

Are the Performance Overestimates Given by Boys With ADHD Self-Protective?

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Tested the self-protective hypothesis that boys with attention deficit hyperactivity disorder (ADHD) overestimate their performance to protect a positive self-image. We examined the impact of performance feedback on the social and academic performance self-perceptions of 45 boys with and 43 boys without ADHD ages 7 to 12. Consistent with the self-protective hypothesis, positive feedback led to increases in social performance estimates in boys without ADHD but to decreases in estimates given by boys with ADHD. This suggests that boys with ADHD can give more realistic self-appraisals when their self-image has been bolstered. In addition, social performance estimates in boys with ADHD were correlated with measures of self-esteem and positive presentation bias. In contrast, for academic performance estimates, boys in both groups increased their performance estimates after receiving positive versus average or no feedback, and estimates were not correlated with self-esteem or social desirability for boys with ADHD. We conclude that the self-protective hypothesis can account for social performance overestimations given by boys with ADHD but that other factors may better account for their academic performance overestimates.

As might be expected of children who are consistently distractible, overactive, and impulsive, children with attention deficit hyperactivity disorder (ADHD) often do poorly in school. They experience more academic problems than their peers, frequently have difficulty meeting the social demands of the classroom, and receive more negative attention from their teachers and rejection by their classmates (Barkley, 1998; Johnston, Pelham, & Murphy, 1985; Whalen, Henker, & Dotemoto, 1981). One obvious concern for a group of children who so regularly encounter negative academic and social feedback is the potential for them to develop a low sense of ability in these areas. Paradoxically, however, research suggests that this is not the case. With respect to academic tasks, boys with ADHD generally expect to perform better than do boys without ADHD, despite the reality that they perform those tasks the same or even worse than boys without ADHD (O'Neill & Douglas, 1991; Whalen, Henker, Hinshaw, Heller, & Huber-Dressler, 1991). Recent studies suggest a similar pattern of overconfidence in the social

performance perceptions of boys with ADHD (e.g., Diener & Milich, 1997). For example, Hoza, Waschbusch, Pelham, Molina, and Milich (2000) found that boys with and without ADHD did not differ in their initial expectations of how good they would be at getting an unfamiliar boy to like them, although observers perceived the boys with ADHD as less socially effective than their non-ADHD counterparts.

Although these studies show that boys with ADHD have an unrelenting optimism with respect to estimating their academic and social performance, the cause of these confident expectations is far from certain. Milich (1994) outlined an explanation based on Dweck and Leggett's (1988) theory of children's motivational goals that states that children facing challenging tasks tend to be motivated by either learning or performance goals. Children with learning goals strive to improve their abilities and persist on difficult tasks until they are mastered. In contrast, children with performance goals are motivated to present themselves in a positive light. Given this orientation, it is not surprising that children with performance goals interpret challenging tasks as a threat to their self-esteem. Dweck and Leggett reviewed evidence showing that having a performance goal orientation creates a susceptibility for helpless behavior and negative cognitions when confronted with difficult tasks, conceivably because persistence in the face of failure only verifies a lack of ability. Milich hypothesized that boys with ADHD are motivated by performance goals. He reasoned that when boys with ADHD are confronted by difficult tasks, their self-esteem is threatened, causing them to give inflated performance

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estimates to portray a positive self-image and to either mask or ward off feelings of inadequacy (see also Diener & Milich, 1997). Thus, by overestimating their performance and avoiding tasks at which they may fail, boys with ADHD present themselves in a positive light. Viewed from this perspective, inflated performance estimates serve a self-protective function, as they allow boys with ADHD to portray a competent self-image.

In support of the self-protective hypothesis, boys with ADHD approach academic tasks like children who hold performance goals. Dunn and Shapiro (1999) reported that 85% of boys with ADHD, compared to only 40% of nonreferred control boys, chose tasks that allowed them to display their skills to others rather than learn a new skill. Boys with ADHD also respond to failure on academic tasks in a manner that is similar to children who hold performance goals. For example, when confronted by failure, boys with ADHD show more helpless behavior and frustration than boys without ADHD (Milich & Okazaki, 1994). Although suggestive, this research has not examined directly whether academic overestimates among boys with ADHD serve a self-protective function.

In the area of social performance, Diener and Milich (1997) provided a direct test of the self-protective hypothesis for ADHD boys' overestimates. They reasoned that if the self-protective hypothesis is correct, providing positive feedback to boys with ADHD should reduce their need to protect against threats to their self-esteem, resulting in them giving more realistic (lower) performance estimates. Consistently, boys with ADHD who received positive feedback after a social interaction with an unfamiliar boy gave lower performance estimates than boys with ADHD who received no feedback, whereas the opposite was true for boys without ADHD. Recently, Hoza et al. (2000) also reported support for the self-protective hypothesis using a social interaction task in which social success with a child confederate was manipulated. Although boys with ADHD gave more positive ratings of their social interactions than boys without ADHD, this effect was more prominent for boys with ADHD after an unsuccessful interaction. This supports the idea that boys with ADHD who are faced with failure make even more positive estimates of their performance to salvage their image. Support for the self-protective hypothesis was limited, however, as boys with ADHD displayed less helpless behavior during the interaction than boys without ADHD.

We conducted this investigation to further test the self-protective hypothesis. In particular, we extended the test to academic, as well as social, performance. We used an academic situation in which a teacher taught boys to complete mazes in a one-on-one situation. This format allowed us to test the self-protective hypothesis for both social (how much the boy thought the teacher

liked him) and academic (how well the boy thought he did the mazes) self-perceptions. Boys made academic and social performance predictions, were taught the mazes, and received one of three types of feedback: positive, average, or none. Given the performance overestimates of boys with ADHD found in previous studies, we considered average feedback to be akin to negative feedback (we did not use failure feedback for ethical reasons). Lastly, boys provided performance estimates.

Like Diener and Milich (1997), we predicted that if the self-protective hypothesis is correct, boys with ADHD who receive positive feedback will lower their estimates of their performance compared to boys with ADHD who do not receive feedback. Also consistent with Diener and Milich, we hypothesized that boys without ADHD will change their performance estimates consistent with the type of feedback provided and those who received positive feedback will increase their performance ratings relative to those who do not receive feedback. We extended the Diener and Milich study by reasoning that, if the self-protective hypothesis is correct, boys with ADHD who receive feedback that is lower than their initial performance predictions will feel an even greater need to protect themselves and subsequently exaggerate their positive performance estimates. Thus, we predicted that boys with ADHD faced with average feedback will increase their performance estimates relative to boys with ADHD who received positive or no feedback. Again, we expected that boys in the comparison group who receive average feedback will lower their estimates relative to those who receive positive feedback.

We also extended the research in this area by investigating three additional issues. First, we examined the relation between performance overestimates and self-esteem. Diener and Milich (1997) were somewhat unclear as to the relation between these two variables. One possibility is that the overestimating bias of boys with ADHD serves to convince the children of their own high self-esteem (i.e., self-denial; for a more detailed consideration of this alternative in other populations see Hughes, Cavell, & Grossman, 1997). In this case, the lower their self-esteem is, the more that boys with ADHD will engage in overestimation to convince themselves otherwise. Thus, we would expect a negative correlation between self-esteem and overestimates. Alternatively, self-esteem reports may also show an overestimation effect intended to create a positive impression and to convince others that they are capable (i.e., other-denial). In this case, boys with ADHD will overestimate both their self-esteem and their ability, although these reports may not reflect true feelings. In this study, we explore these possibilities by examining the correlations between self-esteem and overestimation in both boys with ADHD and boys without ADHD. Second, to further explore the extent to which

children engage in overestimation to present a positive image, we examined the relation between performance estimates and scores on a social desirability measure. If boys with ADHD are trying to protect their self-image by portraying themselves in an unrealistically positive light, then their performance estimates should be positively related to social desirability. Finally, previous studies have demonstrated an overestimation bias among aggressive boys. For example, Zakriski and Coie (1996) found that aggressive-rejected children were able to perceive and report the social status of others accurately but overestimated their own social status more than average or rejected children. Because of the overlap of ADHD and aggression (Hinshaw, 1987), we explored the relations between aggression and self-perceptions in our sample.

Method

Participants

Participants were 45 boys with ADHD and 43 boys without ADHD between 7 and 12 years of age. Participants were recruited through notices placed in community newsletters, community centers, and after-school child-care centers. Notices for boys with ADHD were also placed in parent support group newsletters (i.e., Children and Adults with Attention Deficit Disorder and Attention Deficit Disorder Support Association). Boys were excluded if there was evidence of mental retardation or pervasive developmental disorders (based on maternal report). Boys in the control group were excluded if they showed problems with two or more of the following: learning disabilities, clinically significant *T* scores on the internalizing or externalizing scales of the Child Behavior Checklist (CBCL; Achenbach, 1991), and mental health problems. Boys in the ADHD group were excluded if they were prescribed medication for treatment of their ADHD other than stimulant medication (e.g., antidepressants) because they needed to be medication-free for this study. Thirty-one of the 45 boys with ADHD were being treated with stimulant medication. These boys were withdrawn from their medication for at least 24 hr before completing the task.

Inclusion criteria for the ADHD group were as follows: maternal report that the boy was diagnosed with ADHD by a qualified professional, a *T* score in excess of 60 on the CBCL Attention Problems subscale (Achenbach, 1991), and maternal reports that the child met the ADHD criteria set forth in the current *Diagnostic and Statistical Manual of Mental Disorders* (4th ed. [DSM-IV]; American Psychiatric Association, 1994). This last criterion included having at least six symptoms on the inattentive or hyperactive-impulsive dimensions, symptoms across situations, onset prior to

age 7, and impairment as a result of these symptoms. To determine the number of ADHD symptoms that their sons had, mothers rated their sons' behavior over the past 6 months on the 18 ADHD DSM-IV symptoms on a 4-point scale ranging from 0 (*never or rarely*) to 3 (*very often*; DuPaul, Power, Anastopoulos, & Reid, 1998). For the purposes of this study, ratings above the mid-point were counted as a present symptom. Reliability is supported by high internal consistencies and good stability for parents' ratings over a 1-month interval (DuPaul et al., 1998). Based on mothers' ratings, 15 boys in our sample met criteria for the ADHD-inattentive subtype, 5 for the ADHD-hyperactive-impulsive subtype, and 26 for the ADHD-combined subtype.

Mothers of boys with ADHD were also asked to rate their sons' behavior on the DSM-IV symptoms of oppositional-defiant disorder (ODD) using a 0 (*never or rarely*) to 3 (*very often*) scale. Again using ratings above the mid-point of the scale to indicate a present symptom, 30 of the 45 boys with ADHD in our sample had the minimal number of symptoms required by the DSM-IV definition of ODD.

The average socioeconomic status (SES) of families was middle class for the ADHD group and middle to upper-middle class for the non-ADHD group. The ethnicity of both groups was mainly North American (40 of the ADHD group, 35 of the control group), with European the next most common (3 of the ADHD group, 3 of the control group). In the ADHD group, there was 1 family of Asian descent, and 1 family of mixed (Aboriginal and Caucasian) descent. In the control group, there was 1 family of African descent and 1 family of East Indian descent. For 3 families in the control group, ethnicity information was missing. With the exception of a lower proportion of Asian participants, this sample is generally representative of the ethnicity in the study location. Further information on the composition of the groups is available in Table 1.

Procedure

This research was approved by our university's ethics review committee. When a mother contacted the lab to express interest in the study, a research assistant returned her call to explain the study and administered screening criteria. On their arrival in the lab, mothers and boys met the research assistant and teacher, and mothers consented and boys assented to participate. The task began with the research assistant and boy alone, and the research assistant explained to the boy that the teacher was going to teach him how to do some mazes. She then asked the boy his favorite color, how many siblings he had, and to complete the self-esteem and social desirability measures and provide estimates of how well he expected to do on the mazes and how much he thought the teacher would like him. The re-

Table 1. Means and Standard Deviations for Participant Characteristics

	ADHD Group (n = 45)		Control Group (n = 43)	
	M	SD	M	SD
Child's age (years, months)	9, 10	8.12	9, 5	8.27
Mother's age (years)	38.52	5.77	39.79	4.49
Father's age (years)	41.88	7.64	42.61	6.34
Number of children in the home	1.38	1.13	1.31	1.32
Number of mothers currently married		31		34
Years married	13.53	6.85	12.98	5.05
Children in learning assistance		17		1
Child Behavior Checklist T scores				
Internalizing	63.73	10.20	50.33	9.52
Externalizing	65.68	8.81	48.87	9.49
Attention problems	72.19	7.65	53.72	5.67
Total score	68.78	7.59	50.00	8.84
Number of mother-reported DSM-IV symptoms				
ADHD inattentive (out of 9)	7.70	1.79	—	
ADHD hyperactive-impulsive (out of 9)	6.50	2.36	—	
ODD (out of 8)	4.77	2.07	—	

Note: ADHD = attention deficit hyperactivity disorder; DSM-IV = *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; APA, 1994); ODD = oppositional defiant disorder.

search assistant then reintroduced the boy to the teacher and left the room. The teacher gave the boy a sample maze and standard set of instructions, including, keep the pencil on the paper, avoid entering blind alleys, stay inside the lines, work from the start to finish, and work quickly while avoiding mistakes. The teacher asked the boy do a sample maze and provided corrections from a standard set of comments if necessary (e.g., "keep your pencil on the paper"). Next, the teacher presented a package of nine increasingly difficult mazes (as determined by the number of choices and blind alleys). These mazes were designed specifically for this study because previous experience with the mazes may have influenced the results. After the boy completed the test mazes, the teacher indicated she would take a brief break to score the mazes but would return to do more. The teacher then waited in the hall and completed a rating of how much she liked working with the boy.

After a brief pause designed to make the feedback believable, the research assistant entered the room and gave the boy one type of randomly prechosen performance feedback: (a) positive ("I have great news. I just saw the teacher in the hall and she said you did excellent, way better than most kids your age. Like, you finished up much quicker than most boys. She said she was very impressed and really enjoyed working with you. Way to go!"), (b) average ("I have some news. I just saw the teacher in the hall and she said you did average, which is about in the middle of most kids your age. Like, you finished up about as quickly as the average boy. She said she thought of you and worked with you like an average boy. Okay then."), and (c) none ("I was thinking ... the two of us have something in common. Remember those questions that we did when you first came in? You said [boy's favorite color] was your

favorite color—that's my favorite color, too. That's cool! I can tell you put a lot of effort into those questions and I enjoyed doing them with you"). We included this chat in the no performance feedback condition to control for the length and the positive emotion created by the positive performance feedback to ensure that effects obtained were due to the content of the positive feedback, rather than the positive interaction created by positive feedback. The boy then estimated his performance on the mazes and how much he thought the teacher liked him. There were 15 boys per group in each feedback condition, with the exception of 14 boys in the control groups receiving average and no performance feedback.

When the experimental protocol ended, the research assistant fully debriefed the boy, and none expressed suspicion about the true nature of the study. Boys were given a t-shirt and mothers \$15 in appreciation for their participation.

Training of Teachers and Research Assistants

Ten female university students acted as the teachers. All teachers memorized a detailed script and were trained by the first author to avoid positive and negative feedback about each boy's performance or the boy himself and to use only neutral comments (e.g., "I see," "hmm"). Teachers were blind to the type of feedback that the boy was to be given and to the boy's diagnostic status. Research assistants were three undergraduate female students who were also trained and followed a detailed script in interactions with the boys. The first author reviewed 18 tapes from the ADHD group and 17 of the control group (38.89%) to ensure that teach-

ers and research assistants adhered to their scripts. No teachers deviated from the script. For research assistants, 2 participants in the control group were excluded because the research assistant deviated from the script when giving feedback.

Measures

Child Behavior Checklist (CBCL; Achenbach, 1991). The CBCL problem scales contain 114 items that parents rate from 0 (*never true*) to 2 (*often or always true*) of their child. These items have been grouped into subscales on the basis of factor analytic results (e.g., attention problems), as well as broadband factors reflecting internalizing (withdrawal, somatic complaints, and anxious/depressed behavior) and externalizing (delinquent and aggressive behavior) symptoms. There is evidence for good test–retest reliability over 7 days (average, 0.89) and interparent agreement (average, 0.70).

Self-Perception Profile for Children (SPPC; Harter, 1985). The SPPC is a 36-item measure that asks children to respond on a 4-point scale to statements that indicate self-perceptions in several areas. For the purposes of this study, only the six global self-worth items were used. The internal consistencies for the global self-worth items range from .78 to .84 for children in Grades 3 through 8 (Harter, 1985).

Children's Social Desirability Scale (CSDS; Crandall, Crandall, & Katkovsky, 1965). The CSDS is a 48-item measure (26 items keyed true) that asks children to respond "true" or "false" to statements that are considered unrealistically positive portrayals of one's self (e.g., "I always finish my homework on time"). Good evidence for reliability has been reported, with split-half reliabilities ranging from .82 to .95 (Crandall et al., 1965). Convergent validity is supported by moderate correlations with other measures of socially desirable responding (Crandall et al., 1965).

Maze performance. Boys' actual maze performance was scored by the first author (who was blind to diagnostic status) using the following criteria: (a) number of out-of-boundary pencil marks (i.e., a pencil mark that went outside the alley); (b) number of entries into blind alleys (i.e., attempts to go down an alley that had no exits); and (c) number of mazes failed (i.e., mazes for which the boy did not find a correct solution).

Pre-task teacher liking and academic performance estimates. These questions were based on those asked by Diener and Milich (1997). Before boys were taught how to do the mazes, the research assistant asked the boys to make two ratings on 9-point Likert

scales with five anchors. Each boy was asked how much he thought the teacher would like him (teacher liking estimate; from 1 [*not at all*] to 9 [*a whole lot*]) and how well he thought he would do on the mazes (academic performance estimate; from 1 [*bad*] to 9 [*excellent*]).

Post-feedback performance estimates. These questions were also based on those used by Diener and Milich (1997). Four questions were used to develop a post-feedback social performance score: (a) How much do you think the teacher liked working with you? (b) How much do you think the teacher liked teaching you the mazes? (c) How much do you think the teacher liked you? and (d) How helpful was the teacher to you? The same 9-point scale with five anchors that was used for the pre-task teacher-liking question was used for these questions (i.e., from 1 [*not at all*] to 9 [*a whole lot*]). The internal consistency was .71.

Boys were also asked four questions to assess their post-feedback academic performance estimates: (a) How well do you think you did on the mazes? (b) How well do you think you'll do on the mazes when the teacher comes back? (c) How well would you have done without the teacher? and (d) How hard were the mazes for you? The same 9-point Likert scale with five anchors was used for these questions (i.e., from 1 [*bad*] to 9 [*excellent*]). These four questions were summed together for a post-feedback academic rating; however, this resulted in a low internal consistency (.58). Thus, we decided to exclude the last item because it had the most problematic correlations with the other items. This resulted in acceptable internal consistency (.67).

Teacher ratings of liking the boy. After teachers taught the boys to complete the mazes, they made ratings of how much they liked each boy. This question was modeled after the pre-feedback question asked of boys and was on a Likert scale with five anchors (ranging from 1 [*not at all*] to 9 [*a whole lot*]).

Results

Participant Characteristics

Independent samples *t* tests and chi-squares were used to determine if any demographic differences existed between the ADHD and non-ADHD groups. No significant differences based on child age, mother age, father age, number of children at home, marital status, number of years married, or ethnic group were found ($ps > .22$); however, there was a significant difference in SES, such that the ADHD group was of lower SES, $t(1, 87) = 2.09, p < .05$, effect size = .40 standard deviations. Thus, SES was used as a covariate in ensuing analyses.

Table 2. Means and Standard Deviations for Boys' Prefeedback Reports of Their Self-Perceptions and Their Actual Performance

	ADHD Group			Control Group		
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range
Boys' estimate						
Teacher liking estimates ^a	7.30	1.37	2-9	7.96	1.43	3-9
Maze performance estimates ^a	7.06	1.69	4-9	7.30	1.37	4-9
Teachers' estimates of liking the boy ^a	6.13	1.21	2-8	7.12	1.18	3-9
Maze performance						
Out-of-boundary marks	9.76	7.05	0-27	5.68	3.99	0-14
Dead-end entries	14.81	8.59	0-33	9.91	6.80	0-24
Average mazes failed	.18	.39	0-3	.05	.28	0-2

Note: ADHD = attention deficit hyperactivity disorder.

^aEstimates were assessed on a 1 to 9 scale, with higher scores indicating higher estimates.

Group Differences on Pre-Task Performance Estimates

Before conducting analyses, the distribution of each variable was checked for normality and outliers (defined as more than two standard deviations from the mean). The distributions were normal and there were no outliers, indicating that assumptions for statistical tests were met. Effect sizes are generally reported in eta-squared units, the proportion of variance explained by the independent variable (similar to the R^2 term in multiple regression; Weinfurt, 1995).

To test the hypothesis that boys with ADHD would inflate predictions of their academic and social performance relative to boys without ADHD, univariate analyses of covariance (ANCOVAs), with two groups (ADHD and non-ADHD) and SES as the covariate were used to compare boys' expectations before they were taught the mazes. Means and standard deviations for each group on these measures are presented in Table 2.

Teacher liking estimates. Boys' estimates of how much they thought the teacher would like them were high and did not significantly differ between groups ($p > .13$). However, teachers liked working with boys with ADHD significantly less than comparison boys, $F(1, 81) = 6.97, p < .01$, eta squared = .09.¹

Also of interest, we conducted a repeated measures ANCOVA for each group to compare how much boys expected to be liked with how much the teachers actually reported liking them (repeated measure), with SES as the covariate. There was a tendency for boys with ADHD to expect the teacher to like them more than the

teacher actually did, $F(1, 40) = 3.36, p < .07$, eta squared = .07, whereas comparison boys did not have this tendency, $p > .25$.

Academic performance estimates. Boys' estimates of how well they would perform on the mazes were high and not significantly different between groups ($p > .40$). We tested the idea that boys with ADHD overpredicted their performance by examining differences in the actual performance of the boys in the two groups. As expected, the performance of boys with ADHD was significantly worse than control boys: They showed more out-of-boundary pencil marks, $F(1, 83) = 6.25, p < .02$, eta squared = .07; showed more dead-end entries, $F(1, 83) = 8.36, p < .005$, eta squared = .10; and tended to fail more mazes, $F(1, 83) = 2.41, p < .09$, eta squared = .06. See Table 2 for descriptive information.

Post-feedback performance estimates. Before conducting analyses, distributions were checked for normality and outliers (as defined previously). We found one outlier (at 2.25 *SD*) in the ADHD group that received average feedback. To check on the influence of this score, we conducted all tests with and without the outlier and found no difference in results. Therefore, the outlier is included.

We conducted 2 (Group: ADHD and control) \times 3 (Feedback: positive, average, and none) ANCOVAs, using SES as the covariate. Descriptive information is available in Table 3. Because our hypotheses were made in terms of the change in performance ratings that feedback brought about, consistent with Diener and Milich (1997), we used a difference score (post-feedback estimate - pre-feedback estimate) as the dependent variable. We considered the alternative of conducting a repeated measures ANCOVA with time (pre-post-feedback) as a within-participants variable, to avoid using difference scores. However, the repeated measures approach was considered inappropriate because this model would test the main effect of feedback

¹Because teachers interacted with boys in both groups, we also conducted dependent tests to examine group differences. In cases for which teachers rated different numbers of boys in each group, scores for boys in the group for which there were more scores available were randomly chosen to equal the number of ratings available for the other group. This was also significant, $t(1, 22) = 2.50, p < .02$, eta squared = .25), such that boys in the ADHD group were liked less than comparison boys.

Table 3. Descriptive Information for Pre-Post-Feedback Difference Scores

	ADHD Group			Control Group		
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range
Teacher liking estimates ^a						
Positive feedback	1.39	1.36	-3.60-1.20	38	1.70	-2.00-3.00
Average feedback	.25	2.45	-2.80-5.60	.78	1.59	-2.00-3.13
No feedback	.22	2.35	-3.80-3.20	.20	1.36	-2.80-2.80
Academic performance estimates ^a						
Positive feedback	.53	1.97	-3.47-4.00	.59	1.19	-1.33-3.33
Average feedback	.96	1.50	-3.67-1.33	.91	1.20	-3.00-1.40
No feedback	.52	1.73	-3.00-2.67	.41	1.65	-3.67-2.33

Note: ADHD = attention deficit hyperactivity disorder. Scores are differences (post-feedback estimate-pre-feedback estimate). Maximum/minimum possible values ± 8 .

^aEstimates were assessed on a 1 to 9 scale; higher scores indicate higher estimates

using an average of the pre- and post-feedback scores, which would not reflect the true impact of feedback. It is notable that we did perform a repeated measures ANCOVA, which led to the same results and hence the same post hoc analyses as reported.²

Post-feedback teacher-liking estimates. There was a significant Group \times Feedback interaction for the teacher-liking estimate pre-post difference scores, $F(2, 84) = 3.51, p < .04$, eta squared = .08. Although the appropriate post hoc procedures are *t* tests, we used ANCOVAs because it was necessary to covary SES. First, within each feedback condition, we compared the teacher-liking pre-post-feedback difference scores by boys with ADHD to those by boys without ADHD. In the positive feedback condition, the Group effect was significant, $F(1, 28) = 6.34, p < .01$, eta squared = .20, such that positive feedback resulted in significant decrements of teacher-liking for boys with ADHD relative to boys without ADHD. In the average and no feedback conditions, boys with and without ADHD did not significantly differ ($ps > .11$).

Next, we tested the differences between the feedback conditions for boys in the two groups separately. For the ADHD group, teacher-liking ratings dropped significantly for boys with ADHD who received positive feedback compared to those who received no feedback, $F(1, 30) = 5.12, p < .04$, eta squared = .16, and average feedback, $F(1, 30) = 4.20, p < .05$, eta squared = .14. However, the average and no feedback comparison was not significant for boys with ADHD, $p > .40$. In contrast, for comparison boys, average feedback resulted in a significant drop in teacher-liking ratings rel-

ative to positive feedback, $F(1, 28) = 4.12, p < .05$, eta squared = .14, and no feedback, $F(1, 29) = 4.09, p < .05$, eta squared = .14. However, the contrast between positive and no feedback was not significant for boys in the comparison group ($p > .12$). See Figure 1 for the pattern of change in each of the feedback conditions.

Comparisons of boys' and teachers' ratings of liking. To examine the difference between how much boys thought they were liked by the teacher versus how much the teacher liked them, we conducted repeated measures ANCOVAs with rater (boy vs. teacher) as the within-participant variable and SES as the covariate for each group and feedback type. Interestingly, boys with ADHD who received positive feedback no longer gave higher reports than teachers, $p > .53$, although boys with ADHD who received average and no feedback tended to rate themselves as more liked than the teachers rated them, $F(1, 13) = 3.45, p < .06$, eta squared = .08, and $F(1, 13) = 3.40, p < .07$, eta squared = .07, respectively. For control boys, none of these comparisons were significant, $ps > .15$.

Post-Feedback Academic Performance Estimates The 3 (Feedback) \times 2 (Group) ANCOVA for academic performance estimate difference scores resulted in a significant main effect of feedback, $F(2, 84) = 5.64, p < .005$, eta squared = .13, but group and interaction effects were nonsignificant ($ps > .30$). Consistent with the procedure taken with the teacher-liking ratings, we used ANCOVAs as the post hoc procedure. There were significant differences between positive and no feedback, $F(1, 55) = 5.03, p < .02$, eta squared = .09, and positive and average feedback, $F(1, 57) = 11.89, p < .001$, eta squared = .18, conditions, such that positive feedback resulted in a relatively larger increase in maze performance perceptions relative to average or no feedback. However, the difference between average and no feedback was not significant ($p > .35$). See Figure 2 for the pattern of change.

²Because our hypothesis was that boys with ADHD would feel an even greater need to prove themselves after receiving average feedback because this falls below their high expectations, we also conducted these analyses excluding the 6 participants who had not expected greater than average academic or teacher liking. The results did not change. Similarly, a comparison within the ADHD group of the self-perceptions of boys on and off medication revealed no significant differences.

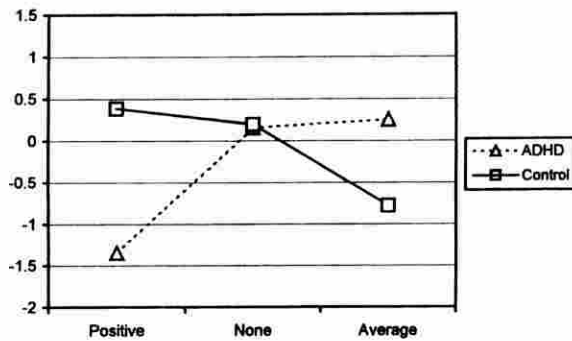


Figure 1. Pre- to post-change in teacher-liking estimates given by boys with and without ADHD.

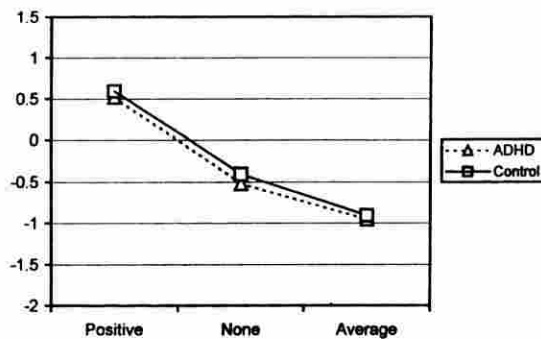


Figure 2. Pre- to post-change in academic performance estimates given by boys with and without ADHD.

Person-centered data. To provide a description of boys' changes in their self-perceptions on an individual level, we examined the number of boys whose ratings went up, down, or did not change from pre- to post- for each type of feedback. As can be seen in Table 4, these proportions of changes are consistent with the means as examined by the ANCOVAs reported previously. For example, the majority of ADHD boys (12 of 15) who received positive feedback reported lowered teacher-liking self-perceptions, with only 1 boy increasing his report. For academic ratings, the majority of boys in both groups who received positive feedback reported heightened self-perceptions (9 of 15 in both groups).

Relations Among Self-Perceptions, Social Desirability, and Self-Esteem

Group differences in global self-worth and social desirability. We conducted ANCOVAs with two groups (ADHD and control), controlling for SES, to examine group differences in SPPC and CSDS scores. For SPPC scores, there was no effect of group, $p > .25$, indicating that the global self-worth ratings of boys with and without ADHD did not differ (control boys' $M = 20.17$, $SD = .54$; ADHD boys' $M = 19.62$, $SD =$

.53). Similarly, there was no effect of group for CSDS scores, $p > .11$, indicating that boys with and without ADHD had similar positive self-presentation biases (control boys' $M = 21.64$, $SD = .92$; ADHD boys' $M = 20.02$, $SD = .90$).

Social desirability. For boys in the ADHD group, teacher-liking expectations were significantly correlated with the CSDS, $r(43) = .51$, $p < .001$, indicating that boys with ADHD who have a more unrealistically positive self-presentation style also made higher estimates of how much the teacher would like them. However, the academic performance estimates were not significantly related to CSDS scores for boys with ADHD, $r(43) = .14$, $p > .35$. For control boys, the opposite pattern was seen. That is, CSDS scores were not significantly correlated with teacher-liking expectations, $r(42) = .23$, $p > .14$, but were with academic performance estimates, $r(42) = .44$, $p < .004$, indicating that comparison boys who have a more unrealistically positive self-presentation style also report higher academic self-expectations.

Global self-worth. For boys in the ADHD group, teacher-liking expectations were significantly correlated with global self-worth, $r(44) = .55$, $p < .003$, suggesting that boys with ADHD who report higher global self-worth gave higher estimates of how much they thought that the teacher would like them. However, academic performance predictions and global self-worth were not significantly related, $r(44) = .17$, $p > .35$. For boys in the control group, global self-worth ratings were not significantly related to either teacher liking, $r(42) = .26$, $p > .10$, or academic performance, $r(42) = .18$, $p > .26$, expectations.

Self-worth and social desirability. The correlation between global self-worth and social desirability was significant for boys with ADHD, $r(44) = .52$, $p < .004$, but not for comparison boys, $r(41) = .25$, $p > .11$. This suggests that boys with ADHD who presented themselves more idealistically reported more favorable perceptions of self-worth.

Relations Among Self-Perceptions, Aggressive Behavior, and ADHD Subtype

To examine the relation between aggression and performance estimates, we correlated the CBCL Aggression subscale with boys' pre-feedback performance estimates in both the ADHD and control groups. Expectations of teacher-liking were not significantly correlated with Aggression scores (ADHD group, $r(42) = .14$, $p > .41$; control group, $r(42) = -.14$, $p > .46$), indicating that how much boys expected the teacher to like them was unrelated to mother-reported aggressive be-

Table 4. Percentages of Boys Increasing, Maintaining, and Decreasing Their Self-Perception Ratings Depending on the Type of Feedback Received

	ADHD Group			Control Group		
	Increase	Maintain	Decrease	Increase	Maintain	Decrease
Teacher liking estimates						
Positive feedback	6.67	13.33	80.00	46.67	13.33	40.00
Average feedback	40.00	20.00	40.00	21.43	7.14	71.43
No feedback	53.33	6.67	40.00	42.86	28.57	28.57
Academic performance estimates						
Positive feedback	60.00	6.67	33.33	60.00	20.00	20.00
Average feedback	6.67	33.33	60.00	7.14	35.71	57.14
No feedback	20.00	26.67	53.33	42.86	7.14	50.00

Note: ADHD = attention deficit hyperactivity disorder.

havior on this measure. Academic performance estimates were also uncorrelated with the Aggression subscale (ADHD group, $r(42) = .07, p > .67$; control group, $r(42) = .08, p > .63$). We also tested for differences in both social and academic self-perceptions within the ADHD group using ODD comorbidity as a grouping variable and found no significant differences. Thus, it appears unlikely that aggression as reported on these scales could account for the overestimation effects found among the boys with ADHD.

Impact of ADHD subtype. To examine subgroup differences, we repeated the analyses, using only boys who met ADHD-combined or hyperactive-impulsive criteria. The results did not change. We did not conduct this analysis for boys with ADHD-inattentive subtype because our small sample sizes limited our ability to detect group differences. Finally, to further test for differences in self-perceptions within the ADHD group, we conducted the previous analyses for the ADHD group using only ADHD subtype as the grouping variable. All tests were nonsignificant ($ps > .20$).³

Discussion

A plethora of research has documented that boys with ADHD overestimate their performance relative to their non-ADHD peers or their actual performance, or both (Deiner & Milich, 1997; Hoza et al., 2000; Milich, 1994). Our study provides further evidence of a self-enhancing bias in ADHD boys' estimates of their social and academic performance. Our primary intention, however, was to test the self-protective hypothesis as an explanation for why boys with ADHD overpredict their performance in these areas. To this end, the results of this investigation are surprising: Although we found considerable support for the self-pro-

jective hypothesis as an explanation for ADHD boys' estimates of how much the teacher would like them, the results of their academic performance estimates were clearly incompatible with this hypothesis.

To begin with our evidence that boys with ADHD overexpected their social performance, we found that boys with ADHD did not differ significantly from comparison boys in their ratings of how much they expected a teacher to like them, despite the fact that teachers liked boys with ADHD significantly less than they liked boys without ADHD. Importantly, boys with ADHD tended to overestimate their likeability compared to how much the teacher actually liked them, whereas control boys did not. This finding is consistent with past research on expectations of peer-liking (Deiner & Milich, 1997; Hoza et al., 2000) but is noteworthy because it is the first to our knowledge to document expectations of teacher-liking. With respect to predictions of academic performance, we similarly did not find a significant difference between the academic performance expectations of boys with and without ADHD. This finding is at odds with previous documentations that boys with ADHD offer inflated performance estimates relative to boys without ADHD (e.g., Milich & Okazaki, 1991). However, we did find evidence that boys with ADHD inflated their estimates relative to their actual performance, as they performed worse on the mazes than boys without ADHD despite their similarly high expectations.

The results of the teacher-liking estimates also provide a compelling argument for the self-protective hypothesis. As we hypothesized, boys with ADHD who received positive feedback dropped their estimates of how much the teacher liked them relative to boys with ADHD who received no feedback. This is consistent with the explanation that boys with ADHD offer inflated predictions in an effort to prove themselves to others; only when their success is confirmed can they shed their mask of grandiosity and reveal their substantially lower perceptions. Furthermore, boys with ADHD who received positive feedback no longer overestimated how much they were liked by the teacher, al-

³We also conducted the analyses again for the ADHD group only, comparing boys who are currently prescribed stimulant medication to those who are not. The results were not significant ($ps > .25$).

though boys with ADHD who received no feedback did. These results mirror those of Diener and Milich (1997), who found that positive feedback about a social interaction with a peer led to lower performance estimates in boys with ADHD as compared to no feedback. However, our results add meaningfully to the literature because, unlike Diener and Milich, our no performance feedback condition entailed a positive interaction between the research assistant and boy to ensure that the two conditions varied only by content (and not by the positive interaction or sense of rapport created by the positive feedback). That these two conditions had significantly different outcomes further bolsters the self-protective argument that the teacher-liking overestimates of boys with ADHD are motivated by a desire to present a positive self-image to others.

We had expected that average feedback would function as negative feedback and therefore enhance the threat to self-esteem, resulting in boys with ADHD giving even more positive performance estimates compared to those who received no feedback. However, no significant difference was found between these conditions. Perhaps the underlying assumption of boys with ADHD is that others consider them socially average, and therefore their reactions are comparable if they receive average feedback or no feedback at all. Nonetheless, this finding does not contradict the self-protective hypothesis, as boys with ADHD continued to overestimate their performance after receiving average feedback. It is important to note that the findings with ADHD boys were in contrast to those with boys in the comparison group, for whom average feedback led to significant decrements in ratings relative to positive or no feedback. Perhaps comparison boys begin with an assumption that their teacher will like them, and thus they react to positive feedback in a way that is similar to receiving no feedback at all.

We found further support for the self-protective explanation for ADHD boys' inflated predictions of teacher-liking. First, there was a significant positive correlation between expectations of being liked by the teacher and a social desirability responding bias in the ADHD sample but not in the comparison sample. This is consistent with the self-protective explanation that boys with ADHD are compensating for their inadequacies by assuming an unrealistically positive self-presentation. Second, expectations of being liked by a teacher were significantly related to global self-worth reports for boys with ADHD but not comparison boys. Again, this is consistent with the self-protective hypothesis of the overestimation of boys with ADHD working to mask feelings of inadequacy. In summary, the support for the self-protective hypothesis for teacher-liking estimates found in our study, taken together with the previous support for peer-liking perceptions found by Diener and Milich (1997), provides persuasive evidence that the social

performance overestimates of boys with ADHD serve a self-protective function.

Obviously, the increased realism of the social performance estimates of boys with ADHD that were invoked by positive feedback and the correlations with self-worth and socially desirable responding do not imply that these boys are aware of and able to perceive all of their deficiencies. However, it is interesting that global self-worth reports were correlated with social desirability scores only for ADHD boys. Thus, although boys with and without ADHD had similar self-esteem scores and similar degrees of socially desirable reporting bias, the reports of self-worth made by boys with ADHD were influenced by their attempts to portray a positive image. This suggests that boys with ADHD are trying to cover up their feelings of inadequacy (i.e., deceive others) rather than trying to ward them off (i.e., deceive themselves). However, the extent to which the performance overestimates of boys with ADHD, in both social and other realms, may serve an other-deceptive versus self-deceptive function, and the extent to which the mechanisms underlying the over-estimates are within the child's awareness (Hughes et al., 1997; Zakriski & Coie, 1996) are questions that await future research.

In contrast to the findings for social performance estimates, we failed to find any evidence for the utility of the self-protective hypothesis in explaining ADHD boys' academic performance estimates. We had expected to find support for the self-protective hypothesis because of evidence that boys with ADHD share similarities with children who hold performance goals; for example, they tend to choose tasks that allow them to display their skills rather than learn (e.g., Dunn & Shapiro, 1999). In addition, the self-protective hypothesis is based on Dweck and Leggett's (1988) theory of children's motivational goals, which has been applied predominantly to children's behavior on academic tasks. However, in contrast to our expectations, the impact of feedback on maze performance estimates given by boys with ADHD closely paralleled those of control boys, such that positive feedback significantly increased performance ratings relative to average or no feedback for both groups. Also discordant with the self-protective hypothesis, academic performance expectations were not related to social desirability for boys with ADHD. In fact, it was the comparison boys' academic estimates that were correlated with social desirability, indicating that their attempts to portray a generally positive image were related to their reports of academic competency. For both groups of boys, self-worth was not related to academic expectations, indicating that their self-esteem was not invested in these ratings.

In sum, we found no evidence that ADHD boys' estimates on academic tasks can be explained by the self-protective hypothesis. Combined with findings by

Milich and colleagues (see Milich, 1994) indicating that attributions offered by boys with ADHD for their academic performance cannot be explained by Dweck and Leggett's (1988) model, our results suggest that other reasons for the academic overestimates of boys with ADHD should be explored. One possibility is that boys with ADHD are inaccurate judges of their academic performance and that their high estimates reflect what they truly believe is above average academic ability rather than an effort to impress others. This hypothesis is compatible with previous findings that boys with ADHD react to academic failure in similar ways to children who hold performance goals, such as with quitting and frustration (e.g., Milich & Okazaki, 1991). It is plausible that if boys with ADHD have a true belief in their academic prowess and wish to display this to others, this belief may combine with emotional dysregulation that typifies boys with ADHD (Barkley, 1998), culminating in aggravation and subsequent premature quitting when their goals are not met.

What could account for the striking differences between the social and academic performance estimates? Perhaps the most obvious possibility is that boys with ADHD care more about their social relationships than their academic performance, and so their self-esteem is more invested in social interactions. This is supported by findings that boys with ADHD show more helpless behavior on academic tasks than boys without ADHD (Milich & Okazaki, 1991), but less helpless behavior during peer interactions than boys without ADHD (Hozza et al., 2000). That is, boys with ADHD may persist longer with social interactions because they are more important to them, whereas they give up on academic tasks because this kind of achievement is not as central to their sense of self. Indeed, informal observation of the boys during the task revealed that they put in a great deal of effort to be agreeable during the experiment relative to their behavior following the experiment.

The conclusions we offer here are tentatively drawn for ADHD boys in general, as we failed to find differences in self-perceptions within the ADHD group depending on ADHD subtype, comorbid ODD, and medication status. However, it is important to acknowledge that such differences may exist and that our limited group size restricted our statistical power to detect them. For example, medication treatment may increase the child's chance of academic success and positive social interactions (DuPaul, Barkley, & Connor, 1998), possibly altering his self-perception. Furthermore, it might be expected that depending on the subtype of ADHD, boys would differ in their self-perceptions, as children with the inattentive subtype have more academic and cognitive difficulties and those with the combined or hyperactive-impulsive subtype tend to have more difficulties socially (e.g., Cantwell & Baker, 1992). Nevertheless, it is important to point out that children with all subtypes of ADHD are at risk for dis-

playing some academic and social problems (e.g., Barkley, 1998), and this may mitigate differences in self-perceptions across subtypes. We encourage future researchers to clarify this issue.

Boys with ADHD are not alone in their tendency to overestimate their performance. Numerous studies indicate that children identified as aggressive by their peers are likely to overestimate their performance (e.g., Hymel, Bowker, & Woody, 1993; Zakriski & Coie, 1996). Because many boys with ADHD also show aggressive behaviors, it is possible that the tendency to overestimate performance seen in this sample was more attributable to aggression than to ADHD. However, we found no relation between self-perceptions and maternal reports of aggression on the CBCL in either of our groups, and we found no evidence that ODD comorbidity influenced the results within the ADHD group. Thus, we believe that co-occurring aggression among the children with ADHD is not an adequate explanation for our findings. It should be noted that the measures of aggression employed in this study were limited. First, the CBCL aggression scale is composed of many items that do not directly tap aggression (e.g., "talks too much"). In addition, although children with ODD are well known to be aggressive (Hinshaw & Anderson, 1996), the conditions are not synonymous. Future research exploring the influence of both ADHD and aggressive behavior on children's estimates of their performance is needed.

This study significantly extends research on the self-perceptions of boys with ADHD. The information gathered here expands on the results of Diener and Milich (1997) with respect to overestimates of social performance, as we included a positive interaction in the no feedback group, included an average feedback condition, and examined correlations of performance predictions with social desirability and self-esteem. Furthermore, we included academic performance self-perceptions. However, there are limitations inherent to the study, such as the small number of boys in each feedback group, which limited our power to detect possible within-ADHD group differences. In addition, we recruited from the community, whereas many ADHD studies have used clinic-referred samples. We do not expect recruitment methodology to critically limit the generalizability of these results, however, as the boys in our sample had been diagnosed by a professional and met full *DSM-IV* ADHD criteria. Moreover, based on a meta-analysis, Gaub and Carlson (1997) concluded that community samples of boys with ADHD are representative of clinical samples. Another limitation is that the extent to which these results generalize to girls with ADHD is unknown. Finally, although we tried to make the lab task realistic and believable, there are limitations inherent in any laboratory paradigm, and so we cannot be sure of the extent to which these results would generalize to an actual classroom situa-

tion where children would be able to access other students or their own history for normative comparisons. Moreover, the use of mazes may have limited ecological validity for academic performance. Future research to clarify this issue is encouraged.

Still, these results are notable and indicate that there may be different explanations for the social and academic overestimates of boys with ADHD. These results imply that efforts to help boys with ADHD change their social behavior by providing them with realistic performance feedback may be counterproductive, as this is unlikely to help them admit their difficulties. Importantly, these results also imply that boys with ADHD do perceive at least some of their social shortcomings. With regards to academic concerns, our results indicate that alternative explanations for the optimistic self-perceptions of boys with ADHD should be explored. Replication and extension of these results will be crucial to fully understand the form and function of self-perceptions of children with ADHD.

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