	Chi-Square	<i>p</i>
1. ADHD	3.07	0.30	9.35	.01
2. Positive Illusory Bias	0.78	0.73	1.12	.57
3. Social Desirability	0.92	-0.09	0.85	.66
4. Mastery Orientation	-1.43	-1.83	5.38	.07
5. Performance Orientation	0.38	-1.21	1.62	.45
6. Number of Topics	-1.03	-0.80	1.71	.43
7. Time (s)	-1.00	-0.71	1.50	.47
8. Total Words	0.36	2.02	4.20	.12
9. Adjectives (%)	3.92	2.70	22.64	.00
10. Adverbs (%)	4.84	3.53	35.91	.00

Exploratory Analyses

LIWC2007 was a valuable resource in analyzing participant letters. In addition to the hypothesized variables, LIWC2007 provided approximately 80 variables relating to boys' tone, affect, pronouns, cognitive processes, and other areas of focus. To generate ideas for future

research correlations between predictor variables and several output variables were examined. In particular, change from first to second letter in overall affect, positive emotion, negative emotion, anxiety, anger, and sadness were examined, as well as change in overall social processes, including references to family, friends, females, and males. These correlations appear in Table 5.

Table 5

Exploratory Correlations (N = 76)

Measure	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. ADHD	--															
2. Positive Illusory Bias	.40**	--														
3. Social Desirability	-.25*	.17	--													
4. Mastery Orientation	.05	.33**	.48**	--												
5. Performance Orientation	.28*	.08	-.10	.05	--											
6. Affective Processes	-.14	.14	.12	.09	-.20*	--										
7. Positive Emotion	-.14	.14	.10	.07	-.18	.98	--									
8. Negative Emotion	-.01	.04	.11	.04	-.11	.18	-.04	--								
9. Anxiety	-.07	-.01	.02	.03	-.06	.01	.00	.06	--							
10. Anger	.08	.10	-.05	-.09	-.14	.16	.02	.67**	-.17	--						
11. Sadness	-.02	-.06	.08	.05	-.21*	.10	-.02	.54**	-.01	.13	--					
12. Social Processes	-.11	-.07	-.14	.02	-.05	-.04	-.02	-.07	-.14	.05	-.03	--				
13. Family	-.08	.04	.10	.15	.04	-.34**	-.33**	-.08	-.05	.06	.00	.24*	--			
14. Friends	-.16	.03	-.01	.05	-.09	.03	.04	-.05	.01	-.03	-.08	.22*	-.05	--		
15. Female references	-.04	-.06	.01	.11	.00	-.23*	-.22*	-.07	.04	.07	.01	.28**	.81**	-.04	--	
16. Male references	.06	.11	-.12	.04	.15	-.16	-.14	-.13	-.20*	.08	.01	.33*	.50**	.16	.41**	--
Mean	16.39	8.45	17.88	24.08	14.53	0.02	0.08	-0.05	0.02	-0.24	0.06	-0.21	-0.04	0.04	-0.18	0.37
Standard Deviation	11.15	21.28	6.62	4.49	5.34	7.77	7.65	1.65	0.29	1.07	0.80	11.23	3.99	2.24	1.94	2.87

Note. * $p < .05$, ** $p < .01$

Previous research suggests that children who endorse stronger performance orientations will also report more negative affect (Diener & Dweck, 1980). This was also true in the current study, in that stronger performance orientations were negatively correlated with decrease in affect. That is, boys with strong performance orientations had a decrease in affect-related words during their second letter-writing task. This can be explained further by examining the specific affect variables (i.e., positive emotion, negative emotion, sadness, anxiety, anger). Of these variables, only change in sadness was significantly correlated with performance orientation. Specifically, boys who were more performance oriented used less sadness-related words in their second letter-writing task than their first. This aligns with the idea of “looking good to others” which is a key component of one’s performance orientation. None of the other output variables from LIWC were significantly correlated with the predictor variables of ADHD symptom severity, positive illusory bias, social desirability, mastery orientation, or performance orientation.

Further exploratory analyses were completed by adding the LIWC variables for affective and social processes to the model and re-examining the path analysis through LISREL 9.3 Using the finalized model, these additional variables were added and the analysis was completed again. These variables did not strengthen the model, as can be seen by examining the fit statistics. $X^2(75) = 206.20$, whereas the RMSEA = 0.15, SRMR = 0.16, CFI = 0.00, and NFI = 0.10. As previously described, the finalized model had much more acceptable fit statistics, including a lower X^2 , RMSEA, and SRMR, as well as a much higher CFI and NFI.

Summary of Results

Results from this study were not as expected. The planned model required several changes to accommodate the data, and did not align well with previous research. It was expected

that boys higher in ADHD symptom severity who endorsed a stronger performance orientation would try harder on the letter-writing task following ostracism, whereas those high in ADHD symptom severity and a stronger mastery orientation would show a decrement in their letter-writing performance. Although boys high in ADHD symptom severity with a strong performance orientation did use more time and more words following the ostracism event, the same was true for boys high in ADHD symptom severity and a strong mastery orientation. Thus, achievement orientation did not appear to moderate the impact of the persistence of boys as a function of ADHD symptom severity following ostracism; across the board, these boys demonstrated increased persistence as measured by time and words in their second letters. Other persistence variables (i.e., topics, adjectives, adverbs) evinced no significant effects. Further, neither positive illusory bias nor social desirability had significant impact on persistence.

CHAPTER V: DISCUSSION

Boys high in ADHD symptom severity have long been known to struggle in their social interactions (Hoza et al., 2005). Their characteristic behaviors of hyperactivity, impulsivity, and lack of attention to detail are unlikely to win the hearts of their peers, and these peer problems have been found repeatedly by researchers. In fact, these children have long been known to experience repeated failures in their peer interactions. Impaired peer relationships have become of increasing concern in school, with 19% students indicating that bullying has a negative impact on their self-image, 14% reporting that bullying had a negative impact on their relationships or schoolwork, and 9% reporting that bullying had a negative impact on their health (NCES, 2017). Impaired peer relationships have been linked to significant, long-lasting psychological and social problems, including depression, anxiety, and low self-esteem (Mrug, Hoza, & Gerdes, 2001; Smith, 2004).

A primary purpose of this study was to develop a better understanding of how boys with varying levels of ADHD symptomology react to ostracism. Much of the existing literature on ADHD refrains from the use of the term ostracism and instead focuses on social exclusion or impaired peer relationships. Twyman, Saylor, Saia, Macias, Taylor, and Spratt (2010) found that children with special health care needs (e.g., Autism Spectrum Disorder, Attention-deficit/Hyperactivity Disorder) report significantly more bullying and ostracism than typically-developing children. Little research, however, has directly examined the impact of ostracism on the behavior of boys with varying levels of ADHD symptom severity. Through the use of *Cyberball*, this was the first known laboratory study to directly investigate responses to ostracism among children with varying degrees of ADHD.

Cyberball, a computer-based game that involves tossing a ball among several players, has been used worldwide to examine participants' responses to and effects of ostracism (Hartgerink, van Beest, Wicherts, & Williams, 2015). The use of a computer to ostracize both children and adults has proven effective in simulating *in vivo* ostracism (Motamedi, Bierman, & Huang-Pollock, 2016; Tobia, Riva, & Caprin, 2017; Zadro, Williams, & Richardson, 2004). This was the first known laboratory study to directly investigate responses to ostracism among children with varying characteristics of ADHD, through the use of *Cyberball*.

The causal factors related to the impaired peer relations among boys with ADHD have yet to be determined. It is well-documented that boys with ADHD engage in more incompetent peer entry strategies, use more dominating and negative play strategies, and have high rates of peer rejection (Hodgens, Cole, & Boldizar, 2000; Ronk, Hund, & Landau, 2011; Stenseng, Belsky, Skalicka, & Wichstrøm, 2016; Wilkes-Gillan, Bundy, Cordier, Lincoln, & Chen, 2016). More recently, researchers have begun examining socio-cognitive factors that may impact the social interactions of those with ADHD to better understand and assist those children (Bunford, Evans, & Wymbs, 2015; Mikami & Normand, 2015; Ronk et al., 2011).

One of the primary socio-cognitive factors examined within this body of research is that of the positive illusory bias, which is a well-documented pattern among those with ADHD of overestimating their competence when compared to evaluation by other informants (e.g., parent, teacher; Hoza, Murray-Close, Arnold, Hinshaw, & Hechtman, 2010). The positive illusory bias has been found among boys high in ADHD symptomology within the academic domains as well as social domains (Hoza, Vaughn, Waschbusch, Murray-Close, & McCabe, 2012). Even when provided with an incentive to rate themselves more accurately, these boys have been unable or unwilling to do so, especially in the social domain (Hoza et al., 2012).

Several researchers have posited that a positive illusory bias serves a self-protective function, masking feelings of incompetence and protecting those children from a low sense of self-worth (Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007). In this study, a social desirability response bias was examined as a possible explanation for the positive illusory bias. That is, it would be expected that children who are trying to hide their limitations or make themselves look good to others would be high in social desirability, thus the rationale for providing answers expected to be received well by others. However, other researchers have also proposed that these children truly lack the ability to rate themselves accurately, which would impact the results in the opposite manner (Owens et al., 2007). In other words, boys who are unable to judge behavior accurately might not know whether or not their actions are appropriate and desirable.

Another cognitive factor examined in this investigation involved boys' achievement orientation, especially in response to failure or exclusion. Achievement orientation relates to the social or academic goals one has, and can be broken down into mastery versus performance orientations (Dweck & Leggett, 1988). According to theory, all children including those low in ADHD symptomology with a mastery orientation would typically try harder after failure, whereas those with a performance orientation would typically give up sooner following failure. Conversely, those high in ADHD symptomology with a mastery orientation have been found to give up sooner, whereas those high in ADHD symptomology with a performance orientation have been found to try harder following failure (Milich & Okazaki, 1991). No known explanation exists for this counterintuitive effect among boys high in ADHD symptom severity. This study posited that the Dweck and Leggett (1988) theory for typically-developing children is

actually reversed for those with ADHD, and this is predicated on the existence and strength of the positive illusory bias, which could in turn be explained by social desirability.

This investigation directly examined the social persistence of boys with varying levels of ADHD symptom severity following their lab-based ostracism. Specifically, boys ranging in level of ADHD symptom severity were asked to write a letter getting to know their fellow game-players, and were then excluded from the game by these same players. Then, boys wrote a second letter and played a second game with the same two players. Letter-writing performance was examined by a number of change scores from Letter 1 to Letter 2, including time, number of words, topics, adjectives, and adverbs. A path analysis was completed to determine the relations between characteristics of these boys (e.g., ADHD symptom severity, positive illusory bias, social desirability, mastery orientation, performance orientation) and the persistence variables measured during the letter-writing task.

Hypothesis Testing

The primary focus of this study was to examine the overall model fit of the socio-cognitive variables as mediators of the relationship between ADHD symptom severity and persistence following social exclusion. It was proposed that boys higher in ADHD symptom severity with opposing achievement orientations (e.g., mastery vs. performance) would differ in persistence in response to ostracism, and these differences would be explained further by the existence and strength of a positive illusory bias. Specifically, boys higher in ADHD symptom severity with a higher mastery orientation would demonstrate less persistence in the letter-writing task, whereas boys higher ADHD symptom severity with a higher performance orientation would demonstrate more persistence in the letter-writing task. Boys lower in ADHD symptom severity with a stronger mastery orientation were expected to demonstrate more

persistence following failure, whereas boys lower in ADHD symptom severity with a stronger performance orientation were expected to persist less following failure. Thus, the relationship between ADHD symptom severity and persistence was expected to be moderated by achievement orientation. The difference in persistence based on level of ADHD symptom severity was expected to be mediated by positive illusory bias. Results indicated the model fit, as examined within Lisrel, was not strong when using this initial model; all fit statistics indicated that the model needed significant revision.

The original goal had been to use persistence in letter-writing as a latent variable. As can be seen in Figure 2, however, the five letter-writing variables measured did not load together in a significantly meaningful way. Based on preliminary findings, once the latent variable was removed, the model fit began to improve significantly. Differences between Letter 1 and Letter 1 regarding number of adjectives and adverbs in particular were weak variables, which may be due to how little they were used by participant boys. Further, the topics used in the LIWC software were not specifically designed for children (Pennebaker, Boyd, Jordan, & Blackburn, 2015); it is possible to create a custom dictionary to use with this software that could focus on child-driven topics and language. Future research should first focus on creating a high-quality custom dictionary for child studies, which could then be used to examine persistence in social exclusion.

The final model, as shown in Figure 3, differs from what was anticipated. Rather than having level of ADHD symptom severity mediated by social desirability to predict achievement orientation, the final model showed ADHD symptom severity with direct paths to social desirability, performance orientation, mastery orientation, and positive illusory bias. As previously explained, it appears that ADHD symptom severity may have direct effects on many of the social-cognitive factors that could impact boys' social interactions. The hypothesized

model proposed both direct and indirect effects, but yielded more support for direct effects.

There were, however, some indirect effects as well. These indirect effects involved differences in time and number of words, which were the only two of the original five persistence variables that were strong enough to survive elimination during the path analysis.

ADHD symptom severity had an indirect effect on time, as well on number of words; however, these effects were complicated. Boys higher in ADHD symptom severity who endorsed a stronger mastery orientation used more time in their letters, but not more words. In contrast, boys higher in ADHD symptom severity who endorsed a stronger performance orientation used more words, but not more time. One explanation for this is that boys with a stronger mastery orientation were focused on doing well, and thus went slower and chose their words carefully. Mastery orientation has been found to be associated with increased self-monitoring, self-efficacy, and self-evaluation (Cellar et al., 2011). It was intriguing, however, that this was found for boys higher in ADHD symptom severity. Perhaps they struggled to know what to say, and thus needed more time. As for those high in ADHD symptom severity with stronger performance orientations, it seems likely that those boys worked quickly in the second letter-writing experience and wrote many words in an attempt to look good to the other boys, which is consistent with the theory (Dweck & Leggett, 1988). Dweck and Leggett (1988) did find that two-thirds of children with a performance orientation engaged in task-irrelevant verbalizations, which could explain the extra words by the boys in this study who endorsed stronger performance orientations. Irrelevant verbalizations tend to be characteristic of boys with ADHD and seem to be a strong correlate of dislike by peers (Ronk et al., 2011).

There were several results that were not congruent with predictions. First, positive illusory bias did not predict persistence variables in any form. It did not work with persistence

variables when they composed a latent variable, nor did it predict them as individual variables. In fact, the final model showed that positive illusory bias was not predictive of any other variables in this study. This incongruence with existing research may be due to measurement bias, in which 24% of parents failed to return forms and thus those parent/child duos were excluded from participation. ADHD has high heritability rates; thus, there may be a reason that those particular parents did not return forms. That is, if the parents who did not return forms also had symptoms of ADHD, they may also have been disorganized and impulsive, leading to difficulty following directions. Further, the positive illusory bias was derived by calculating a difference score between mother and child ratings. Although this is the standard method for determining positive illusory bias, De Los Reyes and Kazdin (2005) argue that comparing rating between various sources will consistently provide discrepancies, regardless of source. In fact, discrepancies have been found in nearly every method of assessment used by researchers to examine behavior in children and adolescents. One possibility for discrepancies may be a different threshold for what constitutes abnormal behavior; mothers most bothered by their son's behavior are more likely to seek assistance, even if those behaviors may be considered typical by others (De Los Reyes & Kazdin, 2005). Boys with more severe symptoms of ADHD will more likely have mothers with ADHD. Mothers with ADHD who have sons with ADHD will be less troubled by the symptomatic behaviors of their sons (De Los Reyes & Kazdin, 2005). In others words, discrepancy scores may be more difficult to interpret among the more severe cases.

Second, positive illusory bias and social desirability were not associated within the model. It may be that social desirability is not a viable explanation for the positive illusory bias, as these children may indeed be unaware of what constitutes good social behavior or if they are meeting those standards. Positive illusory bias was predicted by ADHD symptom severity, which

was one of the few results that aligned well with past literature (Hoza, Murray-Close, Arnold, Hinshaw, & Hechtman, 2010).

The previous research regarding achievement orientation, however, focused on non-interpersonal activities such as puzzles, rather than an evocative social situation (i.e., ostracism; Hoza, Waschbusch, Owens, Pelham, & Kipp, 2001; Milich & Okazaki, 1991). In the present study, it was hypothesized that a positive illusory bias would mediate the relationship between ADHD symptom severity and achievement orientation, as well as the relationship between achievement orientation and persistence. Indeed, Linnea, Hoza, Tomb, and Kaiser (2012) found that the positive illusory bias was correlated with less effortful behavior in children with ADHD. Further, social desirability bias was expected to mediate the relationship between ADHD symptom severity and positive illusory bias. Specifically, boys' greater ADHD symptom severity was expected to be associated with less social desirability, which would explain their greater positive illusory biases. Higher ADHD severity scores were negatively correlated with social desirability, as found in previous research (Ohan & Johnston, 2011). There was no indirect effect on positive illusory bias, however; thus, neither hypothesis was supported.

Within the final model, social desirability was directly linked to mastery orientation but not performance orientation. The connection indicated that boys who showed a stronger social desirability response bias reported that they were seeking to develop strong, high-quality friendships. It could be that these children veritably believe they do things that are socially desirable (e.g., being respectful of other people) and also seek high-quality friendships, or it could be that these children realized that the answers related to quality friendships would sound better than answers such as "I want to be friends with the 'popular' kids." Logically, it would seem that if social desirability were positively correlated with mastery orientation, it would then

be negatively correlated with a performance orientation. However, these orientation categories were modified based on the *Social Achievement Goal Questionnaire*, and are not mutually exclusive on this scale. In this study, children had the option to rank their social goals as high in all areas, low in all areas, or varied (Rudolph, Abaied, Flynn, Sugimura, & Agoston, 2011).

Correlational Findings

ADHD Symptom Severity. First, ADHD was a main area of focus in this study. For the purpose of this study, ADHD was examined dimensionally rather than as a categorical variable. ADHD symptom severity was skewed to the right, meaning there were some outliers high in ADHD symptom severity; however, there was quite a bit of variability within the ADHD parent ratings provided. The sample of included participants were from the general population, and not a clinical population. As such, they were not representative of most children high in ADHD symptom severity. It should be noted that 24 of the participants were missing ADHD data given the lack of parent forms returned and this is a significant limitation of the study. Despite the missing data, ADHD symptom severity was a strong predictor of several variables within the model. As expected, it was correlated with positive illusory bias and social desirability; however, it was also directly correlated with both types of social achievement orientation. The link to achievement orientation was expected to be indirect; it was predicted to explain some existing discrepancies for children with ADHD by linking research on positive illusory bias and social desirability. Based on theory (Dweck & Leggett, 1988), most children with a strong mastery orientation tend to try harder following failure, whereas those with strong performance orientations tend to give up; the opposite effect has been found on several occasions for boys with ADHD (Milich & Okazaki, 1991), and this study was designed to explain this discrepancy by including positive illusory bias and social desirability as potential mediators. It appears,

however, that ADHD symptom severity had more direct links to many of the social-cognitive factors that independently influence boys' peer interactions, including positive illusory bias, social desirability, and both types of social achievement orientation (i.e., mastery and performance).

Consistent with this study, previous research has also found direct links between ADHD and positive illusory bias (Bourchtein, Langberg, Owens, Evans, & Perera, 2017; Linnea, Hoza, Tomb, & Kaiser, 2012; Watabe, Owens, Serrano, & Evans, 2017). Social desirability, however, has shown mixed results regarding its association with ADHD (Hoza, Pelham, Dobbs, Owens, & Pillow, 2002; Ohan & Johnston, 2002). Many researchers have found that children high in ADHD symptom severity tend to overestimate their competence most in domains where they are most impaired, and have concluded that this shows some evidence of a social desirability bias (Hoza et al., 2002). That is, these children must recognize desirable behaviors enough to rate themselves as high in those behaviors, whether or not those ratings are accurate. Other researchers, however, have measured social desirability directly and found in some studies that children high in ADHD symptom severity do score higher on measures of social desirability (Ohan & Johnston, 2011), whereas other studies offer contrary results (Ohan & Johnson, 2002). Further research needs to examine the best way to determine if social desirability is directly linked to ADHD symptom severity, and if it is impacting the behavior of these children.

Positive Illusory Bias. Positive illusory bias was not significantly correlated with any other measures, including the persistence measures that were a primary focus of the study. The non-significant connection between positive illusory bias and the persistence measures did not bode well for hypothesis testing, although it should be noted that 24% of the maternal participants did not return all forms and were thus excluded from data analysis. This is a

significant limitation that must be underscored. A selection bias in participants should be considered, given what is known about heritability of ADHD, and the use of mothers as informants. Griggs and Mikami (2011) found that higher maternal ADHD symptoms predicted more severe symptoms of ADHD in children. Additionally, maternal inattention was associated with mothers' decreased corrective feedback (Griggs & Mikami, 2011). The associated symptoms of ADHD among parents likely has impact above and beyond heritability, in that these parents may also have difficulty modeling appropriate social behavior, providing guidance for peer interactions, and arranging peer playdates (Griggs & Mikami, 2011). Thus, children who could present with more severe ADHD symptoms may very well have been impacted by the intergenerational transmission of ADHD, a more chaotic family life, and a mother less likely to complete research forms.

Most research that has been conducted on the positive illusory bias focused on its relation to ADHD diagnostic status (Hoza, Murray-Close, Arnold, Hinshaw, & Hechtman, 2010), aggression (McQuade, Achufusi, Shoulberg, & Murray-Close, 2014) and learning disabilities (Heath, Roberts, & Toste, 2011). More recent research has sought to explain the reasons for the existence of the positive illusory bias, looking at variables such as executive functioning (Jiang & Johnston, 2017; McQuade, Mendoza, Larsen, & Breaux, 2017). Watabe, Owens, Serrano, & Evans (2017) also sought to determine if the deficit could be due to low competency rather than a tendency to purposefully inflate one's self-evaluation. They exposed children with and without ADHD to a novel task, creating low, medium, and high levels of competency during which time they measured the positive illusory bias of each child. Their results determined that ADHD status per se was not significant, whereas the child's performance level was a significant predictor of bias (Watabe et al., 2017). They concluded that the "ignorance of incompetence" was a better

hypothesis for the positive illusory bias, given that the bias disappeared when competence levels were equated. Given this determination, future research should focus on other variables that may impact the social well-being of children, such as executive functioning or social skills.

One major limitation when examining positive illusory bias involves informant discrepancy. De Los Reyes and Kazdin (2005) examined many correlates of informant discrepancies. For example, younger children (ages 6-11) tend to have better agreement with other sources than older children. In the present study, participants were required to be between the ages of 10 and 15 years of age, given the tasks involved typing a letter; these older ages may have evinced less agreement with parent ratings, which may have inflated discrepancies and positive illusory bias scores. Additionally, De Los Reyes and Kazdin (2005) reported that most children have a tendency to describe themselves in a favorable way, which could also increase discrepancies if other raters are more accurate. In the current study, no self-report measures of parent characteristics were completed; this lack of information may have impacted the results. De Los Reyes and Kazdin (2005) determined that parental psychopathology, particularly depression, can create a negative bias in mothers' report of child behavior, and this bias would also inflate discrepancies. Future studies should examine positive illusory bias in direct social tasks, and seek to reduce informant discrepancy whenever possible.

Other social-cognitive variables that could be helpful to examine are those of perspective-taking and empathy. Smith and Rose (2011) found that perspective taking among girls was more common than among boys and was linked to greater friendship quality. Children high in ADHD symptom severity were rated by parents as less empathic and tend to use lower levels of social perspective taking when solving social dilemmas (Marton, Wiener, Rogers, Moore, & Tannock, 2009). In the context of the current study, it is possible that boys were unable to use social-

perspective taking to consider why they had been excluded, which would have helped them to respond more appropriately. Alternatively, Ma, Lambregts-Rommelse, Buitelaar, Cillessen, and Scheres (2017) examined how boys with varying levels of ADHD symptom severity made decisions in social contexts. Ma et al. (2017) determined that there were no differences in perspective-taking or empathy between boys when examining ADHD symptom severity, but that those high in ADHD symptom severity were less likely to consider fairness as a motive for decision-making. Among college students, empathy was found to moderate the link between exclusion and prosocial behavior, in that students higher in empathy engaged in more prosocial behaviors following exclusion than those lower in empathy (Barford, Pope, Harlow, & Hudson, 2014). In the current study, software was used to extract variables from the letters boys wrote to represent overall affect, as well as negative emotions, positive emotions, anxiety, anger, and sadness. Positive illusory bias was not correlated with any of these variables; however, including a measure of empathy may have been a more effective way to examine prosocial behaviors, and should be considered in future studies.

Social Desirability. In this study, a direct connection was indeed found between level of ADHD symptom severity and social desirability response bias, but this did not mediate the link between social desirability and positive illusory bias. Indeed, this connection was opposite what was expected. Specifically, if a social desirability response bias is meant to explain positive illusory bias as predicted, they should be significantly correlated. The connection between social desirability and positive illusory bias was trending in the positive direction, yet level of ADHD symptom severity was significantly negatively correlated with social desirability. Thus, boys who indicated that they engaged in more socially desirable behaviors also rated themselves as slightly more socially skilled than their parent. However, boys who were higher in ADHD

symptom severity were significantly less likely to evince higher social desirability. These results could have been impacted by the skewed distribution of ADHD ratings. Further, these findings may be also explained by a lack of understanding of what constitutes socially desirable behavior. After all, Hoza et al. (2012) found that boys high in ADHD symptom severity were able to reduce their biases in the academic and behavioral domains when motivated by a monetary reward, but not the social domain. It is well known, however, that using difference scores between raters (e.g., parent-child) will produce inflated discrepancy scores for reasons that have already been described (e.g., differences in threshold; De Los Reyes & Kazdin, 2005). Further research should pinpoint the most accurate measurement of social desirability among children; the measure used in this study and some others (Ohan & Johnson, 2002) may have included outdated references and language, whereas others used no direct measure of social desirability (Hoza et al., 2002). Indeed, some studies used a subscale of an anxiety measure to assess social desirability (Ohan & Johnson, 2011). Inconsistency in social desirability measurement across studies no doubt contributes to discrepant results, but no contemporary child-focused measures exist at this time. Future research to validate an updated scale of children's socially desirable responding would also bring clarity not only regarding social desirability but also to the positive illusory bias; if indeed the discrepancy is a deficit in social skills (i.e., being unaware of appropriate skills or unable to perform them) as opposed to a performance deficit (i.e., not using skills despite knowing these skills), the interventions for children would be quite different.

Social Achievement Orientation. Social achievement orientation was divided into two types of orientation as outlined in the literature (i.e., mastery and performance; Dweck & Leggett, 1988). In this study, strength of mastery orientation was not correlated with ADHD symptom severity, although it was positively correlated with positive illusory bias and social

desirability. Boys who endorsed a strong mastery orientation (i.e., a desire for high-quality friendships) also overestimated their social skills compared to parent ratings, and reported a tendency to engage in more socially appropriate behaviors (e.g., complying right away with parent commands). Performance orientation, however, was significantly correlated with ADHD symptom severity; boys who reported a stronger desire to look good to others also had more parent-related symptoms of ADHD. Children high in ADHD symptom severity have commonly been found to endorse stronger performance orientations (Barron, Evans, Baranik, Serpell, & Buvinger, 2006).

Although the lack of connection between mastery orientation and ADHD symptom severity did have a limiting effect on the overall model, the association between level of ADHD symptom severity and a performance orientation is well documented. Several researchers have proposed that boys with ADHD are more prone to endorsing a performance orientation due to their extensive history of social failures (Hoza et al., 2005; Wilkes-Gillan et al., 2016). These children tend to experience peer rejection often, and thus may be expected to give up sooner in the face of a challenge. Numerous studies have documented this theory of learned helplessness, in which those who have experienced repeated failures feel powerless, and thus may withdraw from social activities (Firmin, Hwang, Copella, & Clark, 2004; Maier & Seligman, 2016). In other words, those who are repeatedly excluded may learn that their efforts will have no effect on the outcome of an aversive social situation, and thus become passive and stop trying (Maier & Seligman, 2016).

It was anticipated that boys low in ADHD symptom severity would endorse a stronger mastery orientation, whereas boys higher in ADHD symptom severity would endorse a higher performance orientation. Since boys with a higher level of ADHD symptom severity are more

familiar with the experience of peer rejection, and become aware that their repeated attempts to be socially included may not be successful, they may conclude there is no use to continue trying (Stenseng, Belsky, Skalicka, & Wichstrøm, 2016). Boys low in ADHD symptom severity, however, have more favorable social experiences. Without examining factors other than achievement orientation, children tend to be evenly split between mastery and performance orientations (Dweck & Leggett, 1988). Further information about these children (e.g., past ostracism experiences, comorbid disorders) would allow researchers to better predict whether these children would endorse strong mastery or performance orientations.

Further Exploratory Analyses

LIWC2007 application offers a wide range of variables that have not previously been examined in regard to the social functioning of boys high in ADHD symptom severity. Although it is widely known that these children struggle within the social domain, any information that would specify their strengths and limitations could be used to design interventions to aide these children. In this study, additional correlations were examined regarding the affective and social processes as outlined within LIWC2007. No hypotheses had been proposed *a priori*, but logic would suggest that there would be an increase in negative affect following exclusion, and that this might be shown through the letter-writing task. Social exclusion via *Cyberball* has been linked to increases in perceived stress, cortisol level, and negative affect (Beekman, Stock, & Marcus, 2016). Current data indicate that boys with a stronger performance orientation used significantly fewer affect-related words during their second letter-writing task compared to their first letter-writing task; that is, they may have chosen to mask their discomfort by acting as though nothing was wrong. Further examination revealed that these boys used fewer sadness-related words, specifically. There are several possible explanations for this. First, boys are

generally conditioned to use fewer emotion-related words due to the socialization of gender roles; thus, it did not take much for a change in number of words to become significant (Bhutto & Imtiaz, 2012). Second, passive victims tend to promote more empathy from bystanders as opposed to assertive victims; thus, a reduction in emotion-related words (specifically, sad words) would be seen as more passive and thus more likely to evoke assistance (Sokol, Bussey, & Rapee, 2015).

Analyses also sought to determine if these affective and social process variables would fit within the proposed model. However, these variables weakened the model that worked best with the hypothesized variables. Future examination into these variables to determine which ones might fit best, or their placement into the model, could help determine a model that better captures their impact on boys with varying level of ADHD symptomology.

Limitations

As reported within preliminary findings, 24% of parents failed to return the requested forms (e.g., ADHD and social skills rating scales). A MANOVA was conducted to determine if there were significant differences in any of the measures between boys whose parents completed forms as opposed to boys whose parents did not; once no differences could be confirmed, FIML data were used to compare initial and final models. It is true, however, that this is still an estimate, and that it is possible the results would be significantly different if those parents had turned in their rating scales.

Further, generalizability of these results is limited to boys ages 10 to 15, and cannot be expanded to other populations until additional research has been completed. Several of the individual difference measures, including social desirability and social goal orientation, were based on self-report of boys and thus may not be reliable estimates of boys' actual behavior.

Additionally, many of the findings in this study were inconsistent with existing literature. One of the reasons may be that an attempt was made to connect several constructs that had not yet been connected. Some of the established literature was considered on achievement orientation (Dweck & Leggett, 1988) and persistence, and attempted to link these studies to social situations. In doing so, a measure on achievement orientation was used that did not align as well with the traditional achievement orientation categories. It may be wise to simply explore more social goal orientation measures and persistence without attempting to restrict participants to a mere two achievement orientations as described in previous studies. Perhaps a model that allows all three orientation categories (development, demonstration-approach, and demonstration-avoidance) would better explain persistence in boys with varying levels of ADHD.

An additional limitation of this study is that it solely examined response to ostracism among boys with varying levels of ADHD. Due to the fact that peer problems among boys with ADHD tend to be qualitatively different from those among girls, a similar study conducted with girls with varying levels of ADHD could provide information on the social-cognitive factors that impact their persistence following ostracism. Indeed, social exclusion through ignoring others has been found to occur more often among girls (i.e., relational aggression; Crick & Grotpeter, 1995; Murray-Close, Ostrov, & Crick, 2007).

Finally, this study did have a relatively low distribution of boys high in ADHD symptom severity, which likely impacted the results. It should also be noted that only boys' total score was examined, which did not allow comparisons between the various presentations of ADHD. Effectively, this study only looked at boys with varying symptoms of the combined presentation of ADHD, which is qualitatively different from the inattentive presentation of ADHD. Children with the combined presentation are most at-risk to be rejected, due to the transactional

relationship between the symptoms of ADHD (Tseng, Kawabata, Gau, & Crick, 2014). Thus, including children high only in the inattentive symptoms of ADHD would likely provide different results.

Implications and Recommendations for Future Research

The results of this study may inform future research. This study was the first known study to directly measure the impact of ostracism on persistence in social situations with boys with varying levels of ADHD symptoms. Thus, this study showed that *Cyberball* is an appropriate way to examine ostracism within the lab for boys with varying levels of ADHD symptom severity. Additionally, a goal within this study was to link existing literature on positive illusory bias to achievement orientation. While this link did not emerge, the results did provide further support for the connection between ADHD symptom severity and boys' performance orientation, as well as further support for the link between ADHD symptom severity and a positive illusory bias. Indeed, the direct connections between ADHD symptom severity and some social-cognitive factors impacting the lives of children may be of greater interest to researchers than the indirect connections.

Based on these findings, several suggestions for future research were generated. First, the importance of parent data cannot be emphasized enough. It may be helpful to offer incentives for parent completion of data; in this study, only children were offered small incentives for participation. Further, designing the data collection process to allow for follow-up contact with parents would be another way to ensure that missing data are avoided. Finally, it was noted that more parents completed their forms when they brought in their child for participation as opposed to having the child participate through the school, as the examiner could have the parent

complete forms while waiting. Having parents complete data on-site would also decrease the probability of missing data.

Further research should examine the three subtypes defined within the *Social Achievement Goal Questionnaire* on their own merit, rather than attempting to fit them into past dichotomous categories. Exploratory analyses may yield more information that would generate new ideas for social research, which may be categorically different than the traditionally achievement orientation research focused on academic areas. Additionally, given the weak connection between social desirability and positive illusory bias, several suggestions for future research are available. First, there may be a more contemporary scale that assesses children's social desirability. The social desirability scale used in this study was thorough and well validated, but it was designed in 1965. Some of the language in that scale seemed outdated, and there may be a more appropriate scale. Second, it may be that the "self-protective hypothesis" is not the best explanation for the positive illusory bias. Watabe, Owens, Serrano, and Evans (2017) examined the positive illusory bias, and sought to determine if this bias among children with ADHD was due to their ADHD status or to their low competency. They concluded that the "ignorance of incompetence" was a better explanation for the positive illusory bias, given that the bias disappeared when actual competence levels were equated. Given that this is the first study that directly examines lab-based ostracism and ADHD, it is highly recommended that future research continue along this avenue. Peer rejection has been shown to have an adverse impact on self-regulation, which in turn leads to worse social skills and more rejection (Bukowski, Laursen, & Hoza, 2010). The connection between peer rejection and ADHD has been found to be reciprocal, in that each predicts the other (Stenseng, Belsky, Skalicka, &

Wichstrøm, 2016). Future studies should directly examine links between ostracism, self-regulation, and persistence among those with ADHD.

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