THE POSITIVE ILLUSORY BIAS: AN EXAMINATION OF SELF-PERCEPTIONS IN ADULTS WITH ADHD SYMPTOMATOLOGY

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IN ADULTS WITH ADHD SYMPTOMATOLOGY

by
CATHERINE M. GOLDEN

has been approved for
the Department of Psychology
and the College of Arts and Sciences by

______________________________

Julie Sarno Owens
Assistant Professor of Psychology

______________________________

Benjamin M. Ogles
Dean, College of Arts and Sciences
Abstract

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THE POSITIVE ILLUSORY BIAS: AN EXAMINATION OF SELF-PERCEPTIONS IN ADULTS WITH ADHD SYMPTOMATOLOGY (110 pp.)

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The primary purpose of this study was to determine if the positive illusory bias is present in young adults demonstrating ADHD symptomatology. Further, if the positive illusory bias was found in this group, this study hoped to determine whether it was a function of ADHD, low achievement (i.e., lack of skill), or both. Ninety-nine college-age students participated in the research protocol. Participants were later categorized into three groups: ADHD (N=31), non-ADHD controls (N=39), and Subclinical ADHD (N=29). Participants completed a demographic measure, the Conners’ Adult ADHD Rating Scale – self-report-screening version (CAARS – S:SV), the Harter Self-Perception Profile for College Students (SPPCS), the Wechsler Individual Achievement Test (2nd edition) – Abbreviated (WIAT-II-A), the Wechsler Abbreviated Scale of Intelligence (WASI), and a logic task.

T-tests revealed that the ADHD group underestimated their competence on three of four intellectual/scholastic domains significant more than did the control group. This finding is inconsistent with the child literature and suggests that adults with ADHD symptomatology may display a different pattern of self-perceptions as compared to that observed in children with ADHD symptomatology. Results replicated previous work (Kruger & Dunning, 1999) in that students who performed the lowest on the logic task, overestimated their competence the most, and students who performed the highest on the
logic task *underestimated* their competence the most. This trend provides some support for the ignorance of incompetence effect. However, this phenomenon does not seem sufficient to explain the ADHD versus CTL group differences that were found in self-perceptions. Implications are discussed.

Approved: ____________________________________________

Julie Sarno Owens

Assistant Professor of Psychology
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The Positive Illusory Bias: An Examination of Self-Perceptions in Adults with ADHD

Symptomatology

Three to seven percent of the child population is estimated to have Attention-Deficit/Hyperactivity Disorder (ADHD; American Psychiatric Association, 2000), making it one of the most commonly diagnosed mental health disorders in childhood. ADHD is defined as “a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequently displayed and more severe than is typically observed in individuals at a comparable level of development” (APA, 2000, p. 87). In order for a proper diagnosis to be made, these symptoms must cause functional impairment and at least some of these symptoms must be present before the age of seven.

Children with ADHD experience functional impairment in numerous domains including academic and social settings (Barkley, 1997; Barkley, 1998; Gaub & Carlson, 1997). Because children with ADHD show deficits in multiple areas of their lives, one might expect that they would present with low self-esteem and low perceptions of self competence. However, an intriguing phenomenon called the positive illusory bias reveals just the opposite. The positive illusory bias is defined as an overestimation of one’s own performance or competence as compared to a criterion.

Numerous studies have found evidence to support the presence of a positive illusory bias in children with ADHD (Diener & Milich, 1997; Hoza et al., 2004; Hoza, Pelham, Dobbs, Owens, & Pillow, 2002; Ohan & Johnston, 2002; Owens & Hoza, 2003). However, it is unclear whether the positive illusory bias is something children with ADHD eventually outgrow or whether it remains into adolescence and adulthood. Further, if the positive illusory bias does persist into adulthood, it is unclear whether it is
specific to adults with ADHD or whether it is also a characteristic of other groups of adults. For example, some researchers have found an overestimation of competence in adults who are unskilled in a given domain and therefore cannot accurately judge their performance in this domain (Dunning, Johnson, Ehrlinger, & Kruger, 2003; Kruger & Dunning, 1999).

Thus, the primary purpose of this study was to determine whether the positive illusory bias is present in young adults demonstrating ADHD symptomatology; and if present, whether the bias is a function of ADHD, low achievement (i.e., lack of skill), or both. The following discussion will (a) provide a broader description of the presentation and trajectory of ADHD from childhood into adulthood, (b) review the literature on self-perceptions in children with ADHD, and (c) describe how this study addresses the limitations in the literature by contributing to an understanding of self-perceptions in young adults with ADHD.

ADHD in Childhood

Etiology

Initially, ADHD was considered a disorder caused by a lack of self-control or immorality, and later, by bad parenting (Connors, 2002). However, the majority of research on ADHD now supports neurobiological factors and environmental risk factors as the root cause (Ellison, 2002). It has only been since the 1980’s that research on the psychophysiological and neurological differences between ADHD children and control children has been undertaken (Barkley, 1998). Although inconsistencies exist, some psychophysiological measures of the nervous system (e.g., galvanic skin responses, heart rate deceleration, etc.) indicate diminished arousal in children with ADHD as compared
to controls (Barkley, 1998). Additionally, neuroimaging (magnetic resonance imaging, MRI) research, encephalograph (qEEG) studies, positron emission tomography (PET), as well as executive function research have all supported the theory that ADHD has a neurological component (Ellison, 2002). These neurological deficits appear to not only to be present in childhood, but later in life. These include increased slow wave activity and beta activity, decreased blood flow to the prefrontal regions and pathways connecting these regions to the limbic system, smaller right hemisphere plana temporale, and smaller corpus callosum (Barkley, 1998).

In addition to neurological differences, numerous studies have found that children with ADHD score approximately 10 points lower than controls on standardized assessment measures of intellectual functioning (Faraone et al., 1993, Barkley, 1998). Further examination suggests that this deflation in overall IQ score may be due to subtests that load onto an executive functioning domain (Schuck & Crinella, 2005). Research has examined intellectual functioning in children with ADHD children using the Wechsler Intelligence Scale of Children – Fourth Edition (WISC-IV; Wechsler, 2003). Results revealed that the ADHD group scored significantly below the matched control group on a number of subtests including digit span, coding, vocabulary, letter-number sequence, matrix reasoning, comprehension, symbol search, information, arithmetic and word reasoning. These subtest differences contribute to the significant between group differences found on the WISC-IV index scores. More specifically, the ADHD group fell significantly below the matched control group on the working memory index and the processing speed index (p ≤ .01; Wechsler, 2003).
Interestingly, a recent meta-analysis that examined neuropsychological performance revealed that adults with ADHD displayed significant performance deficits compared to non-impaired controls in 8 of 10 neurological domains (e.g., verbal IQ, visual/verbal fluency, visual/verbal fluency, visual/figural problem solving, abstract problem solving-working memory, simple attention, sustained attention, focused attention, verbal memory; Schoechlin & Engel, 2005). However, results of this meta-analysis indicated that adults with ADHD did not demonstrate performance deficits on the measures assessing executive functioning. Schoechlin & Engel (2005) argue that this may due to a sampling bias in the research studies, such that only the ADHD children with a better than expected outcome will develop into “outpatients with a relatively good outcome” (p. 739) and only these individuals are likely participated in these studies.

Symptoms and Impairment

Behaviors associated with inattention include making careless mistakes in schoolwork, difficulty sustaining attention in tasks, not listening when spoken to directly, not following through on instructions, difficulty organizing tasks, reluctance to engage in tasks that require sustained mental effort, high distractibility, and forgetfulness (APA, 2000, p. 92). Behaviors associated with hyperactivity/impulsivity include often fidgeting or squirming, often leaving seat in classroom or other situations in which they are expected to remain seated, running or climbing excessively in situations in which it is inappropriate, having difficulty playing quietly, acting as if “driven by a motor,” talking excessively, blurting out answers before questions have been completed, having difficulty awaiting turn, and interrupting or intruding on others (APA, 2000, p. 92). Children
Children with ADHD typically experience impairment in the classroom (Barkley, 1997; Barkley, 1998). For example, children with ADHD are more likely to experience low academic achievement, poor school performance, suspension or expulsion (Barkley, 1997), learning disabilities, grade retention, placement in special classes, and academic tutoring (Faraone et al., 1993). Laboratory-based tests have consistently shown that ADHD children’s academic performance is impaired compared to same-age peers (Ohan & Johnston, 2002; Hoza, Pelham, Waschbusch, Kipp, & Owens, 2001). In addition, children with ADHD not only appear to have more difficulty than non-impaired children in school, but appear to show less effort (Hoza, Pelham, Milich, Pillow, & McBride, 1993), less cooperation (Hoza et al., 2001), and tend to become more easily frustrated than non-impaired children (Milich & Okazaki, 1991).

According to the DSM-IV-TR (APA, 2000), there are three subtypes of ADHD: 1) ADHD predominantly inattentive type (6 or more symptoms of inattention and fewer than 6 symptoms of hyperactivity-impulsivity), 2) ADHD predominantly hyperactive-impulsive type (6 or more symptoms of hyperactivity-impulsivity and fewer than 6 symptoms of inattention), and 3) ADHD combined type (6 or more symptoms of inattention and 6 or more symptoms of hyperactivity-impulsivity).

Unique behavioral characteristics are associated each subtype. Children with ADHD combined type tended to exhibit the “most pervasive patterns of difficulties” (Gaub & Carlson, 1997, p. 109) and were rated as more impaired than children with other subtypes on the variables of Anxious/Depressed, Social Problems, Attention Problems,
and Total Problem Behavior. Children with ADHD predominately-inattentive type were also rated as impaired, however, they were perceived as behaving more appropriately and displaying less externalizing behavior than the other two subtypes. The predominantly-hyperactive group received poorer ratings than the non-impaired group in numerous domains of functioning, but did not appear to demonstrate the internalizing problems or the academic problems of the other two subtypes (Gaub & Carlson, 1997).

Comorbidity

In addition to these challenges, children with ADHD are likely to meet criteria for other psychiatric disorders. Specifically, about 44% of children with ADHD may be diagnosed with one comorbid disorder, while up to 32% may be diagnosed with two comorbid disorders, and 11% of children with ADHD may be diagnosed with three or more comorbid disorders (Szatmari, Offord, & Boyle, 1989).

Comorbidity is commonly present between ADHD and oppositional defiant disorder (ODD) and/or conduct disorder (CD) occurring in as many as 50 to 75 percent of ADHD cases (DSM-IV-TR, 2000; Pelham & Lang, 1999). More specifically, about two-thirds of children with ADHD meet criteria for co-occurring ODD (Carlson, Tamm, & Gaub, 1997) and about 27 to 32 percent of children with ADHD meet criteria for co-occurring CD (Loeber et al., 2000). Although substantial overlap has been found across the three disruptive behavior disorders, factor analytic research suggests that they are indeed three distinct disorders (Pillow, Pelham, Hoza, Molina, & Stultz, 1998; Burns, Walsh, Patterson, Holte, Sommers-Flanagan, & Parker, 1997). Finally, ADHD is also found to co-occur with anxiety and mood-related disorders, at the following rates: anxiety disorder (25%), major depression (25%), and bipolar disorder (6-10%).
It is important to recognize the high occurrence of comorbid disorders in children and adolescents with ADHD, as many of these comorbid disorders may influence self-perceptions in a different manner than would ADHD symptomatology alone. Particularly salient to the current study is the fact that the presence of comorbid internalizing symptoms (i.e., depression) greatly increases during adolescence. Estimates of the comorbidity of internalizing disorders in ADHD samples range from 17 to 30 percent in childhood but may increase to approximately 50 percent in adolescence (Barkley, 1998). Because internalizing disorders have been correlated with deflated self-perception scores (Gladstone & Kaslow, 1995), it is reasonable to surmise that an increase in co-occurring internalizing symptomatology during adolescence may lead to a deflation in self-perception scores, even in an ADHD population. If so, there is a possibility that older adolescents and adults with ADHD may not display positive illusory self-perceptions that are found in children with ADHD.

ADHD in Adolescents and Adults

Historically, the majority of ADHD research has concentrated on childhood. However, the emergence of longitudinal studies reveals that adolescence and adults diagnosed with ADHD in childhood continue to experience symptoms and impairment, indicating that ADHD is a chronic disorder. Wender (1995) estimates that as many as 20 to 30 percent of an initial sample of children with ADHD will have a significantly negative outcome, with antisocial behavior, substance abuse, and alcoholism as major problems. In a longitudinal study by Molina and Pelham (2003), “childhood ADHD was associated with earlier first use of cigarettes, earlier progression to daily smoking, and earlier use of illicit drugs” (p. 504).
Besides earlier drug use, childhood ADHD is also associated with other risk-taking behaviors. A longitudinal study in Canada revealed that adolescents and young adult drivers with ADHD were involved in more traffic accidents than controls (Barkley, Guevremont, Anastopoulos, DuPaul, & Shelton, 1993). Other studies have shown that young adults with ADHD are more likely to drink and drive and to drive without a license (Goldstein, 2002). In a follow-up study on an ADHD population, 25-45% displayed characteristics of antisocial behavior, with 25% of the sample actually qualifying for antisocial personality disorder as adults. Finally, the prevalence rate of ADHD in adult prison populations is estimated to fall between 9 and 25 percent (Goldstein, 2002).

Research on ADHD in adulthood is emerging and a few major contributors are helping to change the appearance of ADHD as a childhood-only disorder. Experts now estimate that 30 to 50 percent of children who are diagnosed with ADHD will continue to meet full-diagnostic criteria into adulthood (Searight, 2000) and some research suggests that ADHD symptoms persist into adulthood in as many as 70-85% of the cases (Ellison, 2002). A more current meta-analysis indicates that the persistence of ADHD into adulthood greatly depends on “what definition of persistence” one uses (Faraone, Biederman, & Mick, 2006, p. 163). Specifically, researchers note that although only approximately 15 percent of children with ADHD meet full DSM-IV criteria at age 25, approximately 65 percent meet criteria when diagnosed with ADHD in partial remission (Faraone, Biederman, & Mick, 2006). At first glance, these data indicate that ADHD remits over time. However, Faraone et al. caution readers that the current DSM-IV diagnosis of ADHD may not be developmentally sensitive to adults.
The core symptoms that characterize ADHD in childhood (i.e., inattention, hyperactivity/impulsivity) are similar to those found in adults with ADHD; however, symptom manifestation and impairment differ as a function of changes in roles and responsibilities in adulthood (Adler & Cohen, 2004). It appears that hyperactivity/impulsivity gradually decreases with age (Barkley, 1998) and childhood symptoms may be replaced by restlessness and difficulty relaxing (Searight, 2000). It is important to note, however, that motor activity also decreases in the general population. Thus, while adolescents and adults with ADHD may show less hyperactivity/impulsivity than they did in childhood, they will likely still show more hyperactivity/impulsivity than same-aged peers.

Interestingly, inattention appears to be more persistent than hyperactivity or impulsivity as children progress through adolescence and adulthood (Mick, Faraone, & Biederman, 2004) and problems paying attention and concentrating may become even more apparent in early adulthood as responsibilities increase (Searight, 2000) and impairments associated with inattention may be more severe. Inattention in adulthood is evidenced by poor organization and forgetfulness in the home and work settings, which may result in paying bills late and careless mistakes in work output.

Wender (1995) notes that “messy school desks become messy desks at work, and overdue inadequate homework becomes delayed and confused reports and memoranda” (p. 22). Further, adults with ADHD are less likely than non-ADHD adults to pursue a post-high school education and are more likely to be employed in skilled labor positions (Johnston, 2002). They also have a higher frequency of job changes and poor academic performance despite average or above-average intelligence (Adler & Cohen, 2004).
Impairment in the social domain manifests in marital discord and difficulty in family communications and problem-solving (Barkley, 1996). Family life can be further complicated if adults with ADHD have children with the disorder as well. Forty-three percent of the children of ADHD parents met DSM-IV criteria for ADHD versus two percent of comparison families (Minde et al., 2003). Children of the parents with ADHD were found to have higher levels of psychopathology and poorer social functioning than the children from the comparison families (Minde et al., 2003). In those families where both the child and at least one parent has ADHD, it is understandable why that family may experience more stress, on average, than other families.

Interestingly, many children with ADHD go undiagnosed until adolescence or adulthood. Advances have been made in developing measures for the assessment of ADHD in adulthood (Weiss & Murray, 2003). However, it should be noted that tools used in the assessment of adult ADHD are new and relatively understudied and researchers are still attempting to come to an understanding on how the symptoms may develop from childhood to adulthood (Barkley, 1998).

Assessment

The American Academy of Pediatrics (2000) provides recommendations for the assessment and diagnosis of children with ADHD. For a comprehensive assessment of ADHD, recommendations include that a primary care clinician initiate and evaluate ADHD, that the child meet DSM-IV-TR criteria for a diagnosis of ADHD, that assessment of ADHD require evidence obtained from parents or caregivers and teachers, and that evaluation should include assessment for coexisting conditions (American Academy of Pediatrics, 2000). Others note that comprehensive evaluations of ADHD in
children should include parent and teacher interviews, parent and teacher rating scales, and direct observation of the child (Barkley, 1998). Although parental interviews are sometimes criticized for being biased, they provide an “ecologically valid and important source of information concerning the child’s difficulties” (p. 267). The parent can provide invaluable information, such as developmental milestones, birth complications, and family history of psychiatric disorder, which can help rule out or determine other differential diagnoses. A child interview is also recommended, though children below the ages of 9 to 12 are not always considered reliable in their reports (Barkley, 1998). If possible, a teacher interview should also be incorporated in the assessment process in order to determine if ADHD symptoms are present in the academic domain.

The assessment of ADHD in adulthood is potentially challenging, as the clinician must establish that symptoms have not only been present within the last six months, but that symptoms were present before the age of seven (American Psychiatric Association, 2000). Therefore, in addition to gathering information from the patient, clinicians are encouraged to gather information from collateral sources, such as parents, spouses, and former teachers. Early school records may be helpful, as report cards may contain objective evidence and teacher comments that may help provide a more accurate historical picture and may document early impairment (Weiss & Murray, 2003). As with children, a collateral informant should complete symptom and impairment rating scales (Weiss & Murray, 2003). Ideally, this should be someone who knew the person as a child (i.e. parent, sibling, etc.) in order to rate them on their behavior during childhood. Potential for comorbidity is high with ADHD, so a semi-structured interview or an
assessment tool that can rule out other disorders should also be incorporated (Adler & Cohen, 2004).

Although there is now evidence that there is a neurological component to ADHD, to date, the specific role of neurological testing in assessment is unclear (Tannock, 2003). First, there is no one neurological marker unique to ADHD. More specifically, although neurological impairments have been found in children with ADHD, they may also be present in children with other disorders. Second, neurological testing cannot be used for diagnosis because no cognitive measures to date have adequate predictive power to rule in or rule out ADHD. However, there is a role for these tests in assessment and treatment of individuals who suffer from ADHD because a failure to identify cognitive impairments may lead to inadequate treatment of co-occurring impairments commonly found in individuals with ADHD (e.g., learning disabilities, etc.) (Tannock, 2003).

Self-Perceptions in Children with ADHD

*Children with ADHD and the Positive Illusory Bias*

Because children with ADHD show deficits in so many areas of their lives, one might expect that they would present with deflated self-perceptions. However, the positive illusory bias provides opposing evidence. The positive illusory bias is defined as an overestimation of one’s own performance or competence as compared to a criterion. Although some studies have found that children with ADHD report lower levels of competence than control children (Horn, Wagner, & Ialongo, 1989; Ialongo, Lopez, Horn, Pascoe, & Greenberg, 1994; Treutling & Hinshaw, 2001), numerous studies have revealed consistent evidence of the positive illusory bias. The following discussion will review this literature in depth.
An early study by Hoza et al. (1993) lays much of the groundwork for studies in the following decade concerning the self-perceptions of ADHD boys. All participants ranged in age from 8.5 to 13 years. This study examined the self-perceptions of 27 boys with ADHD and compared them to the self-perceptions of 25 non-impaired controls. The children completed the Self-Perception Profile for Children (SPPC; Harter, 1985), which is a 36-item instrument composed of six subscales that measure self-perceptions in multiple domains. Children rated themselves on a 4-point scale, where higher scores indicate greater self-perceived competence. With the exception of the behavioral domain (in which controls reported higher competency than the ADHD group), the two groups did not differ on any of the other subscales. That ADHD children perceived their competence to be similar to that of controls despite the presence of academic and social impairment severe enough to warrant intensive treatment suggested an overly positive pattern of self-perceptions in ADHD children. The authors noted that the results could be interpreted in one of two ways. The results may either reflect an adaptive positive illusory bias or the results may be indicative of distorted perceptions and an unhealthy reflection of their functioning (Hoza et al., 1993).

Once internal symptoms were controlled, additional analyses revealed that ADHD boys did not view themselves as any less competent or less well-behaved than their normal peers and actually viewed themselves more positively compared to peers in other domains (Hoza et al., 1993). However, there is a methodological weakness with this approach. Specifically, attempting to control for internalizing symptoms essentially results in a “pure” group of ADHD boys characterized by externalizing symptoms only. Although comorbid internalizing symptoms are not found in all children with ADHD,
internalizing symptoms show a relatively high prevalence rate in this population, with some estimates of comorbidity as high as 17 to 30 percent in childhood (Barkley, 1998). Therefore, to covary, or attempt to “control” for these symptoms results in a population that is no longer generalizable or “real to life.” Miller and Chapman (2001) discuss this methodological issue in depth. They note that when using ANCOVA on samples that tend to display psychopathology, “there is no means of achieving the superficially appealing goal of ‘correcting’ or ‘controlling for’ real group differences on a potential covariate” (p. 40).

A larger study by Hoza et al. (Hoza, Waschbusch, Pelham, Molina, & Milich, 2000) compared the self-perceptions of 120 boys with ADHD with the self-perceptions of 65 non-impaired boys. All participants ranged in age from 7.4 to 12.7 years. This study contained an experimental manipulation in which the child experienced either success or failure in a social “get-acquainted” task with a confederate peer. Self-evaluation ratings were measured on a 10-point scale and assessed the participant’s view of his own performance during the social interaction. Boys with ADHD rated themselves as more successful than did control boys, even following failure, despite that observers who were blind to group status rated the ADHD children as less socially effective than controls (Hoza et al., 2000).

A study that was run simultaneously and on an overlapping sample examined the self-evaluations of ADHD and non-impaired boys in an experimental manipulation task in the academic domain (Hoza, Pelham, Waschbusch, Kipp, & Owens, 2001). Eighty-three ADHD boys and 66 non-impaired boys, ranging in age from 7.4 to 12.7 years, completed self-evaluation questions which were given mid-task and post-task during a
word puzzle completion experiment (e.g., “rated on a 10-point scale the degree to which they thought they did well, were frustrated, how they expected to do if they did the task again, and the degree to which they liked the puzzles” [p. 275]). Boys with ADHD solved fewer puzzles correctly and quit sooner than controls, but did not rate their performance significantly different than did the non-impaired boys. Although these findings are not entirely consistent with the study (Hoza et al., 2000) examining performance in a social setting, it does provide evidence of the positive illusory bias in that the boys with ADHD still displayed an overestimation of competence (i.e., reported perceptions that were more positive than actual performance).

Another study examining ADHD boys’ self-evaluation in the academic domain compared ADHD and non-impaired control boys’ self-ratings to teacher reports as a criterion (Hoza, Pelham, Dobbs, Owens, & Pillow, 2002). The ratings of one hundred ninety-five boys with ADHD on the Harter Self-Perception Profile for College Students (SPPC; Harter, 1985) were compared to the ratings of 73 non-impaired control boys on this same scale. The participants ranged in age from 7.66 to 12.75 years. The teachers completed a teacher version of this same scale, which was used as a criterion against which to judge the children’s SPPC scores. Discrepancy scores were then calculated by subtracting the teacher’s rating from the child’s own rating such that higher scores indicated positive illusory self-perceptions. The discrepancy scores for the boys with ADHD were higher than those of the non-impaired control boys. Significant group differences were found for scholastic competence, social acceptance, and behavioral conduct, such that boys with ADHD overestimated their competence in these areas as compared to teacher reports.
The role of comorbid conditions (i.e., low achievement, aggression, depression) was explored in this sample. To examine the effects of low achievement, the sample was divided into one of three groups: (a) ADHD plus low achievement, (b) ADHD only (with normal achievement), and (c) non-impaired controls. Children with ADHD (both ADHD plus low achievement and normal achieving ADHD children) overestimated their competence in the scholastic domain compared to controls. However, in addition, the ADHD plus low achievement group significantly overestimated their competence in the scholastic domain more than the normal achieving ADHD group (Hoza et al., 2002). Thus, ADHD boys seemed to overestimate most in the domain of greatest impairment suggesting that the positive illusory bias may serve a self-protective function. (This hypothesis is described in greater depth below.)

To examine the effects of comorbid aggression, the sample was divided into groups: (a) ADHD plus aggression, (b) ADHD only (without aggression) and (c) controls. Similar to the results found in the achievement domain, further analysis revealed that ADHD boys tend to overestimate most in the domain of greatest impairment. Specifically, in the social and behavioral domains, the ADHD plus aggression group overestimated their competence significantly more than did the ADHD boys without aggression (and more than the control group).

Lastly, Hoza et al. (2002) investigated the effects of comorbid depressive symptomatology. The sample was divided into one of three groups: (a) ADHD plus depression, (b) ADHD only (without depression), and (c) controls. Results suggest that high levels of depressive symptomatology may be associated with reduced levels of inflation of self-ratings in some domains, but not in others, yielding inconsistent results.
For example, in the physical appearance domain, the scores for boys with both ADHD and depression were significantly lower than that for boys with ADHD only and the control group, whereas the boys with ADHD without depression and control groups did not differ. In the behavioral domain, boys with ADHD plus depression and ADHD only boys still significantly inflated their scores relative to controls. However, in the social domain interesting results were found, in that the scores of boys with ADHD plus depression were comparable to controls; whereas the ADHD without depression group greatly overestimated their scores compared to the other two groups (Hoza et al., 2002). Taken together, this study suggests that comorbid symptoms may moderate the relative presence of the positive illusory bias in some domains, with the moderation effects being much clearer for low achievement and aggression, than for depression.

A study that also utilized the SPPC and the teacher version of this measure (Harter, 1985) found evidence for the positive illusory bias in the academic domain (Owens & Hoza, 2003). Participants included 180 children (137 boys, 43 girls) between 9 and 12 years of age. This study was the first to examine whether gender or subtype (inattentive vs. hyperactive/impulsive/combined) differences were present. When comparing discrepancy scores of child and teacher ratings between the ADHD and control group, analysis indicated that hyperactive/impulsive/combined children overestimated their scholastic competence more than control children, though inattentive children did not differ significantly from either group. The scores on the SPPC were also compared to actual achievement scores based upon the Woodcock-Johnson Achievement Tests (Woodcock & Johnson, 1990). Results of this analysis revealed that hyperactive-impulsive/combined children overestimated their competence more than inattentive
children. When only the results of the math subtest were analyzed, HICB children
overestimated their scholastic competence more so than control children and marginally
more than inattentive children. Gender effects were found only for the math subtest,
where girls overestimated their competence more than boys. This study suggests that
ADHD subtype as well as gender may influence the positive illusory bias. Although this
study was one of the first to examine gender and subtype issues among ADHD children,
due to the small number of females included in the sample, results must be interpreted
with caution. More specifically, the small size ($N = 8$) of the ADHD combined-type
female cell is most limiting.

One final study examined the self evaluations of children with ADHD compared
to teacher and parent-rated perceptions of the child’s competence (Hoza et al., 2004).
Participants were 487 children with ADHD and 287 control children, ranging in age from
7 to 9.9 years. This study incorporated the child and teacher versions of the SPPC
(Harter, 1985) as well as an adapted parent version (based upon the SPPC for teachers).
Results yielded a significant main effect of group on child vs. teacher report, such that
children with ADHD overestimated their competence significantly more than the control
group. A significant main effect for group was also found for both the child vs. mother
and child vs. father reports, such that children with ADHD overestimated their
competence significantly more than the control group. In contrast to Owens and Hoza
(2003), positive illusory self-perceptions in children with ADHD were consistent across
genders. The only exception was that relative to the teacher report, girls in general
(ADHD and control) had lower self-perceptions about their behavioral conduct and lower
self-perceptions about their physical appearance than did boys (Hoza et al., 2004).
Taken together, the above studies reveal that the positive illusory bias has been reliably displayed in children with ADHD and shows consistency across numerous domains (academic, social, and behavioral). The current study will add to the literature by examining whether or not the positive illusory bias is present in an adult sample with ADHD characteristics. The above studies also show evidence that gender and ADHD may play a role in the positive illusory bias. If sample characteristics permit, the current study will also examine the effects of these factors.

As previously mentioned, a few studies have failed to find evidence for the positive illusory bias in ADHD children (Horn, Wagner, & Ialongo, 1989; Ialongo, Lopez, Horn, Pascoe, & Greenberg, 1994; Treuting & Hinshaw, 2001). However, these three studies share a few methodological differences that may have resulted in inconsistencies. First, although two of the studies (Horn, Wagner, & Ialongo, 1989; Ialongo et al., 1994) included females with ADHD in their samples, the percentage of females in each sample were below half (32 and 27 percent, respectively). Second, whereas many of the formerly-discussed studies which found evidence for the positive illusory bias utilized *The Self-Perception Profile for Children* (Harter, 1985), two studies that found opposing evidence (Horn, Wagner, & Ialongo, 1989; Treuting & Hinshaw, 2001) incorporated the *Piers-Harris Children’s Self-Concept Scale* (Piers, 1984). Third, all of the studies that failed to find support for the positive illusory bias examined only absolute self-perceptions between the ADHD group and control group, instead of utilizing discrepancy scores (i.e., absolute self-perception minus a comparison score). Lastly, Treuting and Hinshaw’s (2001) study specifically examined ADHD boys with comorbid aggression. Although they found that ADHD boys with comorbid aggression
endorsed lower scores on a self-esteem measure than did control boys, no differences were found between non-aggressive ADHD boys and control boys. Further examination revealed that the children with comorbid aggression also had higher depression scores. Because there is evidence suggesting that depressive symptomatology may deflate perception scores, it is possible that the comorbid depression, not the comorbid aggression, was responsible for the unexpectedly lower self-perception scores in the ADHD with comorbid aggression group.

In sum, because of methodical differences, these three studies do not provide enough evidence to contradict results obtained regarding the positive illusory bias through more methodically-sound manners (Diener & Milich, 1997; Hoza et al., 2004; Hoza, Pelham, Dobbs, Owens, & Pillow, 2002; Ohan & Johnston, 2002; Owens & Hoza, 2003).

Possible Explanations for the Positive Illusory Bias

_Cognitive Immaturity_

One possible explanation for positive illusory self-perceptions in ADHD children is cognitive immaturity. Milich (1994) notes that children with ADHD are frequently described as immature, both behaviorally and cognitively, so it is possible that this theory may help explain the positive illusory bias. We know that very young children are prone to overestimate their abilities and show unrealistic optimism in performance expectations (Bjorklund & Green, 1992; Mash & Wolfe, 2002). Therefore, if ADHD children are cognitively immature, it makes sense that their self-perceptions may be overly optimistic compared to their same-age peers. If this is the case, as ADHD children age and become more cognitively mature, this optimistic bias would decline.
Although the cognitive immaturity hypothesis is a plausible explanation for the positive illusory bias, existing data fails to support it. For example, Owens and Hoza (2003) found that both ADHD hyperactive-impulsive/combined-type and ADHD inattentive-type were less cognitively mature than controls (i.e. had lower estimated IQ scores). However, the positive illusory bias was only found in the hyperactive-impulsive/combined-type group and not in the inattentive group. If the positive illusory bias was a function of cognitive immaturity, we would expect to find that both these groups exhibited a positive illusory bias. Because this was not found, these data fail to support the cognitive immaturity hypothesis.

For the cognitive immaturity hypothesis to be supported in the present study, college students with ADHD symptomatology must not display a positive illusory bias relative to their peers in the low-achieving non-ADHD group (LA) and the control group (CTL). In other words, if there are not significant differences in self-perceptions among the three groups (ADHD = LA = CTL), the argument that children with ADHD may outgrow these positive illusory self-perceptions would be supported.

Executive Functioning

Another possible explanation for the positive illusory bias in ADHD children deals with executive functioning. Executive functioning can be defined as “the ability to regulate behavior to context and maintain a response set” (Nigg, Savro, Ettenhofer, Hambrick, Miller, & Henderson, 2005, p. 706), which is believed to occur in the frontal lobe of the brain. As mentioned earlier, technological advances have led to the detection of actual neurological differences between children with ADHD and control children. Data suggest that neuropsychological problems are characteristic of ADHD in childhood
(Seidman, Doyle, Fried, Valera, Crum, & Matthews, 2004). These neuropsychological differences may be affecting the self-perceptions of children with ADHD and may be the underlying mechanism behind the positive illusory bias. Hoza et al. (2002) acknowledge “such a deficit could stem from an inability to attend to or comprehend verbal or nonverbal social cues, an inability to accurately report perceptions, or other variables underlying social-cognitive processes” (p. 443). Owens and Hoza (2003) also note the disinhibition characteristic of children with ADHD may be reminiscent of that seen in patients who display disinhibition due to frontal lobe impairments. A characteristic often seen in these patients is agnosignosia, or the lack of awareness of one’s own deficits (Owens & Hoza, 2003). Studies on executive functioning reveal that impairment is associated with these deficits in awareness (Owensworth, McFarland, & Young, 2002). If this is the case in children with ADHD, it would seem that in Owens and Hoza’s (2003) sample, children with hyperactivity/impulsivity may be experiencing more frontal lobe executive functioning problems than children with inattention only. Interestingly, other researchers have found that symptoms of inattention, but not of hyperactivity/impulsivity, are associated with neurological impairment (Chhabildas, Pennington, & Willcutt, 2001).

Some clarity regarding this topic may be found through a meta-analytic review of neurological functioning in individuals with ADHD. Frazier, Demaree, and Youngstrom (2004) identified 123 studies that reported full-scale intelligence scores (FSIQ) for individuals with ADHD and examined ADHD and control group differences on a number of variables. Of note, this meta-analysis included both child and adult samples. As expected, the ADHD group fell significantly below the control group on measures of
FSIQ (i.e., approximately a 9-point difference), which suggests an overall mild, but
global deficit. However, an additional analysis that examined executive functioning
provided support for the more specific “behavioral inhibition and attention and working
memory components of Barkley’s…unified model of ADHD” (Frazier, et al., 2004, p.
522). This finding provides evidence, not for generalized impairment in individuals with
ADHD, but for a specific deficit in executive functioning that likely contributes to
deflation in overall FSIQ.

Although study of the executive functioning of adults with ADHD is limited, a
recent study on an adult ADHD sample has provided some clarity on this particular issue
(Nigg et al., 2005). Nigg et al. found support for a dual-process model in ADHD, such
that executive functioning and processing speed may be the underlying neurological
differences between ADHD subtypes. This study found that executive functioning
deficits in an adult ADHD population were associated with symptoms of inattention-
disorganization but were not associated with symptoms of hyperactivity-impulsivity.
Interestingly, processing speed was associated with both symptom domains (i.e., IA and
HYP/IMP), but in opposite directions. More specifically, inattention-disorganization was
associated with a slow response style while hyperactivity-impulsivity was associated with
a faster response style. This study lends further support that deficits in executive
functioning, which are present in children with ADHD, are also present in an adult
ADHD population.

If the positive illusory bias is a function of deficits in executive functioning, we
would expect to find support for the positive illusory bias in an adult ADHD population.
Thus, if the positive illusory bias is present in the current study, additional exploration
between executive functioning and the positive illusory bias would be warranted. However, because the current study does not include any tests of executive functioning, even if the positive illusory bias is found, the current study cannot examine the executive functioning hypothesis directly.

To be consistent with the executive function explanation, the ADHD group must significantly overestimate their competence as compared to both the low-achieving non-ADHD group (LA) and the control group (CTL), with these two latter groups not differing from each other (ADHD > LA, CTL). In addition, it is possible that the executive functioning explanation can be supported even if the low-achieving, non-ADHD group overestimates their competence compared to the control group so long as the ADHD group still overestimates compared to the low-achieving, non-ADHD group (ADHD > LA > CTL). Either of these scenarios would lend support that the positive illusory bias is a unique characteristic of individuals with ADHD, and may be due to frontal lobe differences between these groups. However, the executive functioning explanation cannot be fully evaluated in the current study, as no tests of executive functioning will be administered.

**Self-Protection**

The study by Hoza et al. (2002) not only found that ADHD boys overestimated their competence relative to teacher report more than controls in the scholastic, social, and behavioral domains, but they also tended to overestimate their competence most in the area of greatest impairment. It is because of this and other findings that some researchers argue that these inflated perceptions of self are not due to cognitive immaturity, but instead serve a self-protective function. This hypothesis states that
children with ADHD are aware of their weaknesses, but when asked to rate themselves in these areas, they tend to overestimate in order to protect themselves by trying to “prove” or convince others that these deficits do not exist; hence, overestimating most in the area of greatest impairment (Hoza et al., 2002).

Numerous researchers have examined this theory, but inconsistencies in the research provide uncertainty regarding the validity of this explanation. These researchers hypothesized that if children are in a positive and supportive environment, the need to overcompensate for their weaknesses is decreased. In a study involving 30 boys with ADHD and 90 boys with no history of ADHD (ages 8 to 11), Diener and Milich (1997) assessed the boys’ self-perceptions before and after a social interaction task. Further, half of the children were given either positive feedback or no feedback about their performance on the task. Prior to the task, ADHD and non-ADHD boys’ ratings of task expectancies did not differ significantly. After the task had ended, however, ADHD boys’ ratings of how much they thought their partner liked them were significantly greater than the ratings of the control boys. After performing the task, children were given either positive feedback or no feedback in order to see if the self-perception scores would decrease. The authors argued that children are able to abandon this inflated stance when they are in an environment where they do not need to defend themselves. In fact, following positive feedback, the ADHD group showed a significant decrease in their self-perceptions, while comparison boys who received positive feedback showed an increase in self-perception scores. In contrast, ADHD boys who received no feedback continued to display inflated self-evaluations.
Ohan and Johnston (2002) investigated the self-protective explanation in the social and academic domains. Their sample included 45 boys with ADHD and 43 boys without ADHD between the ages of 7 and 12 years. Boys with ADHD were taken off of their medication for at least 24 hours before task completion. Prior to a maze task, research assistants asked each boy how well he thought he would do on a task, gave a few other measures, and then introduced the boy to a teacher and left the room. The teacher gave the boy a sample maze, provided corrections if necessary, gave him 9 increasingly difficult mazes, and then left the room. This study provided further evidence for the positive illusory bias among boys with ADHD, as they performed worse on the mazes than boys without ADHD but reported inflated performance estimates. After a short time, the research assistant then reentered the room and provided either positive feedback, average feedback, or no feedback on the task. Again, researchers wanted to examine whether providing positive feedback would allow ADHD children to relax this defensive bias. In contrast to Deiner and Milich (1997), the feedback manipulation did not affect their degree of estimation in the academic domain.

To assess self-perceptions in the social domain, each child was also asked how much they thought the teacher liked him. The average and no feedback comparison was not significant for boys with ADHD. However, as expected, boys with ADHD who received positive feedback no longer gave higher scores than the teachers, while the boys with ADHD who received average or no feedback still showed inflated scores. The authors consider that the self-protective explanation may account for why ADHD boys overestimate in the social performance domain. However, it does not support why they overestimate in the academic domain, as academic estimates were not correlated with
self-esteem or social desirability (Ohan & Johnston, 2002). In summary, both Diener and Milich (1997) and Ohan and Johnston (2002) found support for the self-protective explanation in the social domain, but did not find evidence for it in the academic domain. However, it may be possible that this phenomenon is only present in the social domain. The ambiguity of most social feedback situations may make it difficult for children with ADHD to accurately gauge their social-worth, which may reduce their defensiveness regarding this issue. Perhaps the children with ADHD are defensive regarding both academic and social ability, but continue to stay defensive (i.e., inflated self-perception scores) regarding academics because of the continuous and direct feedback they have likely received throughout their entire schooling.

Because the current research study does not include a manipulation (i.e., no feedback to participants prior to obtaining self-perception scores), the self-protective hypothesis cannot be fully evaluated by this study. However, the results may rule this hypothesis out. For the self-protective hypothesis to not be ruled out as a possible cause of the positive illusory bias, a few scenarios may occur. First, if the ADHD group overestimates more than both the low-achieving, non-ADHD group (LA) and the control (CTL) group (ADHD > LA, CTL), the ADHD group may be inflating their scores due to a need to protect. In a second scenario, both the ADHD group and the low-achieving, non-ADHD group may inflate their scores more than the control group (ADHD, LA > CTL). These results would indicate that the positive illusory bias is not necessarily unique to ADHD but still may occur as a self-protective factor for both of these groups. A third possible scenario is that the ADHD group overestimates their competence compared to the low-achieving, non-ADHD group, who in turn overestimate compared to
the CTL group (ADHD > LA > CTL). In this case, it is possible that both the ADHD and low-achieving, non-ADHD groups are self-protecting, but that the ADHD group is overestimating even more due to their possibly longer history of failure. Lastly, it is possible that even if the low-achieving non-ADHD group overestimates their competence compared to the ADHD group, who in turn overestimates compared to the control group (LA > ADHD > CTL), the self-protective hypothesis may still be supported. If these results occur, one reason may be that students with ADHD attach some of their academic difficulty to their diagnostic label and therefore do not feel as much need to self-protect as the low-achieving, non-ADHD group, who may not be as likely to have a “label.”

*Ignorance of Incompetence*

One final explanation for the positive illusory bias found in ADHD children suggests that the positive illusory bias may be associated with low achievement rather than ADHD symptomotology. Dunning, Johnson, Ehrlinger, and Kruger (2003) argue that people tend to be “blissfully unaware of their incompetence” and deem this phenomenon the “ignorance of incompetence.” Thus, poor performers’ lack of skill does not allow them to produce correct responses, nor does it allow them to recognize that they are not producing them (p. 83). Dunning et al. (2003) asked 141 sophomores in college how well they did on an exam (i.e., asked to estimate their performance relative to other the students), just before they walked out of the classroom. Students in the bottom quartile of performance level greatly overestimated their performance on the test, whereas people in the highest quartile slightly underestimated their performance. This study suggests that the positive illusory bias was displayed by the lowest achieving group relative to a criterion (test score). These results indicate that the positive illusory bias
may be found in non-ADHD samples and may be a function of low skills or achievement in a specific area.

Another study by Kruger and Dunning (1999) showed that participants scoring in the bottom quartile on tests of humor, grammar, and logic grossly overestimated their test performance and ability. For the test of humor, 65 university students rated the level of humor for 30 jokes. After the questionnaire, participants self-reported their own “ability to recognize what’s funny” compared to the average university student. The authors then compared the students’ ratings of the jokes to those of a criterion (i.e. scores that professional comedians achieved on the same measure). By comparing the students’ scores to those of the comedians, the authors could “assess participants’ ability to spot humor.” Students who scored in the lowest percentile (12th or lower) ranked themselves in the 58th percentile on ability to judge humor. Participants in the other quartiles did not overestimate their ability to the same degree as the lowest quartile group. While regression towards the mean may be a factor in these results, the authors concluded that skills necessary to achieve competence in a domain are often the skills necessary to evaluate competence in that domain (Kruger & Dunning, 1999).

The same authors attempted to replicate the results of the above study, focusing on the domain of intelligence. Participants completed a 20-item logical reasoning test taken from a Law School Admissions Test prep guide, and then rated their logical reasoning abilities. They rated their logical reasoning abilities in three different ways. First, they compared their “general logical reasoning ability” (p. 1124) with other students in their class by providing a percentile rank of their performance. They then provided a percentile rank of their actual performance on the test compared to that of
Their classmates. Lastly, they estimated how many of the test questions they answered correctly. Participants were then split into groups based upon their performance on the test. It was once again participants in the lowest quartile who overestimated their logical reasoning ability and test performance the most. Interestingly, participants who fell in the uppermost quartile tended to underestimate their ability (Kruger & Dunning, 1999).

Kruger and Dunning’s (1999) final study attempted to replicate the previous results in a grammar domain. Participants once again overestimated their competence compared to an objective criterion (i.e., actual grammar score). A few weeks later, the researchers invited the top and bottom quartile performers back for a follow-up test. They were then given five tests of their peers to “grade” and asked them how competent the test takers were. As expected, participants in the lower quartile were less able to grade the competence of others than those in the top quartile. After the grading, participants were shown their own test they had completed and asked again to rate their own ability on the test. Again, as predicted, the participants in the lower quartile did not appear to gain insight into their deficiency, as they still rated themselves high on competency of the task, though those who scored in the top quartile did rate themselves more accurately (Kruger & Dunning, 1999).

Ehrlinger and Dunning (2003) note that the self-perception literature rests on two assumptions. The first is that “people receive unambiguous and unbiased feedback about their performances” (p. 14). In most situations, this assumption may not be met due to the unlikelihood of a person receiving very clear feedback (e.g., social settings where one only has non-verbal behavior as feedback). The second assumption (even after the first one is met) is that “people dispassionately note and incorporate the feedback into their
self-views” (p. 14). Interestingly, feedback may aid those who underestimate their competency to form a more accurate self-perception, but it does not appear to help those who overestimate their competency in an area (Subbotin, 1996, as cited in Ehrlinger & Dunning, 2003; Kruger & Dunning, 1999, Study 3). Hence, even when feedback is clear and unbiased, it does not necessarily mean that it will be incorporated.

Because the adult social psychology literature (e.g. Kruger & Dunning, 1999; Ehrlinger & Dunning, 2003) has found inflated self-views in low achieving individuals, one can argue that the positive illusory bias is not unique to an ADHD population. Rather, the positive illusory bias is present in ADHD individuals because they have a general low competency in the areas that are being studied. This study will directly explore the effects of both low academic competency and ADHD.

For the ignorance of incompetence hypothesis to be supported, one of three scenarios must occur. First, the low-achieving, non-ADHD group may overestimate their competence more than both the ADHD and control groups (LA > ADHD, CTL). These results would indicate that overestimation is a function of low-achievement only, and not due to ADHD symptomatology. Second, both the ADHD group and low-achieving non-ADHD group may overestimate their competence compared to the control group (ADHD, LA > CTL). These results would indicate that both groups overestimate because they are both poor at logic tasks and are therefore poor evaluators or are both self-protecting. Third, the low-achieving, non-ADHD group may overestimate their competence more than the ADHD group, who in turn overestimates more than the control group (LA > ADHD > CTL). These results may indicate that the first group is simply the lowest-
achieving group and therefore the worst at evaluating their competence, followed by the ADHD group, who is also a “lower achieving” group relative to the control group.

Learning Disabilities Research

After understanding the link between overestimation of competence and low achievement, it may seem that the previous work on the positive illusory bias in children can be explained by the ignorance of incompetence hypothesis. However, another intriguing phenomenon can be found in the literature on learning disorders. It seems that children with learning disabilities (LD) may be consistently accurately reporting their deficits in certain areas. Some studies show evidence that children with LD report lower self-concepts on items dealing with academic domains (Ayres, Cooley, & Dunn, 1990; Boersma & Chapman, 1981; Kistner & Osbourne, 1987; Smith & Nagle, 1995) as well as social acceptance (Smith & Nagle, 1995). More recent evidence supports the claim that students with LD often demonstrate lower academic and social self-concept, as well as low perceptions of general self-worth (Elbaum & Vaughn, 2003). Other researchers note that learning-disabled children are more likely to believe that success is the result of luck or other external sources rather than their own ability (Boersman & Chapman, 1981; Bryan & Pearl, 1979). Overall, it appears that children with learning disorders have fairly accurate self-concepts, as they seem to be aware of their lower competency in the academic, and even social, domains.

A more recent study compared the self-concepts of students with learning disabilities with and without ADHD (Tabassam & Grainger, 2002). Included in this study were a total of 172 elementary students: 44 students with LD only, 42 students with LD/ADHD, and 86 typically achieving students. The 86 typically achieving students
were matched to the students with LD and LD/ADHD based on their gender and grade placement. A diagnosis of ADHD was made through use of the Conners Teacher and Parent Rating scales (Conners, 1985, as cited in Tabassam & Grainger, 2002). The Self-Description Questionnaire (SDQ-1; Marsh, 1990, as cited in Tabassam & Grainger, 2002) was used to assess participants’ self-concept. This is a 76-item measure with 8 subscales (3 academic, 4 nonacademic, 1 general self-concept). The children respond to simple statements on a 5-point scale (i.e. 1 = false, 5 = true). Interestingly, both the LD and LD/ADHD groups reported significantly lower scores on academic self-concept and general self-concept than the matched control group. Students did not differ in the nonacademic domain (Tabassam & Grainger, 2002). This study suggests that low achievement in children is associated with lower academic self-perceptions, which is contradictory to other research (Dunning et al., 2003; Ehrlinger & Dunning, 2003; Kruger & Dunning, 1999). Of note, unlike some of the previously cited ADHD research that utilized discrepancy scores to compare self-perceptions, Tabassam and Granger (2002) used absolute self-perceptions in their analyses.

Although all of the studies mentioned above lend support to the argument that LD children actually display accurate self-perceptions regarding their functioning, conflicting evidence can also be found in the literature. Hoza et al. (2004) found a pattern of results conflicting with results from Tabassam & Grainger (2002). In this study, both the ADHD plus low achievement sub-group and the normal achieving ADHD group overestimated their scholastic competence compared to controls. Hence, achievement did not influence (or serve to deflate) the positive illusory bias in ADHD children. Further, the ADHD plus low achievement group also significantly overestimated scholastic competence most
in the academic domain (i.e. domain of greatest impairment), providing support for the self-protective explanation. In another study, hyperactive/impulsive children were poorer judges of scholastic competence than were controls or inattentive children (i.e. HICB children had inflated scholastic self-perception scores while controls and IA children were accurate) (Owens & Hoza, 2002). However, if low achievement was the moderating variable for inflated self-perception, the inattentive children should also have reported inflated scholastic self-perceptions, which was not the case.

Similarly, Vaugh, Haager, Hogan and Kouzehanani (1992) found that LD students displayed self-concepts within the average range prior to identification (1st grade) of having a learning disability as well as at the three-year follow-up. This provides support for the positive illusory bias in a learning disabled population in the academic domain. In addition, a meta-analysis by Nowicki (2003) revealed that although children with learning disabilities were significantly more likely to receive negative peer nominations than comparison group members, children with learning disabilities did not differ from average- to high-achieving children on ratings of social self-perception. In other words, their self-report in the social domain was as high as the self-report of children in the comparison groups. This provides evidence for the positive illusory bias in the social domain for children with learning disabilities, as they appear to be overestimating their performance relative to peer report. Interestingly, Nowicki (2003) notes that although children with learning disabilities in this study did not accurately assess their social competence, they “appeared to be well aware of their poor scholastic abilities” (p. 185), which suggests that children with learning disabilities may make more accurate self-assessments in the academic domain than the social domain.
Although both ADHD and LD children are considered to be lower-achieving than their normal-aged peers, and although conflicting data can be found, there is still overwhelming support that only the children with ADHD seem to be overestimating their competency in certain areas. In addition, although the adult social literature regarding inflated self-perceptions makes a convincing argument that the positive illusory bias may be a function of low achievement (and therefore, not unique to ADHD), the child literature on learning disabilities does not lend clear support to this claim. Therefore, pursuit of an understanding of the positive illusory bias in the ADHD adult realm is not only a valid research study, but necessary.

Limitations of Previous Work

One limitation shared by all of the previous literature is lack of late adolescent or young adult ADHD samples. None of the ADHD studies examining the positive illusory bias have included children over the age of 13. Although a few researchers hypothesize that the positive illusory bias may be a function of cognitive immaturity and indicate that the discrepancy between the child’s self evaluation and a criterion may gradually lessen with age, no studies have been able to lend support to this theory due to the age of the participants being incorporated.

Another limitation in the above studies concerns achievement level of the participants. Although a few studies examining the positive illusory bias in ADHD children accounted for achievement as a potential confound, very few studies specifically examine whether overestimation of competence varied as a function of achievement. Also, the adult literature examined inflated self-perceptions scores and discussed them in terms of achievement level, but did not examine an ADHD sample.
Other limitations of the above studies relate to ADHD subtype and gender issues. Less than half of the studies (Horn et al., 1989; Owens & Hoza, 2003; Hoza et al., 2004) included females in their sample. Because results were inconsistent across these studies, continued investigation is needed. Similarly, one study acknowledged that “the majority of ADHD participants most closely resembled the Combined Type of ADHD in DSM-IV” (Hoza et al., 2001, p. 273). However, excluding one (Owens & Hoza, 2003), no other studies specified the relative presence or severity of inattention or hyperactivity/impulsivity in the ADHD sample. Only one study (Owens & Hoza, 2003) examined the role of subtype in the positive illusory bias and results suggest continuous investigation is warranted.

**Current Study**

The current study attempts to examine whether or not the positive illusory bias is present in young adults demonstrating symptoms characteristic of ADHD, low-achieving non-ADHD adults (LA), and average or above-average achieving non-ADHD adults (CTL). Based upon the literature regarding the self-perceptions of children with ADHD, the main hypothesis of the current study is that adults with ADHD symptomatology will display a positive illusory bias in regard to their intellectual functioning and scholastic achievement compared to a low-achieving, non-ADHD group as well as a control group. Specifically, it is hypothesized that the ADHD group will have significantly higher self-perception discrepancy scores than the low achievement and non-ADHD groups. Secondly, if the positive illusory bias is present, this study will explore if it is a function of ADHD, low achievement, or both. Because this has never been examined in the literature, specific directional hypotheses are not made.
Method

Participants

Participants were recruited through four mechanisms: (a) five mass research screenings associated with early level psychology courses in the Department of Psychology at Ohio University, (b) posted advertisements that were displayed around the campus of Ohio University (c) archived records at the Ohio University Psychology and Social Work Clinic, and (d) by posted advertisements at the Access Center (center that assists students with disabilities) at Hocking College. Using these recruitment strategies, 99 college-age students participated in the research protocol. Using screening questions and the originally-proposed inclusion and exclusion criteria, participants were categorized into one of three groups: (a) students with ADHD symptomatology, (b) non-ADHD students with low-achievement, or (c) non-ADHD students with average or above-average achievement. Group identification procedures resulted in 8 students in the ADHD group, 1 student in the non-ADHD, low-achieving group, and 15 students non-ADHD, high-achieving group. Because proposed analyses were not possible with this sample size, new inclusion criteria were established (see procedures section) and participants were categorized into two groups, an ADHD group (N=31) and a non-ADHD group (N=39). Demographic data for participants in these two groups can be found in Table 1. Groups were significantly different on expected variables (i.e., previously diagnosed with ADHD, takes/has taken medication for ADHD). Groups were equivalent on all other variables except for high school GPA, where the ADHD group had a significantly lower high school GPA than the control group. Thus, the ADHD and non-
ADHD group did not differ significantly on intellectual functioning or academic achievement, as assessed by the screening tools described below.

Table 1

*Descriptive Characteristics of Participants by Group*

<table>
<thead>
<tr>
<th></th>
<th>Control Group</th>
<th>ADHD Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n = 39 )</td>
<td>( n = 31 )</td>
</tr>
<tr>
<td>N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 18</td>
<td>15 (38.5)</td>
<td>10 (32.3)</td>
</tr>
<tr>
<td>Age 19</td>
<td>17 (43.6)</td>
<td>13 (41.9)</td>
</tr>
<tr>
<td>Age 20</td>
<td>4 (10.3)</td>
<td>5 (16.1)</td>
</tr>
<tr>
<td>Age 21</td>
<td>2 (5.1)</td>
<td>0</td>
</tr>
<tr>
<td>Age 22</td>
<td>1 (2.6)</td>
<td>1 (3.2)</td>
</tr>
<tr>
<td>Age 23</td>
<td>0</td>
<td>1 (3.2)</td>
</tr>
<tr>
<td>Age 24</td>
<td>0</td>
<td>1 (3.2)</td>
</tr>
<tr>
<td>Gender Male</td>
<td>12 (30.8)</td>
<td>14 (45.2)</td>
</tr>
<tr>
<td>Gender Female</td>
<td>27 (69.2)</td>
<td>17 (54.8)</td>
</tr>
<tr>
<td>HS gpa* 3.5 or above</td>
<td>22 (56.4)</td>
<td>9 (29.0)</td>
</tr>
<tr>
<td>HS gpa* 3.0 to 3.4</td>
<td>12 (30.8)</td>
<td>10 (32.3)</td>
</tr>
<tr>
<td>HS gpa* 2.5 to 2.9</td>
<td>3 (7.7)</td>
<td>12 (38.7)</td>
</tr>
<tr>
<td>HS gpa* 2.0 to 2.4</td>
<td>2 (5.1)</td>
<td>0</td>
</tr>
<tr>
<td>College gpa 3.5 or above</td>
<td>7 (17.9)</td>
<td>3 (9.7)</td>
</tr>
<tr>
<td>College gpa 3.0 to 3.4</td>
<td>9 (23.1)</td>
<td>6 (19.4)</td>
</tr>
<tr>
<td>College gpa 2.5 to 2.9</td>
<td>8 (20.5)</td>
<td>8 (20.5)</td>
</tr>
<tr>
<td>College gpa 2.0 to 2.4</td>
<td>5 (12.8)</td>
<td>5 (12.8)</td>
</tr>
<tr>
<td>College gpa &lt; 2.0</td>
<td>1 (2.6)</td>
<td>1 (3.2)</td>
</tr>
<tr>
<td>College gpa no gpa (1st sem.)</td>
<td>9 (23.1)</td>
<td>10 (32.3)</td>
</tr>
<tr>
<td>Previous ADHD/ADD</td>
<td>0</td>
<td>19 (61.3)</td>
</tr>
<tr>
<td>Previous LD Diagnosis</td>
<td>2 (5.1)</td>
<td>5 (16)</td>
</tr>
<tr>
<td>Taking/taken meds</td>
<td>2 (5.1)</td>
<td>17 (54.8)</td>
</tr>
<tr>
<td>Repeated a grade</td>
<td>0</td>
<td>1 (3.2)</td>
</tr>
<tr>
<td>WASI FSIQ</td>
<td>106.08</td>
<td>110.33</td>
</tr>
<tr>
<td>WIAT Composite Score</td>
<td>110.46</td>
<td>108.61</td>
</tr>
</tbody>
</table>

Indicates variables for which there were significant group differences, * \( p < .05 \), ** \( p < .01 \)
Materials

Screening Materials. The mass screening questionnaire consisted of three forced-choice questions that were designed to grossly screen a large sample of college students (see Appendix A). This questionnaire screened participants for past diagnoses of ADHD and/or learning disabilities, low high school and/or college GPAs, and the willingness of participants to allow questionnaires to be mailed home to their parents.

Demographic Questionnaire. A brief demographic questionnaire (see Appendix B) was used to collect participant demographic characteristics. It was also on this questionnaire that participants provided contact info for their parents/guardians.

CAARS. The Conners’ Adult ADHD Rating Scale – self-report-screening version (CAARS – S:SV) was completed by each participant (Conners, C. K., Erhardt, D., & Sparrow, E., 1999). The screening version of the CAARS consists of 30 items and contains three DSM-IV ADHD symptom subscales (i.e., 9-item Inattentive Symptoms subscale, 9-item Hyperactive-Impulsive Symptoms subscale, Total ADHD Symptoms subscale) and an ADHD Index. If a student was taking medication for inattention or hyperactivity/impulsivity at the time of participation in the experiment, he was instructed to rate his own behavior when not medicated (e.g., when medication had worn off).

The Conners’ Adult ADHD Rating Scale – observer-screening version (CAARS – O:SV) was sent home to the parents of participants. The questions were identical to the self-report-screener. The parents were instructed to rate the behaviors as observed when the student was not taking medication. Because age of onset is also important when diagnosing ADHD, an additional slip of paper was attached to the observer version of the CAARS that stated: “If these problems apply to this student, please circle when they first
appeared: Before Elementary School, Elementary School, Middle School, High School, College.” However, due to the low return rate of observer ratings (51%), neither the CAARS – O:SV nor this extra question were utilized in determining the final inclusion criteria, as it would have reduced the sample size dramatically.

Internal reliability coefficients for males ages 18 through 29 for the DSM-Inattentive Symptoms subscale, DSM-Hyperactive/Impulsive Symptoms subscale, DSM-Total ADHD Symptoms subscale, and the ADHD Index are .81, .64, .78, and .82 respectively (Conners, Erhardt, & Sparrow, 1998). Internal reliability coefficients for females ages 18 through 29 for the DSM-Inattentive Symptoms subscale, DSM-Hyperactive/Impulsive Symptoms subscale, DSM-Total ADHD Symptoms subscale are .84, .75, .86, and .81 respectively (Conners, Erhardt, & Sparrow, 1998).

The Cronbach’s alpha coefficients for the observer measures also revealed adequate reliability, ranging from .80 to .90. Test-retest correlations are only available for the main clinical scales of the CAARS self-report long version. Test-retest reliabilities, with a one-month interval, revealed correlations ranging from .80 to .90.

Construct validity on the ADHD Index was examined by comparing self-report ADHD Index scores to Observer-Report ADHD Index scores on nine occasions. For males, correlations range between .30 and .52. For females, correlations range .41 and .53. Of note, these correlations are consistent with other multi-informant measures (Achenbach et al., 1987).

Authors of the CAARS note that the ADHD Index is the subscale that best distinguishes clinically-diagnosed ADHD adults from non-ADHD adults (Conners, Erhardt, & Sparrow, 1999). Cross-validation of the ADHD Index utilized a sample of
ADHD adults (n = 96) as well as a non-ADHD control sample (n = 96). Cross-validation results indicated that the ADHD Index had an overall sensitivity of 71 percent and overall specificity of 75 percent.

**Harter SPPCS.** The Harter Self-Perception Profile for College Students (see Appendix C; Neeman & Harter, 1985) is a 54-item questionnaire that assesses participants’ self-perceptions of competence in 12 domains that are relevant to the college student. For the purpose of this study, only two domains (scholastic competence and intellectual ability) were used. This measure is an upward extension of the Harter Self-Perception Profile for Children and was used in this study in order to maintain consistency with child-focused studies that were influential in the design of this study. Internal reliability coefficients of the intellectual ability and scholastic competence subscales are .86 and .84, respectively (Neeman & Harter, 1986). Regarding the current sample, reliability analyses revealed internal reliability coefficients of the intellectual ability and scholastic competence subscales to be .95 and .92, respectively. Validity data on the scholastic competence and intellectual ability scales were not available.

A parent version of this measure was also mailed home to the parents of all participants. The parent version of the two subscales was created by the principal investigator for the purpose of this study (see Appendix D). A similar procedure has been used in order to adapt the Child Harter Self-Perception Scale to a parent version (Hoza et al., 2004). However, due to the low return rate of parent ratings (51%), this questionnaire was not used in the final analyses.

**WIAT-II-A (Wechsler Individual Achievement Test (2nd edition) – Abbreviated).** The WIAT-II-A is a standardized screener of academic achievement in reading, math,
and spelling (Wechsler, 2001). For participants between the ages of 17 and 25, the internal reliability coefficients of the subtests range from .92 to .95 (WIAT-II Supplement, 2002). Test-retest reliability of WIAT-II-A scores was assessed using an interval ranging from 7 to 45 days. For the college and adult sample the stability coefficients were .91, .92, and .94 for word reading, numerical operations, and spelling subtests, respectively (Wechsler, 2002). Subtests that compose the WIAT-II-A also show adequate validity with the WIAT-II composite scores, with correlations ranging from .71 to .80 (WIAT-II, 2001). The WIAT-II-A Word Reading subtest scores correlate from .37 to .88 with the *Wechsler Individual Achievement Test* (WIAT), the *Wide Range Achievement Test-3* (WRAT-3), and *Differential Ability Scales* (DAS) reading subtests. The WIAT-II-A Numerical Operations subtest scores correlate from .75 to .78 with the WIAT, WRAT-3, and DAS spelling subtests. The WIAT-II-A Spelling subtest scores correlate from .76 to .86 with the WIAT, WRAT-3, and DAS spelling subtests.

*WASI (Wechsler Abbreviated Scale of Intelligence).* The Wechsler Abbreviated Scale of Intelligence (WASI) was developed to provide a short and reliable estimate of intelligence (Wechsler, 1991). The WASI is designed for use with individuals ranging from 6 to 89 years. An estimate of general intellectual ability can be obtained by using a two-subtest form (FSIQ-2) including the vocabulary and matrix reasoning subtests. The two-subtest form shows adequate reliability for 17 to 24 year olds, with internal consistency coefficients for vocabulary ranging from .90 to .91 and matrix reasoning ranging from .88 to .91 (WASI, 1999). Test-retest reliability of WASI scores was assessed using a 2 to 12 week interval. For adults ranging from 17 to 54 years of age, the
stability coefficients were .87 and .72 for the vocabulary and matrix reasoning subtests, respectively.

The correlation coefficients between the WASI and WAIS-III subtests are .88 and .66 for vocabulary and matrix reasoning, respectively. In addition, the correlation coefficient between the WAIS-III Full Scale IQ score and the WASI FSIQ-2 is .87.

Both convergent and discriminant validity were tested by examining the intercorrelations of the WASI subtests on an adult sample. All subtests correlated at least on a moderate level. Correlation among subtests in similar domains (i.e., Vocabulary and Similarities, correlation coefficient = .79; Block Design and Matrix Reasoning, correlation coefficient = .63) provide evidence for convergent validity. Lower correlations between subtests from different domains (i.e., Vocabulary and Block Design, correlation coefficient = .54; Vocabulary and Matrix Reasoning, correlation coefficient = .61; Similarities and Block Design, correlation coefficient = .55; Similarities and Matrix Reasoning, correlation coefficient = .59) provide evidence for discriminant validity.

Logic Protocol. Participants completed a logic task that was made consistent with procedures developed by Kruger and Dunning (1999). First, participants rated, on a scale ranging from 1 (not at all) to 9 (to an extreme degree), the extent to which they possess eight abilities. One item pertains to the degree to which the participants possess an “ability to reason abstractly,” while the other questions serve as distracter items (see Appendix E). To remain consistent with the child literature (Hoza et al., 2000; Hoza et al., 2001), prior to completion of the task, participants were shown the task and were asked to rate, on a 10-point scale, how well they would do on the task. Upon completion of these scales, the participants completed a 10-item multiple-choice test consisting of
items taken from the analytical section of a Graduate Record Examination (GRE) test preparation guide (Kaplan Educational Centers, 2000, see Appendix F). The test was described by the facilitator as one measuring “logical reasoning.” The participants were then asked to estimate how many of the 10 items they had answered correctly as well as a percentile estimate of their performance relative to other students from Ohio University (between 1 and 100).

Procedure

The specific goal of the mass screening was to broadly screen a large sample of college students to obtain a smaller sample consisting of (a) college students with ADHD symptomatology, (b) low-achieving college students without ADHD symptomatology, and (c) average to high-achieving college students without ADHD symptomatology. During an electronic mass screening, students completed the three questions relevant to screening for this study (see Appendix A). The first question asked participants if they would allow rating forms to be mailed to their parents. Students who did not grant permission for materials to be mailed to their parents or caregivers were excluded from further participation in this project. The second question asked if participants had ever been diagnosed with ADHD/ADD or had ever taken medication for attention problems. Students who responded affirmatively to either of these questions were further evaluated for inclusion in the ADHD group. The third question asked participants to note if their high school grade point average (GPA) was below a C, if their college GPA is below a D or if they had ever been diagnosed with a learning disability. Students who responded affirmatively to any of these questions were further evaluated for inclusion in one of the
three groups. Participants who met the initial screening criteria for one of the above described groups then participated in the full protocol.

Participants were also recruited through the Ohio University Psychology and Social Work training clinic. All clients of the clinic are given the opportunity to sign a research consent form allowing the department to contact them for future research projects. Clients who had provided consent for future contact and who had been diagnosed with ADHD and/or a learning disability were contacted by the principal investigator and invited to participate. Over 40 students were contacted and two participated. Procedures were identical to those described below.

Upon arrival for the testing session, students first completed one of two consent forms (see Appendix G and Appendix H). A signed consent form allowed the researcher to use the data that the participant provided in the context of this study, to obtain the home address of the participant’s parent(s)/guardian(s) (see Appendix B), and consent to mail the Conner’s ADHD Assessment Battery for Adults observer rating scale and a parent version of the Harter Self-Perception Measure for College Students home for one parent to complete. After consent was obtained, students completed the demographic questionnaire, the CAARS-S:SV, WASI, WIAT-II-A, two Harter subscales, and the logic protocol. Each participant received an abbreviated debriefing form at the end of the session (Appendix I). In addition, a more comprehensive debriefing form was mailed to each participant at the end of the academic quarter (Appendix J).

Using the original inclusion and exclusion criteria resulted in a sample that included 8 students in the ADHD group, 1 student in the non-ADHD, low-achieving group, and 15 students non-ADHD, high-achieving group. Proposed analyses were not
possible with this sample size, thus new inclusion criteria were established. Specifically, group inclusion was based upon results of the CAARS-S:SV. For inclusion in the ADHD group, at least one CAARS self-report subscale score had to have a t-score equivalent to or above 65 (ADHD symptomatology “much above average”). For inclusion in the non-ADHD group, all CAARS subscale scores had to have a t-score less than 55 (ADHD symptomatology “average” or “below average”).

Results

Data Preparation

To examine student self-perceptions compared to a criterion, z-scores were created for students’ scores on the Harter SPPCS subscales, the WASI full-scale IQ score, the WIAT-II-A composite score, pre and post-test prediction scores, and total score on the GRE logic test. Six difference scores were calculated by subtracting one of the standardized test scores from one of the standardized self-perception scores. Higher difference scores suggest higher overestimation of competence by the student. A description of the six discrepancy scores can be found in Table 2. Means and standard deviations for all discrepancy scores can be found in Table 3. Correlations between these discrepancy scores can be found in Appendix K.
Table 2

*Description of Discrepancy Scores*

<table>
<thead>
<tr>
<th>Discrepancy Variable Name</th>
<th>Contributing Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSELFIQ</td>
<td>Harter intelligence score – WASI Intelligence score</td>
</tr>
<tr>
<td>DSCHWAS</td>
<td>Harter scholastic score – WASI Intelligence score</td>
</tr>
<tr>
<td>DSSCHOL</td>
<td>Harter scholastic score – WIAT Achievement composite</td>
</tr>
<tr>
<td>DGRESCH</td>
<td>Harter scholastic score – GRE logic score</td>
</tr>
<tr>
<td>DPRETEST</td>
<td>Pre-test question – GRE logic score</td>
</tr>
<tr>
<td>DPOSTTEST1</td>
<td>Post-test question – GRE logic score</td>
</tr>
</tbody>
</table>

Table 3

*Means and Standard Deviations for Self-Perception Discrepancy Scores by Group*

<table>
<thead>
<tr>
<th></th>
<th>ADHD</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 31</td>
<td>N = 39</td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>dselfiq (Harter intel - WASI)**</td>
<td>-.49 (.970)</td>
<td>.624 (1.92)</td>
</tr>
<tr>
<td>dschwas (Harter schol - WASI)**</td>
<td>-.527 (.84)</td>
<td>.575 (1.92)</td>
</tr>
<tr>
<td>dsschol (Harter schol - WIAT)</td>
<td>-.211 (.99)</td>
<td>.348 (1.67)</td>
</tr>
<tr>
<td>dgresch (Harter schol - GRE)*</td>
<td>-.332 (.87)</td>
<td>.551 (1.74)</td>
</tr>
<tr>
<td>dpretest (pre-test – GRE)</td>
<td>-.195 (1.15)</td>
<td>.286 (1.37)</td>
</tr>
<tr>
<td>dposttest (post-test – GRE)</td>
<td>-.085 (.931)</td>
<td>-.162 (1.01)</td>
</tr>
</tbody>
</table>

* Indicates variables for which there were significant group differences (p < .05)
** p < .01
Initially, it was proposed that a 2 (male, female) by 3 (ADHD; low-achieving non-ADHD; high-achieving non-ADHD) MANOVA be performed on four discrepancy scores. However, recruitment strategies did not yield a sufficient sample to conduct this analysis. Thus, six, independent t-tests were conducted to compare the four self-perception discrepancy scores between the ADHD group and control group, as well as to compare pre and post-test prediction scores between the two groups.

**Primary Analyses**

The first t-test was conducted on the intelligence discrepancy scores. T-test results revealed that the ADHD group underestimated their competence in the domain of intelligence (Harter intelligence – WASI score) \( (M = -.48, \ SD = .97) \) significantly more than did the control group \( (M = .62, \ SD = 1.92) \), \( t(67) = -2.89, \ p < .01 \). The second independent t-test revealed that the ADHD group again underestimated their scholastic competence when compared to their WASI score (Harter scholastic – WASI) \( (M =-.53, \ SD = .84) \), significantly more than did the control group \( (M = .58, \ SD = 1.92) \), \( t(67) = -2.93, \ p < .01 \). The third independent t-test (Harter scholastic – WIAT score) revealed no significant differences between the ADHD group \( (M = -.211, \ SD = .99) \) and the control group \( (M = .348, \ SD = 1.67) \), \( t(68) = -1.65, \ ns \); however, it is noteworthy that the pattern of group differences was similar to that found for the other dependent variables. A fourth independent t-test revealed significant differences, such that the ADHD group underestimated their scholastic competence when compared to their logic test score (Harter scholastic – GRE logic test) \( (M = -.33, \ SD = .87) \) significantly more than the control group \( (M = .55, \ SD = 1.74) \), \( t(68) = -2.58, \ p < .02 \).
Two independent samples-tests were also conducted to assess group differences between the ADHD and control group on the pre-test prediction (“Out of 10 questions, how many do you think you will answer correctly?”) and the post-test prediction (“How many of the 10 questions do you think you answered correctly?”) of their test score as compared to actual logic score. The t-test assessing pre-test ratings (Pre-test question – GRE score) revealed no significant differences between the ADHD group (M = -.195, SD = 1.15) and the control group (M = .286, SD = 1.37), t(68) = -1.56, ns. The t-test, assessing post-test ratings (post-test question – GRE score), revealed similar, non-significant results between the ADHD group (M = -.085, SD = .93) and control group (M = .162, SD = 1.01), t(68) = -1.05, ns. Although significance was not achieved for these latter two t-tests, it is noteworthy that the group pattern was consistent with results described above. Namely, ADHD students tended towards underestimation whereas CTL students tended towards overestimation. Means and standard deviations of the pre and post-test predictions can be found below in Table 4.

Table 4

*Means and Standard Deviations for Predictions*

<table>
<thead>
<tr>
<th></th>
<th>ADHD</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>31</td>
<td>39</td>
</tr>
<tr>
<td>M (SD)</td>
<td>6.35, (1.25)</td>
<td>6.87, (1.38)</td>
</tr>
<tr>
<td>Pre-test prediction</td>
<td>5.45, (2.05)</td>
<td>5.64, (1.60)</td>
</tr>
<tr>
<td>Post-test prediction</td>
<td>6.35, (1.25)</td>
<td>6.87, (1.38)</td>
</tr>
</tbody>
</table>
Consistent with Kruger and Dunning (1999), analyses were conducted to examine the relationship between achievement and performance. To maximize the range of scores included in this correlation analyses, participants who were previously excluded from the analyses (e.g., participants with a CAARS ADHD score between 55 and 60), were included, creating a sample of 99. Demographic information for the additional participants (n=29) is provided in Appendix L. For the sample of 99 students, the average response to the pre-GRE logic task prediction question (“Out of 10 questions, how many do you think you will answer correctly?”) was $M = 6.75$ ($SD = 1.52$). On average, actual performance on the GRE logic task was $M=5.37$ ($SD = 5.37$). A paired samples t-test comparing these two scores indicates that the pre-task prediction score was significantly higher that the actual performance score indicating significant overestimation by most students, $t(98) = -6.23$, $p < .001$. On the post-task prediction question (“How many of the 10 questions do you think you answered correctly?”), participants marginally overestimated how many questions they answered correctly, $M = 5.72$ (perceived) vs. 5.37 (actual), $t(98) = 1.9$, $p < .07$. In addition, when asked how well they would perform compared to the average student who receives a 50% on this test, participants significantly overestimated their percentile rank, $M$ percentile $= 58.5$, $t(98) = 5.04$, $p < .001$. The correlations between actual ability on the logic task and the three perceived ability questions (pre-task, post-task, percentile) were .155 ($ns$), .507 ($p < .001$), and .355 ($p < .001$), respectively.

To further examine the relationship between achievement and performance and to remain consistent with methodology used by Kruger and Dunning (1999), participants were split into quartiles based upon their performance on the logic test. As Figure 1
shows, results were consistent with Kruger and Dunning (1999). In general, participants overestimated their performance. Participants overestimated their performance most on the pre-test question. Interestingly, once participants took the test, they provided post-test and percentile predictions that were more consistent with their actual test score. However, significant differences were still found regarding all discrepancy scores such that the lowest quartile significantly overestimated their performance compared to all other quartiles (i.e., lowest quartile significantly overestimating compared to 2nd, 3rd, and upper quartile). In addition, the upper quartile significantly underestimated their performance compared to all other quartiles, except on the percentile discrepancy, where the upper quartile did not differ significantly from the third quartile. Means and standard deviations of each quartile can be found in Table 5. Means and standard deviations for discrepancy scores of each quartile can be found in Table 6.

![Figure 1. Predicted scores versus actual score on logic test](image-url)
Table 5

Means and Standard Deviations for Prediction and Actual Logic Tasks Scores by Quartile

<table>
<thead>
<tr>
<th>Variable</th>
<th>Quartile</th>
<th>N</th>
<th>M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Score</td>
<td>1\textsuperscript{st} Quartile</td>
<td>25</td>
<td>2.53 (0.80)</td>
</tr>
<tr>
<td></td>
<td>2\textsuperscript{nd} Quartile</td>
<td>45</td>
<td>4.56 (0.50)</td>
</tr>
<tr>
<td></td>
<td>3\textsuperscript{rd} Quartile</td>
<td>60</td>
<td>6.00 (0.00)</td>
</tr>
<tr>
<td></td>
<td>4\textsuperscript{th} Quartile</td>
<td>75</td>
<td>7.59 (0.64)</td>
</tr>
<tr>
<td>Pre-Test Prediction</td>
<td>1\textsuperscript{st} Quartile</td>
<td>20</td>
<td>6.41 (1.18)</td>
</tr>
<tr>
<td></td>
<td>2\textsuperscript{nd} Quartile</td>
<td>40</td>
<td>6.50 (1.57)</td>
</tr>
<tr>
<td></td>
<td>3\textsuperscript{rd} Quartile</td>
<td>60</td>
<td>7.00 (1.83)</td>
</tr>
<tr>
<td></td>
<td>4\textsuperscript{th} Quartile</td>
<td>75</td>
<td>7.04 (1.34)</td>
</tr>
<tr>
<td>Post-Test Prediction</td>
<td>1\textsuperscript{st} Quartile</td>
<td>20</td>
<td>4.59 (1.28)</td>
</tr>
<tr>
<td></td>
<td>2\textsuperscript{nd} Quartile</td>
<td>40</td>
<td>4.97 (1.71)</td>
</tr>
<tr>
<td></td>
<td>3\textsuperscript{rd} Quartile</td>
<td>60</td>
<td>6.39 (1.56)</td>
</tr>
<tr>
<td></td>
<td>4\textsuperscript{th} Quartile</td>
<td>75</td>
<td>6.74 (1.61)</td>
</tr>
<tr>
<td>Percentile Prediction</td>
<td>1\textsuperscript{st} Quartile</td>
<td>20</td>
<td>4.90 (1.04)</td>
</tr>
<tr>
<td></td>
<td>2\textsuperscript{nd} Quartile</td>
<td>40</td>
<td>5.30 (1.39)</td>
</tr>
<tr>
<td></td>
<td>3\textsuperscript{rd} Quartile</td>
<td>60</td>
<td>6.24 (1.72)</td>
</tr>
<tr>
<td></td>
<td>4\textsuperscript{th} Quartile</td>
<td>75</td>
<td>6.80 (1.72)</td>
</tr>
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</table>

Table 6

Means and Standard Deviations for Self-Perception Discrepancy Scores by Quartile

<table>
<thead>
<tr>
<th>Variable</th>
<th>Quartile</th>
<th>N</th>
<th>M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>dpregre (GRE pre-</td>
<td>lowest quartile</td>
<td>17</td>
<td>1.33(.999)</td>
</tr>
<tr>
<td>prediction)</td>
<td>2\textsuperscript{nd} quartile</td>
<td>32</td>
<td>.279(1.02)</td>
</tr>
<tr>
<td></td>
<td>3\textsuperscript{rd} quartile</td>
<td>23</td>
<td>-.176(1.21)</td>
</tr>
<tr>
<td></td>
<td>upper quartile</td>
<td>27</td>
<td>-1.02(.958)</td>
</tr>
<tr>
<td>dpostgre (GRE post-</td>
<td>lowest quartile</td>
<td>17</td>
<td>.923(.841)</td>
</tr>
<tr>
<td>prediction)</td>
<td>2\textsuperscript{nd} quartile</td>
<td>32</td>
<td>.026(.871)</td>
</tr>
<tr>
<td></td>
<td>3\textsuperscript{rd} quartile</td>
<td>23</td>
<td>.034(.868)</td>
</tr>
<tr>
<td></td>
<td>upper quartile</td>
<td>27</td>
<td>-0.641(.869)</td>
</tr>
<tr>
<td>dpercentile (Percentile</td>
<td>lowest quartile</td>
<td>17</td>
<td>.979(9.82)</td>
</tr>
<tr>
<td>rank)</td>
<td>2\textsuperscript{nd} quartile</td>
<td>32</td>
<td>.171(.751)</td>
</tr>
<tr>
<td></td>
<td>3\textsuperscript{rd} quartile</td>
<td>23</td>
<td>-.071(.945)</td>
</tr>
<tr>
<td></td>
<td>upper quartile</td>
<td>27</td>
<td>-.7593(1.26)</td>
</tr>
</tbody>
</table>
An attempt was made to determine whether ADHD and control groups significantly differed on their scores within each of the quartiles. T-tests comparing ADHD to control groups revealed no significant group differences within any of the quartiles for any of the prediction questions. However, due to the small number of ADHD members in each quartile (4, 15, 5, and 7 respectively), appropriate power could not be achieved utilizing the current sample. Figures 1 and 2 in Appendix M depict the relationship between predicted and actual scores on the logic task for the ADHD and CTL groups, respectively.

Secondary Analyses

The small cell size associated with the originally proposed inclusion criteria prohibited the proposed analyses that simultaneously examined the effects of ADHD and achievement on self-perception scores. However, an attempt to examine these effects simultaneously was made by grouping students according to their composite score on the WIAT-II-A. Subjects were divided into three groups according to their WIAT-II-A scores (Group 1: 90-109; Group 2: 110-119; Group 3: 120 and above).

Four, 2 (Group: ADHD versus non-ADHD) by 3 (achievement: Average versus High Average versus Superior) ANOVAs were conducted on the four main self-perception discrepancy scores. Significant effects of group were found for all four ANOVAs, such that ADHD students underestimated their competence as compared to each criterion significantly more than the CTL students. Significant effects of achievement level were found in only one ANOVA. Specifically, the ANOVA examining the effect of achievement on the perception of scholastic competence compared to actual performance on the WIAT-II was significant. None of the ADHD-
Achievement interactions were found to be significant. Means and standard deviations for all four of the 2 by 3 ANOVAs can be found in Table 7. The results associated with each of the four ANOVAs are described below.

The first 2 by 3 ANOVA examined intellectual competence relative to the WASI score. Consistent with the t-test described above, there was a statistically significant main effect of group, $F(1, 61) = 4.05, p < .05$, such that the ADHD group underestimated their intelligence significantly more than did the control group, who overestimated their intelligence. The main effect for achievement, $F(2, 61) = .886, \text{ns}$, and the interaction effect, $F(2, 61) = .552, \text{ns}$, did not reach statistical significance.

A 2 by 3 ANOVA was conducted to examine the impact of ADHD symptomatology and achievement level on self-perception of scholastic competence relative to one’s WASI score. Consistent with the t-test described above, there was a statistically significant main effect of group, $F(1, 61)=4.17, p < .05$, such that the ADHD group underestimated their intelligence significantly more than did the control group, who overestimated their intelligence. The main effect for achievement, $F(2, 61) = 2.05, \text{ns}$, and the interaction effect, $F(2, 61) = .251, \text{ns}$, did not reach statistical significance.

A 2 by 3 ANOVA was conducted to examine the impact of ADHD symptomatology and achievement level on self-perceptions of scholastic competence compared to a criterion (i.e., WIAT score). Interestingly, although the t-test on these variables revealed no significant differences between the ADHD and control group, the 2 by 3 ANOVA revealed a statistically significant main effect of group, $F(1, 62)= 4.11, p = < .05$, such that the ADHD group underestimated their scholastic competence significantly more than did the control group, who overestimated their scholastic
competence. There was also a statistically significant main effect of achievement group, $F(2, 62)= 15.2$, $p < .001$. Post-hoc comparisons indicated that Group 1 (WIAT 90-109) overestimated their competence ($M = .56$, $SD = 1.06$), Group 2 (WIAT 110-119) was relatively accurate in their competence estimations ($M = .093$, $SD = 1.70$), and Group 3 (WIAT 120 and higher), underestimated their competence the most ($M = -1.49$, $SD = .226$). Post hoc comparisons also revealed that both Group 1 and 2 were significantly different from Group 3. The interaction effect, $F(2, 62) = .151$, $p = .ns$, did not reach statistical significance.

A 2 by 3 ANOVA was conducted to examine the impact of ADHD symptomatology and achievement level on self-perception of scholastic competence relative to score on the logic task. Consistent with the t-test described above, a significant main effect was found for group, $F(1, 62) = .4.33$, $p < .05$, such that the ADHD group underestimated their competence significantly more than the control group, who overestimated their competence. The main effect for achievement, $F(2, 62) = 1.02$, ns, and the interaction effect [$F(2, 62) = .154$, ns] did not reach statistical significance.

Table 7

<table>
<thead>
<tr>
<th>dselfiq</th>
<th>WIAT Grp.</th>
<th>ADHD/CTL</th>
<th>$M(SD)$</th>
<th>$N$</th>
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<td></td>
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<td>.144(1.74)</td>
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Table 7: continued

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<td>-.723(.873)</td>
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<td>total</td>
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<td>.583(1.94)*</td>
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Table 7: continued

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<tr>
<td>120-end</td>
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<td></td>
<td>-.358(1.48)</td>
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<td>adhd</td>
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<tr>
<td></td>
<td>.553(1.76)*</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>.144(1.50)</td>
<td>68</td>
</tr>
</tbody>
</table>

* Indicates variables for which there were significant group differences (p < .05)

Discussion

The present study extends the literature on the positive illusory bias by exploring self-perceptions in college-aged adults with ADHD symptomatology. Prior to this study, no known studies have investigated the positive illusory bias in young adults with ADHD. In addition, not only did this study explore the impact of ADHD symptomatology on adult self-perceptions, but it also provided a preliminary exploration of the impact of achievement level on self-perceptions in college-aged adults with ADHD symptomatology. Research investigating self-perceptions and achievement level in adults has occurred, but has been mostly confined to literature in the social psychology domain utilizing non-impaired participants. Implications of the study results as well as their role in supporting or disconfirming possible explanations for the positive illusory bias are provided below.

Taken together, the results of this study failed to provide support for the presence of the positive illusory bias in the self-perception of college students with ADHD. Three of the four t-tests conducted on the main discrepancy scores reached statistical significance. Unexpectedly, however, the direction of the group differences was opposite of the author’s hypothesis and existing research on ADHD children’s self-perceptions.
(Diener & Milich, 1997; Hoza et al., 2004; Hoza et al., 2002; Ohan & Johnston, 2002; Owens & Hoza, 2003). Namely, adults in the ADHD group underestimated their competence in a number of domains significantly more than did the control group. More specifically, t-test results revealed that the ADHD group significantly underestimated their competence in both the intelligence domain (Harter intelligence – WASI score) and the scholastic domain (Harter scholastic – WASI; Harter scholastic – logic score). All four, 2 by 3 ANOVAs yielded significant main effects of group such that the ADHD group underestimated their competence more so than the control group, who in turn overestimated their competence. No ADHD by achievement interactions were found.

In addition, support was found for the ignorance of incompetence phenomenon. To restate, the ignorance of incompetence hypothesis asserts that individuals who display low competence in a specific domain also tend to display a poor ability to evaluate their competence in that domain. When examining the entire sample, those who fell within the lowest quartile on achievement as measured by the GRE logic task, overestimated their competence on numerous domains significantly more than those in all other quartiles. In addition, those who fell within the upper quartile underestimated their competence on numerous domains significantly more than those in all other quartiles. These results replicate those found by Kruger and Dunning (1999). Additional support for the ignorance of incompetence hypothesis was found in one of the 2 x 3 ANOVAs. Namely, the ANOVA examining one of the two scholastic (Harter Scholastic – WIAT) self-perception discrepancy score indicated a significant main effect among the three achievement groups. Consistent with existing social psychology literature on the ignorance of incompetence hypothesis (Dunning et al., 2003; Erlinger & Dunning, 2003;
Kruger & Dunning, 1999), the post-hoc comparisons revealed that the lowest achieving group, Group 1 (WIAT 90-109), overestimated their competence followed by Group 2 (WIAT 110-119), who just slightly overestimated their competence, and Group 3 (WIAT 120 and above), who underestimated their competence the most. This trend provides some support for the ignorance of incompetence explanation for inflated self-perceptions, such that lower-achieving individuals, regardless of ADHD symptomatology, were more likely than their higher-achieving peers to overestimate their competence.

Cognitive Immaturity

Taken together, the results reveal that the current ADHD sample is underestimating their competence in both intellectual and scholastic domains. These effects were unexpected based on past research that found that children with ADHD tend to overestimate their competence as compared to a criterion (e.g., Hoza et al., 1993; Hoza et al., 2000; Hoza et al., 2001; Hoza et al., 2002; Hoza et al., 2004; Owens & Hoza, 2003). As previously discussed, the cognitive immaturity hypothesis is one possible explanation for the positive illusory bias in ADHD children (Milich, 1994). At first glance, it appears that the cognitive immaturity hypothesis is supported by these results.

In other words, children with ADHD who display immature cognitions (i.e., overestimation of competence) may eventually “outgrow” this cognitive style and begin to report estimations of competence that are more consistent with their actual performance. However, for the cognitive immaturity explanation to be supported, we might expect no significant differences between the ADHD and control groups on their self-perceptions, as these two groups did not differ significantly on intellectual functioning or achievement. Thus because significant group differences were found, the
cognitive immaturity explanation cannot fully explain why the young adults with ADHD symptomatology in the current sample underestimated their competence in the intellectual and academic domains significantly more than the control group.

**Feedback**

One possible explanation for the significant group differences in this study may be related to the amount and type of feedback that the ADHD adults have received. Based on demographic data provided, it is possible that the ADHD adults have received repeated feedback that they are not performing better than their peers. Specifically, 39% of the ADHD group members had B-C averages or lower in high school. Thus, over their academic trajectory, they have likely received a significant amount of constructive criticism and/or negative feedback compared to students without ADHD (only 13% had B-C averages or lower), which may have caused deflated self-perceptions.

The studies that concluded that ADHD children overestimate their competence in certain domains, studied participants between the ages of 7 and 12 (Hoza et al., 1993; Hoza et al., 2000; Hoza et al., 2001; Hoza et al., 2002; Hoza et al., 2004; Owens & Hoza, 2003). It is possible that for children in the early stages of problematic academic careers, lack of awareness or denial about actual performance may occur, leading to inflated competence scores. In elementary school, feedback on academic performance is arguably less obvious (e.g., children often do not understand or review their own report card), grades are less specific (e.g., “S” versus “S-” or “S+”) and the duration of feedback is comparatively shorter (e.g., 3 years verses 13 years). Thus, children may be either less aware of their actual competence or may engage in self-protection or denial while the evidence may still be relatively limited. However, over time and by young adulthood, as
the feedback consistently builds, awareness may increase or self-protection may become a less effective means of defending against the quantity and chronicity of feedback. These individuals have received years of direct feedback in the form of actual grades, state and national proficiency scores, and SAT/ACT scores. These years of impairment may also have resulted in the development of decreased self-perceptions of competence in the domains of intelligence and scholastic achievement. More specifically, years of critical feedback is likely associated with increased depression and research shows a clear link between depression and deflated self-perceptions (Gladstone & Kaslow, 1995).

In addition to feedback in the academic domain, pursuit or receipt of treatment for ADHD may have an impact on the presence of the positive illusory bias. For example, in the current sample of adults with ADHD, 61.3% were previously diagnosed with ADHD or ADD prior to participating in the study. Most individuals who receive a diagnosis of ADHD or ADD can only do so after seeking help from a professional regarding their impairment and obtaining an assessment of their performance. Seeking an assessment for one’s academic impairment implies that one must acknowledge that academic impairment is occurring (or at least having parents who acknowledge it). In addition, over half of the individuals in the current ADHD sample (54.8%) have either taken or are currently taking psychopharmacological drugs to treat their ADHD symptoms, providing further evidence that this group of individuals has sought help for their impairment. These data suggest that the sample has some awareness of their limitations and has sought assistance for their limitations. It is possible that years of academic impairment in elementary, middle school and high school forced participants to acknowledge their academic weaknesses and caused them to seek treatment.
These data associated with previous diagnosis and treatments are relevant in two ways. First, it appears likely that acknowledgement of one’s own limitations may be directly connected to help-seeking behavior. Second, treatment may enhance an individual’s awareness of their limitations. This increased ability to reflect upon limitations may directly influence self-perceptions. For example, with treatment, young adults may learn more about their strengths and limitations, situations in which they may need to use medication verses not, and strategies for coping with distraction. Indeed, it is possible that one of the reasons this sample of adults with ADHD are enrolled in a 4-year college, is that they actively sought, and received, treatment early. In sum, it is possible that awareness of one’s own relative strengths and limitations serves to deflate any positive illusory bias that may have existed in childhood.

These interpretations have implications for understanding the possible self-protective nature of the positive illusory bias. If the positive illusory bias exists in childhood, but does not exist in adulthood, it is possible that self-protection becomes less adaptive, influencing these individuals to then drop this bias. More specifically, if one is receiving regular negative feedback, one may not be able to defend against the high quantity or extended chronicity of it. If ADHD children are really inflating their competence scores as a function of self-protection, one would assume that an increase of negative feedback would mean a compensatory inflation of competence scores. However, it is possible that a “tipping point” is reached, such that children/adolescents can no longer defend against the barrage of negative feedback. Perhaps these children must finally acknowledge their difficulties because denial, or self-protection, no longer has the utility that it once had.
It is noteworthy that the above discussion is purely speculative, as this study did not directly examine self-protective mechanisms. In order to directly assess the self-protection hypothesis, experimental manipulation of positive and negative feedback on a task is required. Because support has been found for self-protection in ADHD children, and because this study failed to find support for the positive illusory bias in college students with ADHD, additional research on the positive illusory bias, as well as self-protection that spans the developmental trajectory (i.e., childhood, adolescence, adulthood) is warranted.

*Ignorance of Incompetence*

Had a positive illusory bias been found in this sample of young adults with ADHD, the author had intended to examine the relative contributions of ADHD symptomatology and low achievement in explaining this bias. Although support for the positive illusory bias was not found, the role of low achievement (low competence) was examined in an effort to replicate previous relationship between low competence and self-perception that has been found in the social psychology literature (i.e., the ignorance of incompetence phenomenon; Kruger & Dunning, 1999). Indeed, in the overall sample, support for the ignorance of incompetence explanation was found. Namely, that the lower one’s competence in a domain, the more one tends to overestimate their competence in that domain.

However, the ignorance of incompetence phenomenon does not fully explain the differential pattern of self-perceptions between young adults with and without ADHD symptomatology. An attempt was made to determine if the pattern associated with the ignorance of incompetence phenomenon differed between the ADHD and CTL groups.
There was insufficient sample size to detect significance. However, an interesting pattern emerged. Specifically, the ADHD and control students in the 1\textsuperscript{st} and 2\textsuperscript{nd} quartiles demonstrated a similar pattern of overestimation to that in the full sample. However, in the 3\textsuperscript{rd} and 4\textsuperscript{th} quartiles, it appears that ADHD students are more likely to underestimate than CTL students. (See Appendix O.) Thus, with a larger sample, it may be that ADHD status may be predictive of self-perceptions beyond that predicted by the ignorance of incompetence explanations. This may be the case for childhood populations as well, but in the opposite direction.

\textit{Sample Characteristics}

The present findings must also be interpreted in the context of this study’s sample, which has several noteworthy characteristics. First, over half of the participants in the current sample’s ADHD group are female (54.8%), making it an atypical ADHD sample due to the fact that ADHD is diagnosed more often in males than in females. In fact, male to female gender ratios for ADHD range from 3:1 in the general population to 6:1 and 9:1 in clinic-referred samples (Barkley, 1996). It is no surprise that most research on ADHD children utilize all-male, or predominately male samples (e.g., Hoza et al., 1993; Hoza et al., 2000; Hoza et al., 2001; Hoza et al., 2002).

The greater proportion of girls further renders this sample different from other samples because of gender-specific ADHD symptomatology. Specifically, there is evidence suggesting that females with ADHD present with different symptoms than males with ADHD. Brown, Abramowitz, Dadan-Swain, Eckstrand, and Duncan (1998) found that clinic-referred girls with ADHD presented with more internalizing symptoms than their male counterparts. More specifically, the girls with ADHD displayed elevated
levels of anxiety and depression as compared to the boys with ADHD. It is possible, therefore, that the current sample may be displaying elevated levels of anxiety and depression, because the majority of the sample is female. Because internalizing symptoms are associated with deflated self-perception scores (Gladstone & Kaslow, 1995), it is possible that this sample’s self-perception scores were deflated due to comorbid internalizing problems among the female ADHD group members, who comprised the majority of the sample. Unfortunately, data regarding internalizing symptoms were not obtained for the current study.

In addition to gender, participants in the current sample may be more likely to display internalizing symptoms because of age. Estimates of the comorbidity of internalizing disorders and ADHD range from 17 to 30 percent in childhood but increase to approximately 50 percent in adolescence (Barkley, 1998). Although research on the comorbidity of internalizing symptoms in adults with ADHD is lacking, it is likely that that the rates of anxiety and depression in young adults with ADHD are similar to those of adolescents with ADHD, which is relatively high. Taken together, both age and gender may have deflated the perceptions of ADHD group members in this sample due to a higher incidence of internalizing problems.

Interestingly, “depressive realism” (Alloy and Abramson, 1979), a phenomenon found in the social psychology domain, may help to explain the current results. The term “depressive realism” describes the observation that depressed individuals appear to have more accurate and realistic perceptions relative to nondepressed peers. Although numerous researchers have found evidence to support this phenomenon, a common criticism of these studies is that they utilize analogue samples (i.e., dysphoric college
students) that may not generalize to a broader population (Dobson and Pusch, 1995). Additionally, other researchers have postulated that “depressive realism” may not indicate a more accurate perception of self or the world, but may be due to “an overly cautious response strategy” common to a more depressed population (Wood, Moffoot, and O’Carroll, 1998, p. 124). Assessing whether depressed/dysphoric individuals actually display more accurate self-perceptions than their nondepressed peers is not the focus of this paper. However, it would be neglectful not to note that current results in this study display similarities to those found in the depressive realism literature and utilizes a similar population as that found in this literature (i.e., college students).

Lastly, one sample characteristic worth noting is that this sample of ADHD individuals is likely higher-achieving than other ADHD samples. Thus, this sample may only generalize to adults who experience mild to moderate ADHD symptomatology. For example, all students in the sample were enrolled in college, and very few participants had repeated a grade or had below average or failing grades. That is one reason why an attempt was made to recruit through a 2-year technical college, but efforts were unsuccessful. Additionally, the sample’s average WASI and WIAT scores, 108.7 and 110.5 respectively, are relatively high compared to the general population (i.e., score of 100). Further, the distribution indicated that almost all of the students fell within the Average, High Average, or Superior range of intelligence and achievement. More specifically, over 94% of individuals fell within the Average classification category or higher on the WASI and over 97% of individuals fell within the Average classification category or higher on the WIAT. Based upon this information, the ignorance of
incompetence explanation could not fully be explored with this sample, as there is truly not a “low-achieving” group found in this sample (i.e, WIAT scores below 90).

Based upon the current sample’s history of somewhat mild impairment, it is possible that this sample was less impaired in childhood than other comparison samples. Of note, with the exception of Owens and Hoza (2003), most studies on the self-perceptions of ADHD children utilized clinically-diagnosed samples. If the current sample is less impaired, it is possible that they never even demonstrated the positive illusory bias in childhood. If this is true, then the positive illusory bias may only be present in the most extreme cases of ADHD, whether in childhood or adulthood. In order to assess this, a more clinically-impaired sample of ADHD adults should be examined. However, it may be very difficult to obtain a clinically-impaired sample of ADHD adults. The current ADHD group’s average IQ score (i.e., 108.7) is within the range found in a recent meta-analysis examining ADHD adults’ cognitive and neurological functioning (Schoechlin & Engel, 2005). More specifically, Schoechlin & Engel (2005) found that the average full-scale IQ for each ADHD group included fell between 105 and 125. This range may indicate that only adults with average or above-average IQs, who are also likely to be higher functioning, participate in studies examining neuropsychological performance in adults with ADHD. Schoechlin & Engel (2005) go so far as to postulate the following: “It is probable that the patients included in adults studies represent only a specific part of the former child samples, as in nearly all studies adult patients are intelligent outpatients with a relatively good outcome. ADHD children with poor outcome, such as criminality, chronic drug abuse or severe psychiatric disorders, are usually not included in the studies analyzed here” (p. 739). Based upon information
obtained from the current sample (e.g., IQ scores, grades) as well as the fact that all participants are currently enrolled in college, the current sample is also likely to represent a higher-achieving subset of individuals with ADHD.

Limitations

Due to recruitment difficulties, the sample obtained for the current study is relatively small. This small sample size limited the analyses that could be performed and decreased the power to detect significant differences. Another limitation of the current study is the homogeneity of the current sample. Although an attempt was made to recruit participants from both a 4-year and a 2-year college, only students from the 4-year liberal arts college volunteered to participate. This likely increased homogeneity of the sample by limiting the range of SES, ethnicity and achievement levels of the participants.

Further, it is important to acknowledge that the current findings can be generalized to college-based ADHD samples, but perhaps not to clinic-based ADHD samples, as this sample is likely less impaired than the clinic-based population. As previously mentioned, based upon WASI and WIAT scores, coupled with average college GPA, the current sample of ADHD individuals seems to be performing “on par” with their same-aged peers. For example, Barkley (1996) notes that approximately 30% of ADHD children will likely repeat a grade during their schooling; however, in this sample only one of the adults in the ADHD group had ever repeated a grade. In addition, no ADHD group members reported having a high school GPA that fell between 2.0 and 2.4. Moreover, the control group had two members who endorsed having a high school GPA between 2.0 to 2.4 (5.1% of control group). The absence of these individuals in the ADHD group presents further evidence that high school students who are most impaired
by ADHD symptomatology may be less likely to attend college. Interestingly, researchers note that almost 10% of hyperactive adolescents in their sample (Barkley, Fischer, et al., 1990) dropped out of school at a one-year follow-up, compared to none of the controls.

Additionally, a relatively liberal ADHD group inclusion criterion was utilized due to the small size of the current sample. Namely, inclusion into the ADHD group was met by achieving a t-score of 65 or greater on any score of the CAARS-S:SV. However, for an individual to receive a diagnosis of ADHD based upon the DSM-IV-TR criteria, the individual must evidence, (a) for at least 6 months, six or more symptoms of inattention and/or six or more symptoms of hyperactivity, (b) that some symptoms were present before the age of 7, (c) impairment in two or more settings and (d) clinically significant impairment in social, academic, or occupational functioning. In addition, none of the symptoms can be better accounted for by another mental disorder. To evaluate most of these criterion, particularly criterion 2, observer report (i.e., parent) would be important to obtain. Although rating scales were mailed home to the parent(s) of all participants, the return rate was only 51 percent. Including only those students in the final ADHD group whose data contained parent report would have limited this small sample even further. In addition, to ensure that ADHD symptom manifestation was not “better accounted for by another mental disorder,” a comprehensive clinical interview, or comprehensive clinical battery, would need to be administered to each participant. Time constraints did not allow this to occur. However, additional information certainly would have assisted the researcher in determining if depressive symptomatology was associated with deflated self-perception scores in the ADHD group.
Taken together, this information may indicate that the current sample of adults with ADHD symptomatology did not experience the level of impairment in childhood and adolescence typical of most individuals whose ADHD was diagnosed in elementary school.

Conclusions

The current study is the first to investigate self-perceptions of young adults who display ADHD symptomatology. Most importantly, results revealed that college-enrolled adults with symptoms of ADHD do not overestimate their competence in intellectual and scholastic domains as found in past research with ADHD children, but instead, underestimate their competence in these areas significantly more so than controls. In addition, this study offers continued support for the ignorance of incompetence phenomenon in the general college population. However, the ignorance of incompetence phenomenon does not seem sufficient to explain the ADHD versus CTL group differences in self-perceptions.

Of note, prevalence rates of college students with ADHD range from .5 to 5 percent nationally (Farrell, 2003). With the increased push through federal and state mandates requiring equity in education for individuals with disabilities, it is expected that there will be an increase in the percent of college students who suffer from ADHD. It is crucial that institutions of higher education understand the needs of this population to help ensure that equity in education for these individuals can occur. In addition, treatment issues with this population may warrant different treatment plans than those designed for children with ADHD or adults without ADHD. If self-perceptions impact
motivation and/or performance, it will be important to understand the relationship among these factors for the new generation of ADHD students attending college.

**Future Research**

It is unclear whether results obtained from this study were a function of ADHD symptomatology alone, or whether results may be influenced by comorbid problems of those within the ADHD group. Because the pattern of differences in self-perceptions between ADHD and non-ADHD individuals may differ across the developmental trajectory, additional research exploring these group differences across the lifespan is warranted. Perhaps most notable is a lack of research regarding self-perceptions of adolescents with ADHD and the limited research on adults with ADHD.

Future research should consider examining both clinical and non-clinical ADHD samples, ADHD subtype differences, ADHD groups with a broad range of achievement levels, and ADHD groups with comorbid symptomatology. More specifically, because of the influential nature that depressive symptomatology may have on individuals' self-perceptions (i.e., deflation in self-perception scores), it is imperative that future research on self-perceptions in ADHD samples incorporate and examine measures of internalizing symptoms.

As previously mentioned, the high number of female participants in the current sample may have contributed to the unexpected finding of the ADHD group underestimating their self-perceptions significantly more than the control group. Future studies examining the positive illusory bias should attempt to include both males and females with ADHD symptomatology so that a more comprehensive examination of
gender effects on self-perceptions in individuals with ADHD symptomatology may occur.

Additionally, although the current study found support for the ignorance of incompetence phenomenon, this phenomenon could not fully explain the significant between group differences (i.e., ADHD vs. CTL) that were found. Thus, further exploration of the positive illusory bias in ADHD samples is warranted. In particular, replication and elaboration of studies examining the self-protective hypothesis (Diener & Milich, 1997; Ohan & Johnston, 2002) may be most helpful in determining the mechanism underlying the positive illusory bias.
References


disorder in adolescents and young adults: A 3- to 5- year follow-up survey.

*Pediatrics, 92*(2), 212-218.


*American Psychologist, 47*(1), 46-54.


Carlson, C., Shin, M., & Booth, J. (1999). The case for DSM-IV subtypes in ADHD.


Wood, J., Moffoot, A., & O’Carroll, R. (1998). “Depressive realism” revisited: Depressed patients are realistic when they are wrong but are unrealistic when they are right. *Cognitive Neuropsychiatry, 3*(2), 119-126.

Appendix A – Mass Screening

1. Do you grant permission for us to send two short questionnaires home to your parent(s)/guardian(s)? It is the same one that you will complete if you are chosen to participate in this study, and it includes questions about your academic performance as well as any symptoms of inattention and hyperactivity/impulsivity. The mailing address will be obtained from you at a later date. By checking “Yes” below, you are granting permission for these questionnaires to be mailed.

_____ Yes, I grant permission for the questionnaires to be mailed to the address I provide.
_____ No, I do not grant permission for anything to be mailed.

2. _____ Check here if you have ever been diagnosed with ADHD (Attention-Deficit/Hyperactivity Disorder) or ADD (Attention Deficit Disorder) or have ever been prescribed any of the following medications for attention or hyperactivity/impulsivity problems.

3. _____ Check here if your high school GPA was less than or equal to 2.5 (less than a C) or your overall college GPA is less than or equal to 2.0 (less than a D) or you’ve been diagnosed with a learning disability BUT never been diagnosed with ADHD.
Appendix B – Demographic Form

Check one answer for each of the following:

1. Gender: ___ Male    ___ Female

2. Age: ___ < 18 ___ 18 ___ 19 ___ 20 ___ 21 ___ 22 ___ 23 ___ 24 ___ > 24

3. Ethnicity: ___ White ___ Black ___ Hispanic ___ Asian
   ___ Other (please describe) _______________________

4. Year in college: ___ Freshman ___ Sophomore ___ Junior ___ Senior

5. What was your high school GPA?
   ___ less than or equal to 2.5
   ___ 2.51 to less than 3.0
   ___ 3.0 or greater

6. What is your current overall college GPA?
   ___ less than or equal to 2.0
   ___ 2.1 to less than 2.5
   ___ 2.5 or greater

7. Have you ever been diagnosed with any of the following:
   Check all that apply.
   ___ ADHD (Attention-Deficit/Hyperactivity Disorder) or ADD (Attention Deficit Disorder)
   ___ Learning Disability

8. Have you ever taken medication, or are currently taking medication for any of the above problems? Check one. ___ Yes ___ No
   If yes, please check any medications that apply:
   ___ Ritalin
   ___ Adderall
   ___ Strattera
   ___ Dexedrine
   ___ Concerta
   ___ Metadate
   ___ Cylert
   ___ Focalin
   ___ Other: Please list ____________________________________________________________

9. Have you ever repeated a grade? Check one. ___ Yes ___ No
   If yes, which grade?: ______
10a. Have you ever received special educational services throughout your academic career (elementary, middle, high school or college) for attention problems, behavioral problems, or learning difficulties? (e.g. resource room, tutoring, etc.) Check one.
   ___Yes  ___No

If yes, briefly explain:

10b. If you checked “yes” above, have your parents/guardians or teachers ever commented that these problems were present during elementary school? Check one.
   ___Yes  ___No

11. You previously granted permission for us to send two short questionnaires home to your parent(s)/guardian(s). It is the same one that you will complete if you are chosen to participate in this study, and it includes questions about your academic performance as well as any symptoms of inattention and hyperactivity/impulsivity.

Please type the address to which the questionnaires should be mailed.

   Name:

   Address:

   Town/State/Zip:

12. Based upon the information obtained in these questionnaires, you may be eligible to participate in another research study that will occur later this school year. If you are willing to have us contact you about this opportunity, please provide us with your contact information below.

   Name:

   E-mail address:

13. Please provide your local (school) address in the space below in order that we can fully debrief you on this study once we receive your parents/guardians respective forms.
Appendix C - What I Am Like

ID Number ________________

The following are statements which allow college students to describe themselves. There are no right or wrong answers since students differ markedly. Please read the entire sentence across. First decide which one of the two parts of each statement best describes you; then go to that side of the statement and check whether that is just sort of true for you or really true for you. You will just check ONE of the four boxes for each statement. Think about what you are like in the college environment as you read and answer each one.

<table>
<thead>
<tr>
<th></th>
<th>Really True For Me</th>
<th>Sort of True For Me</th>
<th>BUT</th>
<th>Sort of True For Me</th>
<th>Really True For Me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other students do not feel so confident.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other students don’t do very well at their studies.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other students rarely have trouble with their homework assignments.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other students usually do feel intellectually competent at their studies.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other students wonder if they are as smart.</td>
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<tr>
<td>6.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other students feel they are very mentally able.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other students wonder if they are as bright.</td>
<td></td>
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<tr>
<td>8.</td>
<td></td>
<td></td>
<td>BUT</td>
<td>Other students feel they are intelligent.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix D – Parent Version

Subject Number ________________

The following are statements which allow you to describe college students. There are no right or wrong answers since students differ markedly. Please read the entire sentence across. First decide which one of the two parts of each statement best describes your child; then go to that side of the statement and check whether that is just sort of true or really true. You will just check ONE of the four boxes for each statement. Think about what your child is like in the college environment as you read and answer each one.

<table>
<thead>
<tr>
<th></th>
<th>Really True</th>
<th>Sort of True</th>
<th></th>
<th>Sort of True</th>
<th>Really True</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td>OR</td>
<td>My child does not feel so confident.</td>
<td></td>
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<td>2.</td>
<td></td>
<td></td>
<td>OR</td>
<td>My child doesn’t do very well at her/his studies.</td>
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<td>3.</td>
<td></td>
<td></td>
<td>OR</td>
<td>My child rarely has trouble with her/his homework assignments.</td>
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<td>4.</td>
<td></td>
<td></td>
<td>OR</td>
<td>My child usually does feel intellectually competent at her/his studies.</td>
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<td>5.</td>
<td></td>
<td></td>
<td>OR</td>
<td>My child wonders if s/he is as smart.</td>
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<td>6.</td>
<td></td>
<td></td>
<td>OR</td>
<td>My child feels s/he is very mentally able.</td>
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<td>7.</td>
<td></td>
<td></td>
<td>OR</td>
<td>My child wonders if s/he is as bright.</td>
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<td>8.</td>
<td></td>
<td></td>
<td>OR</td>
<td>My child feels s/he is intelligent.</td>
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</tbody>
</table>
Rate the degree to which you possess the following abilities on a scale from 1 to 9.

1 (not at all) .................................................. 9 (to an extreme degree)

**Ability to be Creative**

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<th></th>
<th>1</th>
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<th>3</th>
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**Ability to be Social in New Settings**

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**Organizational Ability**

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**Ability to Detect Humor**

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<th>5</th>
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**Athletic Ability**

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<th>5</th>
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**Ability to Reason Abstractly**

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**Ability to Maintain Friendships**

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**Driving Ability**

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Appendix F - GRE

This test is designed to measure logical reasoning. Each group of questions is based on a passage or a set of conditions. You may wish to draw a diagram to answer some of the questions. Choose the best answer for each question.

1. A spice farmer must harvest exactly five spices grown on her farm. The spices must be harvested consecutively, the harvest of one being completed before the harvest of the next begins. The five spices to be harvested are allspice, cloves, nutmeg, sage, and thyme.

   Nutmeg must be harvested before thyme.
   Cloves must be harvested immediately after allspice.
   Sage must not be harvested first.

If nutmeg is the fourth spice harvested, which of the following must be false?

   (A) Allspice is the first spice harvested.
   (B) Sage is harvested immediately after cloves.
   (C) Exactly one crop is harvested between sage and thyme.
   (D) Nutmeg is harvested immediately after cloves.
   (E) Thyme is the last spice harvested.

2. If a judge is appointed for life, she will make courtroom decisions that reflect the accumulated wisdom inherent in this country’s judicial history, relying upon the law and reason rather than upon trends in political thinking. If, on the other hand, the judge is appointed or elected for short terms in office, her decisions will be heavily influenced by the prevailing political climate. In sum, the outcome of many court cases will be determined by the method by which the presiding judge has been installed in her post.

Which of the following, if true, does NOT support the argument in the passage above?

   (A) Surveys indicate that judges enjoy their work and want to remain in office as long as possible.
   (B) Judges appointed for life are just as informed about political matters as are judges who are elected or appointed for short terms.
   (C) The ruling of judges who must run for re-election are generally approved of by the voters who live in their elective districts.
   (D) Most judges appointed for life hand down identical rulings on similar cases throughout their long careers.
   (E) Only judges who are elected or appointed for short terms of office employ pollsters to read the mood of the electorate.
3. An athlete has six trophies to place on an empty three-shelf display case. The six trophies are bowling trophies $F$, $G$, and $H$ and the tennis trophies $J$, $K$, and $L$. The three shelves of the display case are labeled 1 to 3 from top to bottom. Any of the shelves can remain empty. The athlete’s placement of trophies must conform to the following conditions:

   - $J$ and $L$ must not be on the same shelf.
   - $F$ must be on the shelf immediately above the shelf that $L$ is on.
   - No single shelf can hold all three bowling trophies.
   - $K$ cannot be on Shelf 2.

   If no tennis trophies are on Shelf 3, which pair of trophies must be on the same shelf?
   
   (A) $F$ and $G$
   (B) $L$ and $H$
   (C) $L$ and $G$
   (D) $K$ and $J$
   (E) $G$ and $H$

4. Young Cowanga lion cubs in the wild often engage in aggressive play with their siblings. This activity is instigated by the cubs’ mother. Cowonga lion cubs born in captivity, however, never engage in this aggressive play. Some zoologists have concluded that this particular form of play teaches the young lions the skills needed for successful hunting in the wild, and that such play is not instigated in captivity because the development of hunting skills is unnecessary in such an environment.

   The zoologists’ conclusion would be most strengthened if it could be demonstrated that:

   (A) all Cowanga lion cubs raised in the wild are capable of hunting successfully
   (B) other predatory animals also engage in aggressive play at a young age
   (C) no Cowanga lion cub that has been raised in captivity is able to hunt successfully in the wild
   (D) the skills used in aggressive play are similar to the skills necessary for successful hunting
   (E) female lions that were raised in captivity will not instigate aggressive play among their offspring
Ohio University
Statement of Informed Consent

**Title of Research:** Understanding Young Adults’ Achievement Skills  
**Principal Investigators:** Catherine Golden and Julie S. Owens, Ph.D.  
**Department:** Ohio University Department of Psychology

_Federal and university regulations require us to obtain signed consent for participation in research involving human subjects. After reading the statements below, please indicate your consent for participation by signing this form._

**Explanation**  
This study attempts to examine if characteristics present in children with symptoms of inattention and hyperactivity/impulsivity are also present in young adults with symptoms of inattention and hyperactivity/impulsivity or other college students without these symptoms. Therefore, recruitment of both college students _with_ these symptoms as well as college students _without_ these symptoms is necessary. All screening information will be gathered from participants through a screening questionnaire. If the participant meets the criteria for the study during the mass screening, one scheduled session will take place, lasting from 1 ½ to 2 hours.

**Risks and Discomforts**  
Although risk for participants is minimal, there is a chance that some students may experience mild discomfort when answering questions. Also, participants may not enjoy completing the tasks or may become frustrated throughout the task.

**Confidentiality and Records**  
Participation in this study is entirely voluntary. Responses will be kept strictly confidential and will be used only by the investigators for purposes of analyses. All personal information such as telephone number, address, and name will be stored in a locked file separate from the locked file where questionnaires are stored.

**Benefits**  
There are no direct benefits to participants in this study. Your responses to the rating scales and study tasks are quite valuable, because they will provide researchers further understanding of the similarities and differences between students who demonstrate problems with inattention and hyperactivity and those who don’t.

**Compensation**  
Two hours of research participation credit will be offered for participation in this study.

**Parental/Guardian Involvement**
Do you grant permission for us to send two short questionnaires home to your parent(s)/guardian(s)? They are the same ones that you will complete if you participate in this study, and they include questions about your academic performance as well as questions about your experiences with symptoms of inattention and hyperactivity/impulsivity. By providing your parent(s)/guardian’s address and signing below, you are granting permission for these questionnaires to be mailed. Lack of parental participation (i.e. neglecting to send forms back) will have no penalty for you.

Contact Information
Should you have any questions concerning this study, please contact either the above principal investigator (cg193203@ohio.edu) or her advisor, Julie Owens, Ph.D., at (740) 593-1707. If you have any questions regarding your rights as a research participate, please contact Jo Ellen Sherow, Director of Research Compliance, Ohio University, (740) 593-0664.

I certify that I have read and understand this consent form and agree to participate as a subject in the research described. I agree that known risks to me have been explained to my satisfaction and I understand that no compensation is available from Ohio University and its employees for any injury resulting from my participation in this research. I certify that I am 18 years of age or older. My participation in this research is given voluntarily. I understand that I may discontinue participation at any time without penalty or loss of any benefits to which I may otherwise be entitled. I certify that I have been given a copy of this consent form to take with me.

Signature __________________________________________________ Date ______________

Printed Name _______________________________________________

Please print your local address where a debriefing form can be mailed at the end of the quarter:

<table>
<thead>
<tr>
<th>Address</th>
<th>State</th>
<th>Zip</th>
</tr>
</thead>
</table>

Please print the address of your parent(s)/guardian(s) where we can send the parental questionnaires:

<table>
<thead>
<tr>
<th>Name(s)</th>
<th>Address</th>
<th>State</th>
<th>Zip</th>
</tr>
</thead>
</table>
Ohio University
Statement of Informed Consent

Title of Research: Understanding Young Adults’ Achievement Skills
Principal Investigators: Catherine Golden and Julie S. Owens, Ph.D.
Department: Ohio University Department of Psychology

Federal and university regulations require us to obtain signed consent for participation in research involving human subjects. After reading the statements below, please indicate your consent for participation by signing this form.

Explanation
This study attempts to examine if characteristics present in children with symptoms of inattention and hyperactivity/impulsivity are also present in young adults with symptoms of inattention and hyperactivity/impulsivity or other college students without these symptoms. Therefore, recruitment of both college students with these symptoms as well as college students without these symptoms is necessary. All screening information will be gathered from participants through a screening questionnaire. If the participant meets the criteria for the study during the mass screening, one scheduled session will take place, lasting from 1 ½ to 2 hours.

Risks and Discomforts
Although risk for participants is minimal, there is a chance that some students may experience mild discomfort when answering questions. Also, participants may not enjoy completing the tasks or may become frustrated throughout the task.

Confidentiality and Records
Participation in this study is entirely voluntary. Responses will be kept strictly confidential and will be used only by the investigators for purposes of analyses. All personal information such as telephone number, address, and name will be stored in a locked file separate from the locked file where questionnaires are stored.

Benefits
There are no direct benefits to participants in this study. Your responses to the rating scales and study tasks are quite valuable, because they will provide researchers further understanding of the similarities and differences between students who demonstrate problems with inattention and hyperactivity and those who don’t.

Compensation
Ten dollars, provided in cash, will be offered for participation in this study.

Parental/Guardian Involvement
Do you grant permission for us to send two short questionnaires home to your parent(s)/guardian(s)? They are the same ones that you will complete if you participate in this study, and they include questions about your academic performance as well as questions about your experiences with symptoms of inattention and hyperactivity/impulsivity. By providing your parent(s)/guardian’s address and signing below, you are granting permission for these questionnaires to be mailed. Lack of parental participation (i.e. neglecting to send forms back) will have no penalty for you.

Contact Information
Should you have any questions concerning this study, please contact either the above principal investigator (cg193203@ohio.edu) or her advisor, Julie Owens, Ph.D., at (740) 593-1707. If you have any questions regarding your rights as a research participant, please contact Jo Ellen Sherow, Director of Research Compliance, Ohio University, (740) 593-0664.

*I certify that I have read and understand this consent form and agree to participate as a subject in the research described. I agree that known risks to me have been explained to my satisfaction and I understand that no compensation is available from Ohio University and its employees for any injury resulting from my participation in this research. I certify that I am 18 years of age or older. My participation in this research is given voluntarily. I understand that I may discontinue participation at any time without penalty or loss of any benefits to which I may otherwise be entitled. I certify that I have been given a copy of this consent form to take with me.*

Signature _______________________________________________  Date___________
Printed Name ____________________________________________

Please print your local address where a debriefing form can be mailed at the end of the quarter:

<table>
<thead>
<tr>
<th>Address</th>
<th>State</th>
<th>Zip</th>
</tr>
</thead>
</table>

Please print the address of your parent(s)/guardian(s) where we can send the parental questionnaires:

<table>
<thead>
<tr>
<th>Name(s)</th>
<th>Address</th>
<th>State</th>
<th>Zip</th>
</tr>
</thead>
</table>
Appendix I – First Debriefing Form

Debriefing Form

Understanding Young Adults’ Achievement Skills

Dear Participant:

Thank you very much for participating in this study.

I greatly appreciate the time and effort you took to complete the study’s questionnaires and lab tasks. If you wish to find out what the project has learned about the link between inattention, hyperactivity, achievement, and adulthood please feel free to email me at the address below or call (740) 597-1707. (Note: A more thorough debriefing form will be sent to your local address at the end of the quarter.)

If you feel that you would benefit from speaking to a counselor, please contact:

Ohio University
Counseling & Psychological Services
Hudson Health Center
740-593-1616

Ohio University Psychology and Social Work Clinic
740-593-0902

Cordially,

Catherine Golden
Ohio University Psychology Department
cg193203@ohio.edu
Appendix J – Second Debriefing Form

Debriefing Form
Understanding Young Adults’ Achievement Skill

Dear Participant:

Thank you once again for participating in the above study earlier this school year! The purpose of this form is to more thoroughly inform you on the purposes of this study.

The primary objective of this study is to examine the positive illusory bias, defined as an overestimation of one’s own competence compared to a criterion, in three adult samples: (a) college students with ADHD (attention-deficit/hyperactivity disorder) symptomatology, (b) non-ADHD college students with low-achievement, and (c) non-ADHD college students with average or above-average achievement.

Numerous researchers have noted that there appears to be a positive illusory bias found in children with ADHD. The positive illusory bias has been studied in ADHD children in various domains, including academic competence, social acceptance, athletic competence, physical appearance, and behavioral conduct.

It is unclear whether the positive illusory bias is something children with ADHD eventually outgrow or whether it remains into adolescence and adulthood. Further, if the positive illusory bias does persist into adulthood, it is unclear whether it is specific to ADHD adults or whether it is also a characteristic of other groups of adults. For example, some researchers have found an overestimation of competence in adults who are unskilled in a domain and therefore have difficulty accurately assessing their performance in that given domain. These studies suggest that those with low achievement or limited skills would not be able to accurately judge their skill level, and would therefore overestimate their competence.

Interestingly, all research on the positive illusory bias and ADHD has involved child populations only. However, the field of psychology has acknowledged that ADHD is a chronic disorder, with nearly two-thirds of children with ADHD retaining symptoms into adulthood. Even if the positive illusory bias does not cause negative consequences in childhood, its presence in adulthood may warrant concern. With the added responsibility adulthood brings, making important decisions based on inaccurately perceived competence could have serious negative implications. On the other hand, it is possible that ADHD adults may not exhibit positive illusory bias. One theory suggests that the ADHD children may eventually “out-grow” this cognitive process.

Thus, the primary purpose of this study is to determine if the positive illusory bias is present in a young adult population. Further, if the positive illusory bias is found, this study will determine whether it is a function of ADHD, low achievement (i.e., lack of skill), or both. Therefore, recruitment of college students who display symptoms of inattention and hyperactivity/impulsivity, as well as college students who do not display these symptoms, was necessary.

If you wish to find out what the project has learned about the link between inattention, hyperactivity, achievement, and adulthood please feel free to email me at the address below or call (740) 597-1074 and leave your name and contact information with the department secretary.

If you feel that you would benefit from speaking with a counselor, please contact:
Ohio University Psychology and Social Work Clinic
740-593-0902

Cordially,
Catherine Golden
Ohio University Psychology Department
cg193203@ohio.edu
## Appendix K – Correlations between Discrepancy Scores

### Correlations between Discrepancy Scores

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<th>dsselfiq</th>
<th>dsschol</th>
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<th>dgresh</th>
<th>dpretest</th>
<th>dposttest1</th>
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<td>dsselfiq</td>
<td>1.00</td>
<td>.054</td>
<td>.652**</td>
<td>.183</td>
<td>.133</td>
<td>.058</td>
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<td>Dsschol</td>
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<td>.508**</td>
<td>.523**</td>
<td>.118</td>
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<td>dschwas</td>
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<td>1.00</td>
<td>.561**</td>
<td>.176</td>
<td>.118</td>
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<td>1.00</td>
<td>.657**</td>
<td>.655**</td>
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<td>1.00</td>
<td>.657**</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>dposttest1</td>
<td>1.00</td>
<td></td>
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** Correlation is significant at the .01 level (2-tailed).
* Correlation is significant at the .05 level (2-tailed).
Appendix L – Descriptive Characteristics

*Descriptive Characteristics of Borderline Group Members (CAARS score 55-60)*

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<thead>
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<tr>
<td></td>
<td><em>n = 29</em></td>
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<tr>
<td></td>
<td>N (%)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>12 (42)</td>
</tr>
<tr>
<td>19</td>
<td>12 (42)</td>
</tr>
<tr>
<td>20</td>
<td>3 (10)</td>
</tr>
<tr>
<td>21</td>
<td>1 (3)</td>
</tr>
<tr>
<td>22</td>
<td>0</td>
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<tr>
<td>23</td>
<td>1 (3)</td>
</tr>
<tr>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11 (38)</td>
</tr>
<tr>
<td>Female</td>
<td>18 (62)</td>
</tr>
<tr>
<td>HS gpa</td>
<td></td>
</tr>
<tr>
<td>3.5 or above</td>
<td>13 (45)</td>
</tr>
<tr>
<td>3.0 to 3.4</td>
<td>12 (42)</td>
</tr>
<tr>
<td>2.5 to 2.9</td>
<td>4 (14)</td>
</tr>
<tr>
<td>2.0 to 2.4</td>
<td>0</td>
</tr>
<tr>
<td>College gpa</td>
<td></td>
</tr>
<tr>
<td>3.5 or above</td>
<td>4 (14)</td>
</tr>
<tr>
<td>3.0 to 3.4</td>
<td>10 (34)</td>
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<tr>
<td>2.5 to 2.9</td>
<td>9 (31)</td>
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<tr>
<td>2.0 to 2.4</td>
<td>2 (7)</td>
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<tr>
<td>&lt; 2.0</td>
<td>0</td>
</tr>
<tr>
<td>no gpa (1st sem.)</td>
<td>4 (14)</td>
</tr>
<tr>
<td>Previous ADHD/ADD Diagnosis</td>
<td>4 (14)</td>
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<td>1 (3)</td>
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<tr>
<td>Taking/taken meds</td>
<td>4 (14)</td>
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<tr>
<td>Repeated a grade</td>
<td>1 (3)</td>
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Appendix M – Predicted vs. Actual Scores

Figure 1: Predicted vs. Actual Scores on Logic Task for ADHD Group ($N = 31$)

Figure 2: Predicted vs. Actual Scores on Logic Task for CTL Group ($N = 39$)
Appendix N – Cover Letter to Parent

<<Date>>

<<Line 1>>
<<Line 2>>
<<Line 3>>

Dear <<Line 4>>:

Your son/daughter, <<Line 5>>, has expressed an interest in participating in our study comparing the self-perceptions of college students who display symptoms of inattention and hyperactivity/impulsivity with the self-perceptions of students who do not show these symptoms. Your son/daughter may or may not show these symptoms, but because s/he has given permission to contact you, s/he is eligible to participate in this study for course credit. This study has been approved by Ohio University’s Institutional Review Board and the Ohio University Department of Psychology. The goal of our research is to learn more about potential differences between these groups. Differences between these groups have been displayed in the child literature, but have yet to be examined in the adult literature. Since it is standard procedure for parental questionnaires to be used in the assessment of symptoms of inattention and hyperactivity/impulsivity, we must contact the parents of all participants to request additional information to complete this study.

Your help in completing our investigation would be greatly appreciated. We ask that you take a few minutes to complete the attached questionnaire and return it in the enclosed postage-paid envelope. All responses to the questionnaire remain strictly confidential. To help ensure confidentiality, each questionnaire is identified with a numerical code only. This number is used to combine your responses with the information provided by your child. Please do not put your child’s name on any of the pages.

By completing the enclosed questionnaire, it is understood that you are consenting to the use of this information in our research project. You are, of course, under no obligation to complete this questionnaire. Further, the grades of your child attending Ohio University will in no way be affected by this decision.

I would like to thank you for your kind attention to this letter. If you require any further information, please do not hesitate to contact me or my advisor, Dr. Julie Owens, at 740-593-1707.

Sincerely,

Catherine M. Golden
Graduate Student in Clinical Psychology
PARTICIPATE IN A NEW PROJECT AT OHIO UNIVERSITY.
EARN $10.00 FOR HELPING OUT.

- **WHO?**: ANYONE BETWEEN THE AGES OF 18 AND 23 WHO HAS EVER BEEN DIAGNOSED WITH ADHD or ADD (Attention-Deficit/Hyperactivity Disorder) AND/OR A LEARNING DISABILITY

- **WHAT?**: THE PROJECT ATTEMPTS TO LEARN MORE ABOUT ACHIEVEMENT SKILLS AMONG COLLEGE STUDENTS WITH ADHD AND/OR LEARNING DISABILITIES.

- **WHERE?**: PARTICIPATION WILL OCCUR IN PORTER HALL, ON THE CAMPUS OF OU, OR AT HOCKING COLLEGE (Specific location TBA).

- **WHY?**: TO EARN $10.00. INFORMATION GAINED WILL HELP RESEARCHERS BETTER UNDERSTAND ACHIEVEMENT SKILLS OF THOSE WITH ADHD AND/OR LEARNING DISABILITIES.

- **QUESTIONS**: Please contact Catherine Golden (Principal Investigator) at cg193203@ohio.edu or 740-597-2925 or Dr. Julie Owens (Faculty Supervisor) at 740-593-1074.

- If you are interested in helping with this project please detach a tab below and contact:

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<thead>
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<th>ADHD/LD Study</th>
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<td>E-mail:</td>
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<tr>
<td>Catherine Golden</td>
<td>Catherine Golden</td>
<td>Catherine Golden</td>
<td>Catherine Golden</td>
</tr>
<tr>
<td><a href="mailto:cg193203@ohio.edu">cg193203@ohio.edu</a></td>
<td><a href="mailto:cg193203@ohio.edu">cg193203@ohio.edu</a></td>
<td><a href="mailto:cg193203@ohio.edu">cg193203@ohio.edu</a></td>
<td><a href="mailto:cg193203@ohio.edu">cg193203@ohio.edu</a></td>
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<td>or call:</td>
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