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Does a Positive Bias Relate to Social Behavior in Children with ADHD?

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Abstract

This study examines whether positively biased self-perceptions relate to social behaviors in children with attention-deficit/hyperactivity disorder (ADHD) as compared to control children. The social behaviors of children with ADHD ($n = 87$) were examined relative to control children (CTL; $n = 38$) during a laboratory-based dyadic social interaction task. Children with ADHD were subgrouped into those with a positive illusory bias (PIB) in their self-perceptions (ADHD+PIB) versus those without such a bias (ADHD-PIB). Using a behavioral coding system adapted for this study, ADHD+PIB, ADHD-PIB, and CTL participants were compared on objectively-coded social behaviors occurring within the context of the social interaction task. Whereas both ADHD groups displayed more disruptive behavior than controls, only the ADHD+PIB group displayed less prosocial behavior and less effortful behavior. This study breaks new ground by examining positively biased self-perceptions as they relate to social behavior in children with ADHD and provides promising new insight into the social problems experienced by these children.

Keywords

Positive illusory bias; social behavior; ADHD; self-concept; positive bias

Research suggests that children with attention-deficit/hyperactivity disorder (ADHD) have poor peer relationships (Hoza et al., 2005). They are overwhelmingly rejected by their peers and are less likely to have close dyadic friendships (Hoza, Mrug, Pelham, Greiner, & Gnagy, 2003). Historically, researchers and clinicians have hypothesized that negative behaviors related to core ADHD symptoms are largely responsible for impaired peer relationships in children with ADHD. Recent research, however, has identified other possible contributory

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factors. One such factor that may be particularly relevant, as it is evident on the part of many children with ADHD, is a lack of social insight, or an inability to accurately report on one's own social competence (e.g., Hoza, Waschbusch, Pelham, Brooke, & Milich, 2000). This phenomenon, termed a "*positive illusory bias*" (PIB; Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007), is defined as a self-enhancing discrepancy between self-reported competence and actual competence such that the child's report of his/her own skills is higher than warranted. Unfortunately, researchers have not yet examined whether or not the possession of a positively biased self-perception is related to actual behavior in social interactions for children with ADHD. Thus, the goal of this study was to examine if the social behaviors of children vary as a function of both ADHD diagnosis and positively biased self-perceptions in the context of a laboratory social interaction task. More specifically, children with ADHD exhibiting a positive bias, children with ADHD not exhibiting a positive bias, and control children were compared on specific behaviors as well as task persistence/effortful behavior.

What Do We Know About the Peer Functioning of Children with ADHD?

Even in new social situations, the peer problems of children with ADHD are almost immediately apparent (Hoza, 2007). This social deficit has been demonstrated in studies that place children with ADHD in naturalistic and laboratory settings with unfamiliar peers. For example, one study that compared non-familiar boys with and without ADHD on peer rejection and liking during the first three days of a summer camp found that after the first day, boys with ADHD were more rejected by their peers than non-ADHD participants (Ernhardt & Hinshaw, 1994). Further, by the end of day three, boys without ADHD were rated as more desirable friends and received a greater number of positive nominations and a lesser number of negative nominations relative to boys with ADHD (Ernhardt & Hinshaw, 1994). Similarly, a study that placed children with ADHD in a laboratory play setting with non-ADHD peers reported that, within minutes, the non-ADHD youth were complaining about the behavior of the children with ADHD (Pelham & Bender, 1982).

Given the nearly instantaneous manner in which children with ADHD are rejected by their peers, prior studies have focused primarily on negative behaviors that may characterize the interaction style of children with ADHD. For example, in Pelham and Bender's (1982) laboratory-based social interaction study, findings suggest that relative to non-ADHD youth, children with ADHD were more aggressive and bossy in their interaction style. In addition, findings from multiple observational studies suggest that children with ADHD are more likely to be disruptive, impulsive, aggressive, and to exhibit a hostile interaction style when compared to non-ADHD youth (e.g., Buhrmester, Whalen, Henker, MacDonald, & Hinshaw, 1992; Hinshaw & Melnick, 1995). Traditionally, these aggressive/disruptive behaviors have been attributed to the core symptoms of ADHD (i.e., inattention, hyperactivity, and impulsivity). However, past research has generally neglected other possible explanations for social difficulty on the part of children with ADHD. Specifically, with few exceptions (e.g., Ronk, Hund, & Landau, 2011), studies have rarely considered prosocial or socially skilled behaviors that may play a role in the peer problems of children with ADHD. The present study addresses these prior gaps in the literature and extends prior work by considering both positive and negative social behaviors in a mixed sample of children with ADHD and comparison children.

Self-Perceptions of Children with ADHD

There is a large body of research that suggests that, on average, children with ADHD overestimate their competence relative to external criteria for evaluating competence (e.g., adult ratings or actual task performance) more than control children do (Owens et al., 2007). More specifically, past research has indicated that many children with ADHD, though not

all, overestimate their own abilities in the academic, social, and behavioral domains relative to more objective measures of competence (Hoza, Pelham, Dobbs, Owens, & Pillow, 2002; Hoza et al., 2004). For example, on a laboratory social interaction task, on average, boys with ADHD were rated by research assistants as performing significantly worse than boys without ADHD, yet these same boys rated themselves as performing more favorably than their non-ADHD counterparts (Hoza et al., 2000). Although the current literature suggests that children with ADHD are more likely to exhibit a positive bias when compared to their non-ADHD peers, there has been a lack of work examining variability in overestimation of competence within an ADHD sample. Previous literature has cited that, on average, children with ADHD display a PIB, but this literature is referencing the mean level differences between children with ADHD and controls, and is not referring to the frequency with which PIB exists among individual children with ADHD. Previous studies have not typically reported the *proportion* of children with ADHD that exhibits a positive bias but instead the average dimensional PIB score for a group of children with ADHD. Therefore, it is likely that the mean level of PIB in children with ADHD is driven by only a portion of that sample with high levels of PIB. This paper addresses this gap in the literature by comparing children with ADHD who do and do not exhibit such a bias in the social domain to each other, in addition to comparing both groups to control children.

Positively Biased Self-Perceptions, Behavior, and Motivation

Although this phenomenon of positively biased self-perceptions has been well documented for children with ADHD, it remains unclear whether a positive bias serves a damaging or self-protective role (for a review see Owens et al., 2007). On one hand, maintaining a positive self-view despite experiencing failure may promote continued effort at difficult tasks and may also protect children against low self-esteem or depression (Bjorklund, 1997; Taylor & Brown, 1988). In fact, there is some evidence that over time, decreases in positive bias are associated with increases in depression (Hoza et al., 2010). On the other hand, children who are unaware that they are failing at a given task or situation may be less motivated to take steps to improve their performance or skill set (Milich & Okazaki, 1991). Thus, in a social context, it is unclear whether positively biased self-perceptions will enhance a child's motivation to engage in or work to improve social interactions, or if this bias will inhibit a child's ability to recognize the need to improve their social responses or behavior.

As successful and socially appropriate responses require an accurate appraisal of social cues, positively biased self-perceptions may be a critical factor underlying social functioning. For example, if a peer appears bored, a child must pick up on this cue and adjust his/her own behavior or approach accordingly in order to reengage the peer and navigate the peer interaction successfully. In addition to an accurate appraisal of social cues, it is also required that the child be motivated to pick up on these cues and put forth effort to behave accordingly in a given social context. At the present time there is no research examining the question of whether children's actual social behaviors and/or their motivation to properly engage with their peers varies as a function of whether or not children exhibit positively biased self-perceptions. Thus, the current study is the first to our knowledge to consider the social behaviors and motivation of a well-characterized and clinically-diagnosed sample of ADHD youth with and without positively-biased self-perceptions in the social domain.

Based on previous school-sample research, it is reasonable to expect that children who exhibit positively biased self-perceptions in the social domain are experiencing greater social impairment than children without such a bias. For example, a study examining a non-clinical school sample of children with overly enhanced self-perceptions (i.e., a discrepancy between view of self and an external criterion in the positive direction) to children

exhibiting a negative illusory bias (i.e., a discrepancy between view of self and an external criterion in the negative direction) and nondiscrepant children found that teachers rated children with a positive bias lower on social skills and higher on behavior problems relative to children in the other two groups (Gresham, Lane, MacMillan, Bocian, & Ward, 2000). Further, children with a positive bias were less well-liked by their peers than children in the other groups (Gresham et al., 2000). Similarly, Colvin et al. (1995), found that certain negative behaviors displayed by college-aged men and women during a laboratory social interaction task were significantly correlated with enhanced self-perceptions. For men, these behaviors included bragging, interrupting, speaking quickly, and talking at, rather than to, their interaction partner. For women, these behaviors included seeking approval, irritability, skepticism, and an awkward interpersonal style. Exhibiting social skills and being liked by their interaction partners were significantly negatively correlated with enhanced self-perceptions for men and women. Given these findings in non-clinical school aged and college aged samples, it seems likely that children with ADHD who have positively biased self-perceptions will also display less prosocial behavior and more negative behavior relative to their peers.

It is important to consider how positively biased self-perceptions may relate to the aggressive and disruptive behaviors that are typical of children with ADHD (Pelham & Bender, 1982). Until recently, these behaviors have been attributed largely to the disorder's core symptoms and other possible contributory factors have been overlooked. Borrowing from the social psychology literature, Baumeister and colleagues (1996) argue that individuals with an overly inflated view of the self exhibit aggressive behavior in response to their inflated self view being challenged or contradicted by external evaluations. Specifically, they suggest that as a result of this challenge to self-views, individuals defend their fragile sense of self. Applying this perspective to the inflated self-views of many children with ADHD, it is likely that these children also would respond negatively to socially challenging situations, given the level of social impairment many children with ADHD experience (Hoza, 2007). In support of this argument, recent work by Kaiser et al. (2008) found that negative social behaviors exhibited by children with ADHD, such as lying, swearing, teasing and interrupting, were at least partially (if not fully) explained by the presence of positively biased self-perceptions. Thus, we predicted that children with ADHD who exhibit positively biased self-perceptions would display more maladaptive/negative social behaviors than those without this bias during a laboratory social interaction task.

As mentioned previously, it may not be enough to examine social skills and negative behaviors when considering the role positively biased self-perceptions may play in the social functioning of children with ADHD. It is also important to consider how positively biased self-perceptions may influence the effort or the motivation that is put forth by children to properly engage in and adjust behavior during a social interaction. Thus, this study also will examine whether children with ADHD who exhibit positively biased self-perceptions display more or less effortful behaviors during a challenging social interaction than those without biased self-views. Specifically, Harter (1981) argues that perceived self-competence serves as a motivator to engage in future challenging tasks. Thus, children with ADHD who exhibit enhanced self-perceptions in a particular domain should be more persistent than those without such a bias. Interestingly, research examining task persistence in children with ADHD finds that children with ADHD are actually *less* persistent and/or effortful on tasks despite self-ratings of performance that are similar to or better than control children (Hoza et al., 2001; Milich & Okazaki, 1991). For example, a study by Hoza et al. (2001) examining performance self-evaluations of children with and without ADHD on a find-a-word puzzle task reported that children with ADHD gave up more often, performed less well, and were rated as less effortful; yet, there were no differences in how they evaluated their

performance relative to control children. Similarly, other studies (e.g., Milich & Okazaki, 1991) document that children with ADHD give up more frequently on laboratory tasks and display more frustration than control children, despite rating their performance more favorably. Importantly, no prior studies separated children with ADHD into those with versus without a positive bias. Thus it remains unclear if ADHD status or having positively biased self-perceptions is associated with less task persistence. In this study, we examine whether children with ADHD who do versus do not exhibit positively-biased self-perceptions differ in terms of effortful behavior during a laboratory social interaction task.

In summary, despite a long history of research directed at the peer dysfunction associated with ADHD, few studies have examined the possible role of positively biased self-perceptions in these peer problems. As a consequence, the adaptive and/or maladaptive consequences of this bias are not well understood. Thus, the present study examines behavioral differences within the context of a laboratory-based social interaction task among three groups of children: (1) children with ADHD who exhibit positively biased self-perceptions (ADHD+PIB), (2) children with ADHD who do not exhibit positively biased self-perceptions (ADHD-PIB), and (3) control children (CTL). Given prior research documenting less socially skillful behavior in non-ADHD individuals with positively biased self-perceptions (Colvin et al., 1995; Gresham et al., 2000), we predicted that the ADHD +PIB group would display lower levels of socially skillful behaviors (e.g., friendliness, responsiveness, engagement) as compared to the other two groups. In light of prior work documenting a link between positively biased self-perceptions and aggression and conduct problems (Baumeister et al., 1996; Kaiser, Hoza, Pelham, Gnagy, & Greiner, 2008) we expected that the ADHD+PIB group would show higher rates of most negative behaviors (e.g., odd behavior, inappropriate speech, pushiness, frustration) as compared to the other two groups. Further, we explored whether differences in effortful behavior exist among the three groups; however, we made no specific predictions about direction of effects given the relative paucity of prior research in this area. Finally, in addition to the primary analyses, we performed supplemental follow-up analyses to further elucidate specific behavioral differences between our three groups of children. Overall, this study expands upon prior literature by considering whether the problematic social behaviors typically associated with ADHD are present to a greater degree in those ADHD youth who also exhibit positively biased self-perceptions.

Method

Participants

Participants were 87 children diagnosed either with Combined Type or Hyperactive/Impulsive Type ADHD (69.6%) and 38 control children (30.4%) who did not exhibit positively biased self-perceptions; these children were a subset of a larger sample of children participating in a study of self-perceptions in youth with and without ADHD. Our sample was comprised of 26 females (20.8%) and 99 males (79.2%) and ranged in age from 7 to 11 years (see Table 1 for a breakdown of control vs. ADHD groups). Except for the establishment of an ADHD diagnosis, eligibility requirements were the same for both the control children and children with ADHD. Recruitment sources included local University clinics, radio, newspaper and television advertisements, local pediatricians, psychiatrists and psychologists; parent initiated referrals and local schools.

Each child enrolled in the study received a comprehensive diagnostic assessment. This assessment included: a clinical interview (74% of these interviews were with the child's birth or adoptive mother, 14% were with the child's birth or adoptive father, and the remaining were with other caretakers) completed by a graduate- or doctoral-level clinician; parent- and teacher-completed DSM-IV version of the Disruptive Behavior Disorders Rating

Scales (DBD; Pelham, Gnagy, Greenslade, & Milich, 1992); the parent version of the Computerized Diagnostic Interview Schedule for Children, DSM-IV version (DISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000); and the Child Behavior Checklist and Teacher Report Form (Achenbach & Rescorla, 2001). Means and standard deviations for rating scales may be found in Table 1. Utilizing all available information gathered during this assessment, two Ph.D.-level psychologists assigned each child a diagnosis (including the possibility of no diagnosis). Participants were eligible for the ADHD group if they met criteria for a DSM-IV diagnosis of either combined type or predominantly hyperactive/impulsive type ADHD. Children with predominantly inattentive type ADHD were excluded given our interest in studying children who exhibit both positively biased self-perceptions and disruptive behavior, neither of which typically characterize children with predominantly inattentive type ADHD (Owens & Hoza, 2003; Gaub & Carlson, 1997). Control children could not currently nor in the past have met criteria for ADHD and those control children exhibiting a positive bias in the social domain were excluded from this study ($n=7$).

In order to maximize the generalizability of the sample to the general population, children meeting diagnostic criteria for oppositional defiant disorder (ODD), conduct disorder (CD), or internalizing disorders such as anxiety and/or depression were retained in both the control and ADHD samples. To the extent possible, controls were selected to have the same sex and racial/ethnic composition as the children with ADHD and, in fact, demographic characteristics of the ADHD and comparison samples were comparable (see preliminary analyses).

All participants, regardless of ADHD status, were excluded based on the following: (1) having an IQ below 80; (2) a history of seizures or other neuropsychological problems and/or taking medication to prevent seizures; (3) being treated for ADHD with medications that could not be withheld for testing (e.g., anti-depressants); (4) a childhood history or current diagnosis of pervasive developmental disorder, schizophrenia or other psychotic disorders, sexual disorders, organic mental disorder, or eating disorder; (5) absence of teacher ratings necessary to compute variables needed for this study.

Medication status of ADHD participants

All ADHD children were unmedicated at the time of the eligibility assessment as well as during all research participation sessions. Further, parents and teachers were instructed to rate each child's behavior off medication.¹ The decision to keep participants off medication during the research tasks was based on the well-known potentiating effects of ADHD medications on a variety of performance variables (e.g., Pelham, Hoza, Kipp, Gnagy, & Trane, 1997).

Measures

Self- and teacher-reported competence—The child and teacher versions of the Self-Perception Profile for Children (SPPC; Harter, 1985) were completed by each participant and their teacher, respectively. The SPPC is designed to assess domain-specific self- or teacher-perceived competence for the scholastic, social, athletic, physical appearance, and behavioral conduct domains; it also includes a subscale indexing global self-worth. Ratings are made on a 4-point scale with higher scores indicating greater perceived competence. The child version has 36-items (6 per subscale) and generally is comparable in content to the teacher version, which contains 15 items (3 per subscale; there is no global self-worth subscale for teachers). Only the social domain was of interest to the current study. We

¹Despite this instruction, 9 teachers completed ratings regarding children's medicated behavior and 1 teacher did not report whether or not his/her ratings were of a child's medicated or unmedicated behavior.

expanded the teacher version to 5 items in the present study in order to make the teacher version as comparable to the child version as possible. The two additional items were created to parallel items within the child version and included: “This child is always doing things with a lot of kids OR This child usually does things by him/herself” and “Not many people this child's age like him/her OR Most people this child's age do like him/her.” Reliability of the SPPC subscales is well-documented, with Cronbach's alphas reported by Harter (1985) to be between 0.71 and 0.86. In the present sample, the alphas for the social domain were 0.96 for the expanded teacher report version and 0.76 for the child report version. The mean teacher and child SPPC scores for the entire sample were 2.73 (SD=.91) and 2.79 (SD=.80), respectively. The mean teacher and child SPPC scores for the control group were 3.49 (SD=.53) and 3.12 (SD=.63), respectively. The mean teacher and child SPPC scores for children with ADHD without a positive bias were 2.67 (SD=.80) and 2.36 (SD=.76), respectively. For the children with ADHD and a positive bias, the mean teacher and child SPPC scores were 1.76 (SD=.56) and 3.33 (SD=.54), respectively.

Computation of positive bias scores—Using the SPPC, discrepancy scores were computed to reflect differences between how the child and his/her teacher evaluated the child's competence in the social domain. Specifically, each child's mean teacher-rated social competence score was subtracted from the child's own mean self-reported social competence score to create a measure of the child's positive bias in the social domain. Higher scores in the positive direction thus indicated greater overestimations of competence by the child, relative to the teacher.

Coding system—A coding system specifically geared to the purposes of the present study was derived following procedures similar to Hoza et al. 2000. The final version of this coding system included 27 items, the first 19 of which described behaviors such as friendliness, engagement, responsiveness, being on task, and frustration. Five items were specific to typical ADHD characteristics (e.g., fidgeting, looking around the room, interrupting). The remaining three items were global ratings of overall positive and negative emotions of the participant and level of anxiety. Each item was rated on a Likert-type scale ranging from 1 to 7. The intraclass correlation coefficient was used to compute reliability for each item. An item was considered reliable if the reliability coefficient was at least .70. Four items did not meet this cut-off and were not considered further. Reliability for the remaining items ranged from .72 to .92 with a median reliability of .85.

Level of problem behaviors and symptoms—In addition to its use in the initial diagnostic assessment of all participants, the teacher and parent versions of the DSM-IV update of the Disruptive Behavior Disorders Rating Scale (DBD; Pelham et al., 1992) was used to describe the level of ADHD, ODD, and CD symptoms present across groups. Specifically, each item was rated on a 4-point scale ranging from 0 (not at all present) to 3 (very much present). An item was considered endorsed if it was rated as “pretty much” (2) or “very much” present (3). Symptom counts of endorsed ADHD, ODD, and CD symptoms were derived and compared across our three groups of participants (see Table 1). In the present sample, alphas ranged from .74 to .96 based on parent report and from .77 to .97 based on teacher report.

The Child Behavior Checklist (CBCL) and Teacher Report Form (TRF; Achenbach & Rescorla, 2001) were completed by parents and teachers, respectively. The CBCL assesses children's competencies and behavioral/emotional problems. The TRF assesses children's academic performance, adaptive functioning, and behavioral/emotional problems. These measures were used to compare our three groups on the Attention Problems, Attention Deficit/Hyperactivity Problems, Externalizing, Internalizing, and Total Problems scales derived from the CBCL and TRF. These scales have Cronbach's alphas that range from .84-

97 on the CBCL and .90-.97 on the TRF (Achenbach & Rescorla, 2001). In the present sample, alphas ranged from .85-.93 on the CBCL and .89-.96 on the TRF.

Procedure

Each child participated in a “TV talk show” task during which the outcomes on the task were manipulated (for details, see Hoza, Tomb, Kaiser, & Waschbusch, 2009). The current study focuses solely on two five minute interactions that took place during this task between the participant and a child confederate. During each of these interactions, the participant was the “host” of a “TV talk show.” The host's instructions were to be “entertaining” for the guest and audience, and to try to get the “guest” (a trained child confederate) to talk about as many topics as possible from a list of eight topics. During the first five minute interaction (unbeknownst to the child participant), the confederate child was instructed to talk only about the first two topics on the eight-topic list in order to ensure that the child participant experienced a socially challenging situation. Throughout this interaction, the confederate also was instructed to act uninterested, bored, and quiet. During the second five minute interaction, the confederate was instructed to talk about six of the eight topics on the participant's list and to act enthusiastic, friendly, and talkative. Each of these five minute interactions was videotaped and these tapes were used to code the behaviors of interest for the present study.

Recordings of each interaction were individually coded over a three month period by a total of five undergraduate (n=3) and graduate (n=2) research assistants that had been trained to use the coding system. All recorded interactions were randomly assigned to the five coders and were coded by two (n=30) or three (n=95) coders. All but one coder had no previous experience with the participants and all coders were blind to ADHD status. In addition, all but one coder were blind to the hypotheses of both the current study and the larger project. The order in which tapes were watched/coded (as well as the coding order of the first and second conditions for each participant) was randomly assigned. Coders watched each condition twice and rated each item at the end of viewing the interaction for the second time. Inter-coder reliability was calculated once a week as coding was completed and meetings were held to discuss any major discrepancies (i.e., any difference of three or more points between coders on an item). When major discrepancies occurred, discrepant items from that tape were recoded by the coders originally assigned to that tape and the recoded items were used in the final analyses.

Confederate children—All child confederates were recruited through fliers, word of mouth, and media advertisements. Each child confederate began training approximately a month in advance of working with participants and was required to be able to deliver their lines verbatim and to follow verbal and nonverbal rules during practice sessions before they were permitted to work with participants. To ensure that each child confederate continued to perform in a standardized way, trained graduate students observed each interaction in live time and recorded and monitored their performance. In addition, the recordings used in this study were viewed at a later date by a team of graduate students and child confederates were rated on the number of lines they delivered as well as whether or not they followed the verbal and nonverbal rules of each interaction. In general, adherence was high and on average, child confederates delivered all of their lines 70% of the time and at least two of three lines 93% of the time and they were rated well above average on following scripted verbal (86%) and nonverbal (92%) rules. Child confederates were roughly the same age as child participants and child participants were paired with child confederates of the same gender.

Results

Preliminary Analyses

Comparison of ADHD and comparison children on demographic variables—

Preliminary analyses were conducted to assess whether children with and without ADHD were comparable on demographic measures. Using two-tailed chi-square analyses, comparisons were conducted on sex, race, family composition, parental income, and parental education. Because there were expected cell sizes less than 5 in some of these analyses, categories were collapsed as necessary. Specifically, race was collapsed into white vs. non-white (the non-white category included: African-American, Hispanic, Asian, and more than one race) and parental income was collapsed into two categories; \$40,000 and \$40,001. Finally, a univariate analysis of variance (ANOVA) was conducted to compare children with and without ADHD on age. No significant differences emerged between children diagnosed with ADHD and controls on any of the demographic variables (see Table 1).

Definition of subgroups—In order to compare children with ADHD who had positively-biased self-perceptions to those ADHD youth without such a bias and control children, we divided our participants into three groups. Children with ADHD who had discrepancy scores of $+1.0$ were considered to be high in positive bias (ADHD+PIB, $n=26$; 30% of the ADHD sample), whereas those whose discrepancy scores were < 1.0 were considered low in positive bias (ADHD-PIB, $n=61$; 70% of the ADHD sample). A cut off score of one was used as it was approximately one standard deviation from the mean of the discrepancy scores in the overall sample. PIB scores ranged from 1.00 to 2.63 ($mdn=1.50$) in the ADHD +PIB group, from -1.67 to .80 ($mdn= -0.27$) in the ADHD-PIB group, and from -1.83 to .83 ($mdn= -0.20$) in the control group. Importantly, the groups that emerged using raw scores were the same when we examined groups using z-scores. Due to the ease of interpretation, raw scores were retained for all further analyses.

Comparisons of groups on level of problem behaviors and symptoms—

To provide validity data for our ADHD versus control groupings and to ensure that there were no significant differences between the two ADHD groups on severity of problem behaviors, univariate analyses of variance (ANOVAs) were conducted comparing all three groups on the internalizing, externalizing, total problems, attention problems, and ADHD problems T-scores from the CBCL and TRF. As expected, the controls had fewer problem behaviors than both ADHD groups and there were no significant differences between the ADHD groups on any variables compared. Similarly, ANOVAs were conducted comparing all three groups on the number of hyperactive/impulsive symptoms, inattentive symptoms, oppositional defiant disorder symptoms and conduct disorder symptoms endorsed by parents and teachers on the DBD rating scale. Again, as expected, the controls had significantly fewer symptoms of hyperactivity/impulsivity, inattention, oppositional defiant disorder, and conduct disorder; there were no significant differences between the ADHD groups on the number of symptoms endorsed.

Item score computation and data reduction—A mean item score from the observational coding system was computed for each item separately for the first and second conditions by averaging the ratings of all coders for that child. These mean scores were subsequently averaged across conditions and submitted to an exploratory factor analysis. Using a principal components analysis with varimax rotation, six factors emerged with eigenvalues greater than 1.0. Two of these factors were eliminated due to having low internal consistencies (α s < 0.6). Based on the component items loading on each factor, we labeled the four remaining factors as follows: 1) Prosocial (6 items); 2) Negative Style (4

items); (3) Effort (4 items) and (4) Disruptive Behavior (5 items); see Table 2 for individual items and factor loadings.

Unweighted factor scores then were created by averaging the items that loaded most highly on each factor (in bold in Table 2). Items were reverse coded, as needed, so that all items on a given factor were coded in the same direction, with higher scores indicating higher levels of the factor. Higher scores were more adaptive for the Prosocial and Effort factors, lower scores were more adaptive for the Negative Style and Disruptive Behavior factors. Internal consistencies for these factor scores were acceptable (Prosocial $\alpha = .90$, Negative Style $\alpha = .88$, Effort $\alpha = .68$, and Disruptive Behavior $\alpha = .63$).

Primary Analyses

Factor comparisons by subgroup—Four univariate analyses of variance (ANOVAs) were conducted to compare the subgroups (ADHD+PIB, ADHD-PIB, controls) on the four factors (Prosocial, Negative Style, Effort, and Disruptive Behavior; see Figure 1). Results indicated significant differences among the groups on the Prosocial factor ($F(2,122)=6.95$, $p<.01$), the Negative Style factor ($F(2,122)=3.15$, $p<.05$), the Effort factor ($F(2,122)=4.25$, $p<.05$), and the Disruptive Behavior factor ($F(2,122)=7.61$, $p<.01$).

Post-hoc comparisons were conducted for each factor to pinpoint exactly which subgroups differed. On the Prosocial factor, the control ($M=3.34$, $SD=0.68$) and ADHD-PIB groups ($M=3.26$, $SD=0.89$) were rated as displaying significantly more prosocial behavior relative to the ADHD+PIB group ($M=2.65$, $SD=0.66$; Cohen's $d = -1.03$ and -0.78 , respectively). On the Negative Style factor, the control group ($M=1.23$, $SD=0.34$) was rated as displaying significantly fewer negative behaviors than the ADHD-PIB group ($M=1.52$, $SD=0.53$, Cohen's $d=0.65$). On the Effort factor, the control group ($M=5.54$, $SD=0.65$) was rated as displaying more effortful behavior than the ADHD+PIB group ($M=5.09$, $SD=0.62$; Cohen's $d = -0.71$). Lastly, on the Disruptive Behavior factor, controls ($M=2.23$, $SD=0.49$) were rated as exhibiting less disruptive behavior than both the ADHD-PIB ($M=2.63$, $SD=0.63$; Cohen's $d=0.71$) and ADHD+PIB ($M=2.73$, $SD=0.56$; Cohen's $d=0.95$) groups.

Supplementary analyses—Given our goal of understanding specific behavioral differences among the three groups, and in light of the scarcity of prior studies considering this question, we conducted supplemental exploratory analyses comparing the three groups at the item level for each factor. Of the nineteen items analyzed, twelve yielded significant between-groups differences (see Table 3). Specifically, as compared to ADHD+PIB children, both controls and ADHD-PIB children were rated as being more friendly, responsive and engaged. Controls were rated as displaying greater positive emotion relative to the ADHD+PIB group and the ADHD-PIB group was rated as being significantly more entertaining relative to the ADHD+PIB group. The ADHD-PIB children were rated as more frustrated and as displaying greater negative emotion than controls. The ADHD+PIB children were rated as exhibiting more odd behavior, as looking around the room more, and as behaving more helplessly than control children. As might be expected, controls were rated as fidgeting less than children in both ADHD groups. A significant difference emerged for asking different types of questions but follow-up tests showed no significant differences between the three groups. No significant differences were found between the three groups for items assessing reciprocity, using a pushy style, seeking adult help, on task behavior, withdrawn behavior, appropriate speaking style, and moving in seat.

When making this many comparisons, it is standard practice to adjust the significance level to decrease the chance of a false positive (due to inflated alphas). However, because this is the first study to consider the specific social behaviors that may distinguish ADHD+PIB children from ADHD-PIB and control children, we took an exploratory approach in these

follow-up comparisons and this adjustment was not used. Of note, however, had we applied a Bonferroni correction, six significant comparisons would have remained (See Table 3).

Discussion

This study breaks new ground by providing data clarifying the association between positively-biased self perceptions and actual social behaviors in children with ADHD. By comparing children with ADHD+PIB, children with ADHD-PIB, and control children during a social interaction task, we were able to examine differences among these groups in terms of how they interacted with an unfamiliar peer. Further, because we used an unfamiliar child confederate who responded to all participants in a standardized way, any differences found among the three groups cannot be attributed to partner influence or previous reputation. Additionally, any differences found between the two groups of children with ADHD that were separated based on the presence or absence of positively biased self-perceptions cannot be attributed to differing levels of severity of behavior problems as these two groups were not significantly different on ratings of symptoms and behavior problems.

In support of our hypothesis, when we compared our three groups to each other on the factor scores, we found that both the control and ADHD-PIB groups were rated higher on the Prosocial factor than the ADHD+PIB group. This indicates that, compared to the ADHD+PIB group, the control and ADHD-PIB children engaged in more positive social behaviors during the interaction. In fact, when comparisons were made at the item level on behaviors comprising the Prosocial factor, the ADHD+PIB group was rated as less friendly, less responsive and less engaged than both the ADHD-PIB and control groups. Additionally, the ADHD+PIB group was rated as displaying less overall positive emotion than the control group. These findings suggest that having positively-biased self-perceptions, rather than simply a diagnosis of ADHD, may account for these differences.

In addition to these findings, it is also of note that the ADHD-PIB group was rated as significantly more entertaining than the ADHD+PIB group. Given that being entertaining was one of the main goals of the TV talk show task, this finding lends support to the argument that positively biased self-perceptions may inhibit appropriate self-monitoring and the adjusting of one's behavior in an ongoing social interaction. Further, being entertaining required that the participant follow the rules of the TV talk show and that they were involved and enthusiastic while interacting with the child confederate. Hence, the significant difference that emerged between our two ADHD groups, may suggest that positively biased self-perceptions contribute to impairments in the social skills and forethought required for adaptive ongoing social interactions.

When we compared our three groups on the Disruptive Behavior factor, we found that both ADHD groups exhibited more disruptive behaviors than did controls. At first glance, this was not surprising as many of the items that loaded on this factor are typical ADHD behaviors. However, when we examined between-groups differences at the individual item level, we found that two of the three significant differences at the item level were between the control group and the ADHD+PIB group. Specifically, the ADHD+PIB group was rated as displaying significantly higher rates of odd behavior and looking around the room compared to the control group. This suggests that primarily the ADHD+PIB group displayed these behaviors to an extent that exceeded normative levels.

Although the findings presented above partially support our hypothesis that children with ADHD+PIB would show higher rates of negative behavior than control and ADHD-PIB groups, what we did not expect to find was a significant difference between the control and ADHD-PIB groups on the Negative Style factor. Specifically, we found that only the

ADHD-PIB group and not the ADHD+PIB group was rated higher than the control group on the Negative style factor. Item level comparisons revealed additional curious findings that the ADHD-PIB group, not the ADHD+PIB group, was rated as displaying more frustration and more overall negative emotions than the control group. It is possible, however, that this finding is the result of differential sample size and hence power to detect differences between the controls and each of the two ADHD groups as means and standard deviations of these items for the two ADHD groups are quite similar (Table 3).

Based on the developmental literature suggesting that children with positively biased self-perceptions are more likely to exhibit and maintain motivated behavior on challenging tasks (Harter, 1981), we reasoned that our ADHD+PIB group would display more effortful behavior if, indeed, their positive bias is serving an adaptive role for them. However, when we compared our three groups on the Effort factor, we found that the ADHD+PIB group displayed significantly less effortful behavior than the control group during the social interaction task. At the individual item level, significant differences again emerged between the ADHD+PIB group and the control group such that the ADHD+PIB group displayed more helpless behavior than the control group. Although this did support our hypothesis that there would be differences between groups based on the presence or absence of a PIB, it did not support the argument that having positively biased self-perceptions are advantageous in the social domain in terms of facilitating task persistence and motivating children to continue to engage in social tasks. Further, as helpless behavior and lack of effort imply, these children actually were less engaged with the confederate child and in the social task in general thus implying that there was less opportunity to learn from and experience the social interaction. What this may translate to for children with ADHD and a positively biased self-perception is that their helpless behavior and lack of effortful behavior is inhibiting them from participating in social situations during school, camp, and other areas of peer interaction and thus limiting their opportunity to improve their social skills and to learn from their peers in social settings.

Finally, these results are consistent with previous findings from the academic domain indicating that children with ADHD tend to give up more frequently on laboratory tasks (Milich & Okazaki, 1991). Importantly, however, there were no significant differences found between the ADHD-PIB group and the control group on either the factor assessing effort or the item assessing helplessness. Perhaps then, it is the subgroup of children with ADHD who also possess positively biased self-perceptions that are driving the results of previous studies comparing effort put forth by children with versus without ADHD during laboratory tasks, as these studies did not separate children with ADHD into groups based on the presence or absence of positively biased self-perceptions.

Limitations

Several limitations of this study should be noted. First, because behaviors were coded during a laboratory task, findings may not generalize to children's natural settings (e.g., at school or camp). Additionally, these behaviors were coded during a performance task and not during a free-play laboratory interaction. Although this allowed us to examine effort, participants were not free of instruction and were aware that they would be evaluated on their performance throughout the task. Having a task to complete may have prevented a more natural interaction from taking place between the participant and the confederate child.

Additional limitations of this study largely pertain to its sample characteristics. Because children with a diagnosis of predominantly inattentive type ADHD were not included, results cannot be generalized to that population. Due to the fact that only 26 girls were included and only 18 participants were classified as "non-white," power was not sufficient to examine subgroups by sex or race. Further, because this study was cross-sectional, no

causal relationships can be established. It also should be noted that the “Disruptive Behavior” factor had modest internal consistency ($\alpha=.63$) and thus the results of this factor should be interpreted with caution.

Implications

To our knowledge, this was the first study to examine whether the social behaviors of children with ADHD differ as a function of the presence or absence of positively biased self-perceptions. Further, this is the first laboratory interaction task to identify specific component behaviors that may underlie differences in social functioning between children with ADHD and positively biased self-perceptions, children with ADHD but without positively biased self-perceptions, and comparison children. Results of this study support the idea that a positive bias in the social domain is maladaptive as children with this bias displayed significantly less prosocial behavior than did children without such a bias. Perhaps the most important point here is that there were no significant differences between children with ADHD who did *not* exhibit a positive bias and control children in terms of the level of their prosocial behavior. Similarly, our findings revealed that children with ADHD+PIB displayed more odd behavior and helplessness (on the item level) than control children and less effort than control children, yet there was not a significant difference between ADHD children without a positive bias and control children on these items or on this factor. These findings have several interesting implications. First, it is of note that our results suggest that merely grouping children as control vs. ADHD in future work may be insufficient; instead, we argue for the utility of grouping children in future research based on the presence or absence of a positive bias.

Second, and more importantly, the current results suggest that it may not be ADHD per se that is associated with poor social skills. Instead, it may be less skillful social behavior (more odd behavior, less positive behavior) on the part of children with ADHD in combination with biased self-perceptions that prevents children from accurately assessing and consequently altering their behavior in response to situational cues, thereby contributing to the maintenance of poor peer functioning in children with ADHD+PIB. This explanation is bolstered by the fact that we found no differences between our groups of children with ADHD on internalizing problems, externalizing problems, total problems, attention problems and ADHD problems on CBCL and TRF scales and no differences between our groups of children with ADHD on the number of hyperactive/impulsive symptoms, inattentive symptoms, oppositional defiant disorder symptoms, and conduct disorder symptoms endorsed by parents and teachers. If this is in fact the case, it may be the combination of ADHD status and positively biased self-perceptions that contributes to poor peer relationships in children with ADHD. Further, it may be the case that treatments for peer problems of children with ADHD should vary as a function of whether a child targeted for treatment also exhibits positively biased self-perceptions. We urge future researchers to explore these questions.

Lastly, although we do not know how the presence or absence of certain behaviors influences peer relationships among children with ADHD, it is not unreasonable to assume, for example, that positive social behavior is associated with greater liking amongst peers. More specifically, it is reasonable to expect that children who are engaged, friendly, and responsive throughout social interactions make better friends and are more attractive to peers. Along these lines, it is likely that peers find odd behavior and looking around the room during conversations aversive. Finally, because we found children with positively biased self-perceptions to be less effortful and more helpless during the social interaction task, it may be that the presence of this bias does in fact prevent these children from recognizing the need to change their behavior in social settings. Without this knowledge, we cannot expect children with this bias to improve their social behavior and act appropriately.

Although these are reasonable assumptions, the consequences of these specific behaviors in these children should be further examined.

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Highlights

- Examined positively biased self-perceptions and social behavior in children with ADHD
- Behaviors were coded within the context of a social interaction task
- Those without biased self-perceptions were more prosocial and effortful
- Provides insight into social problems of children with ADHD

Note. Columns with different subscripts are significantly different.

Figure 1.

Factor comparisons by subgroups (Controls, ADHD-PIB, and ADHD+PIB)

Table 1**Demographic Variables for Children with ADHD and Comparison Children**

Variable	Children with ADHD	Comparison children	<i>p</i>
Age, <i>M</i> (<i>SD</i>)	8.64 (.94)	8.74 (.93)	ns
Gender, <i>N</i> (%)			
Male	70 (80.5)	29 (76.3)	ns
Female	17 (19.5)	9 (23.7)	ns
Race, <i>N</i> (%)			ns
White	74 (86.0)	32 (84.2)	
Non-White	12 (14.0)	6 (15.8)	
Family Composition			ns
% 2 parents	70.1	86.8	
% 1 parent	29.9	13.2	
Father's Income, <i>N</i> (%) *			ns
\$40,000	32 (45.1)	12 (36.4)	
\$40,001	39 (54.9)	21 (63.6)	
Mother's Income, <i>N</i> (%)			ns
\$40,000	65 (77.4)	32 (86.5)	
\$40,001	19 (22.6)	5 (13.5)	
Father's Education, <i>N</i> (%)			ns
High School or Less	23 (31.5)	6 (17.6)	
Some College (< 4 yrs)	23 (31.5)	11 (32.4)	
4-yr College Degree	15 (20.5)	11 (32.4)	
Post-Graduate	12 (16.4)	6 (17.6)	
Mother's Education, <i>N</i> (%)			ns
High School or Less	17 (20.0)	7 (18.4)	
Some College (<4 yrs)	28 (32.9)	19 (50.0)	
4-yr College Degree	20 (23.5)	6 (15.8)	
Post-Graduate	20 (23.5)	6 (15.8)	
Child Behavior Checklist, <i>M</i> (<i>SD</i>)			<i>p</i> <.05
Externalizing T score	62.09 (9.16)	46.89 (8.47)	
Internalizing T Score	61.01 (9.85)	51.26 (10.16)	
Attention Problems T score	70.66 (9.15)	52.29 (3.81)	
ADHD Problems T score	68.91 (7.23)	52.24 (4.26)	
Total Problems T score	65.41 (7.60)	46.87 (10.14)	
Teacher Report Form, <i>M</i> (<i>SD</i>)			<i>p</i> <.05
Externalizing T score	61.67 (7.32)	48.54 (7.12)	
Internalizing T score	59.71 (9.42)	47.11 (8.20)	
Attention Problems T score	65.00 (7.91)	51.78 (3.36)	
ADHD Problems T score	66.78 (8.32)	52.11 (3.71)	
Total Problems T score	64.69 (7.55)	47.14 (6.80)	
Parent Disruptive Behavior			<i>p</i> <.05

Variable	Children with ADHD	Comparison children	<i>p</i>
Disorders Rating Scale, <i>M</i> (<i>SD</i>)			
Hyperactive/Impulsive symptoms	5.69 (2.52)	.34 (.75)	
Inattentive symptoms	6.33 (2.47)	.29 (.87)	
ODD symptoms	2.95 (2.29)	.21 (.74)	
CD symptoms	.47 (.78)	.00 (.00)	
Teacher Disruptive Behavior			<i>p</i> <.05
Disorders Rating Scale, <i>M</i> (<i>SD</i>)			
Hyperactive/Impulsive symptoms	5.45 (2.92)	.42 (1.08)	
Inattentive symptoms	5.75 (2.66)	.45 (1.03)	
ODD symptoms	2.43 (2.42)	.29 (.96)	
CD symptoms	.43 (.92)	.03 (.16)	

Note. N's differed across analyses due to missing data. Sample size for the ADHD group ranged from 72 to 87. Sample size for comparison children ranged from 33 to 38. ns=non-significant.

Table 2

Structure Matrix After Varimax Rotation

Factor	Prosocial	Negative style	Effort	Disruptive behavior
1. Friendly towards guest	.899	-.153	.056	-.064
2. Entertaining for guest and audience	.701	.074	.100	.274
3. Responsive to the guest	.661	-.345	.210	-.108
4. Reciprocity in conversation	.756	-.190	.212	.084
5. Engaged in conversation	.743	-.145	.264	-.219
6. Positive emotions	.888	-.144	.034	.110
7. Uses a pushy style	-.127	.856	.103	-.002
8. Frustrated with the interaction	-.236	.864	-.060	.172
9. Seeks adult help	.046	.710	-.453	.107
10. Negative Emotions	-.338	.848	-.037	.107
11. Use of different types of questions	.269	-.050	.618	-.039
12. Keeps conversation on task	.036	.545	.635	-.113
13. Helpless in their ability	-.221	.334	-.718	.065
14. Withdrawn behavior	-.345	-.079	-.578	-.106
15. Weird or odd behavior	.081	.055	-.171	.861
16. Appropriate verbalizations	-.045	-.226	.163	-.815
17. Fidgeting	-.107	-.038	.174	.650
18. Moving in seat	.076	-.169	.177	.471
19. Looking around the room	.146	.203	-.084	.588

Note. Bolded items are the items that loaded most highly on each factor.

Table 3

Item level ANOVA results

Item	Controls		ADHD-PIB		ADHD+PIB		F(2,122)
	M	SD	M	SD	M	SD	
Friendly+	3.43	.75	3.27	.97	2.71	.84	5.58**
Entertaining	1.78	.72	2.13	.94	1.62	.57	4.35*
Responsiveness+	4.10	.83	3.96	1.01	3.29	.87	6.46**
Reciprocity	2.99	1.38	2.94	1.42	2.49	1.06	1.23
Engaged+	4.68	.80	4.35	.95	3.38	.79	17.92***
Positive emotions	3.09	.85	2.92	1.04	2.42	.86	4.03*
Pushy	1.23	.56	1.56	.90	1.41	1.05	1.77
Frustrated	1.36	.58	1.76	.81	1.74	1.06	3.17*
Help	1.13	.26	1.30	.44	1.33	.56	2.26
Negative emotions	1.20	.34	1.50	.59	1.58	1.06	3.30*
Different questions	4.11	1.15	3.69	.92	3.50	1.03	3.35*
On task	5.02	1.12	5.08	.86	4.74	.90	1.22
Helpless ^a +	1.52	.60	1.65	.64	1.99	.85	4.67*
Withdrawn	1.50	.63	1.58	.73	1.87	.89	2.00
Odd behavior	1.20	.34	1.39	.73	1.61	.73	3.97*
Appropriate verbalizations	6.89	.22	6.80	.47	6.72	.40	1.42
Fidgeting+	3.07	1.01	3.76	1.21	3.83	1.19	6.98***
Seat	3.30	1.35	3.81	1.30	3.56	1.25	1.83
Looking around+	2.57	.95	2.96	.78	3.38	.99	5.61**

Note.

+remains significant after Bonferroni correction.

* p .05

** p .01

\$watermark-text

\$watermark-text

\$watermark-text

 p .001

χ^2 item reverse coded.