J Abnorm Child Psychol (2016) 44:575–586
DOI 10.1007/s10802-015-0056-1

Positively Biased Self-Perceptions in Children with ADHD: Unique Predictor of Future Maladjustment

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Published online: 24 July 2015

Abstract This study assessed children's overestimations of self-competence (positively biased self-perceptions or positive bias [PB]) relative to parent/teacher ratings of children's competence in predicting children's adjustment in a new setting. Eighty-five children (13 boys and 11 girls with Attention-Deficit/Hyperactivity Disorder [ADHD]; 30 boys and 31 girls who were typically developing [TD]), ages 6.8 to 9.8 years (M=8.13; SD=0.82), attended a 2-week summer day camp grouped into same-age, same-sex classrooms with previously unacquainted peers and counselors. Prior to camp, PB was assessed by creating standardized discrepancy scores between children's self-ratings relative to parent or teacher ratings of the children's social and behavioral competence. The relative ability of these discrepancy scores to predict peer preference and oppositionality at camp in relation to parent or teacher ratings alone was evaluated. For children with ADHD, both discrepancy scores and informant ratings of competence were uniquely predictive of peer preference and oppositionality assessed during camp. For TD children, only informant ratings of competence were predictive of outcomes at camp. These results suggest that PB may be a unique predictor of maladjustment within a novel environment for children with ADHD, but not TD children.

Keywords ADHD · Positive bias · Peer preference · Oppositionality

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Attention-Deficit/Hyperactivity Disorder (ADHD), a developmental disorder with a worldwide prevalence of 5.3 % in school-aged children, is characterized by pervasive and impairing symptoms of hyperactivity/impulsivity and/or inattention (Barkley 1990). In the social domain, children with ADHD are often rejected by peers (have low peer preference) and have poor social skills (Hoza et al. 2005). In the behavioral domain, common deficits include hyperactive behaviors (e.g. excessive talking, bragging, difficulty sitting still), impulsive behaviors (e.g. difficulty waiting turn, interrupting others), and oppositionality towards adults (Barkley 1997; Biederman 2005). The present study focuses on low peer preference and oppositionality in children with ADHD as they are common maladjustments in this population (82 % score one standard deviation below the mean on peer preference; approximately 60 % have comorbid Oppositional Defiant Disorder) and have been shown to place children at risk for a myriad of negative outcomes (Biederman 2005; Hoza et al. 2005).

Despite the presence of these impairments, children with ADHD tend to hold overly positive self-perceptions of their competence, a phenomenon referred to as "Positive Bias" (PB; also known as "Positive Illusory Bias"; Hoza et al. 2004). Although children with ADHD usually have lower social and behavioral competence than typically developing (TD) as well as non-referred children, they tend to report equivalent or more favorable self-assessments of their own competence (Hoza et al. 2002, 2004). These overestimations are evident when their self ratings are compared to objective measures of competence, such as ratings by parents and teachers (Evangelista et al. 2008; Hoza et al. 2004), ratings by observers unaware of their diagnostic status (i.e., children with ADHD rated themselves as more socially effective than controls, whereas observers rated them as less so; Hoza et al. 2000) and previously unacquainted peers (i.e., children with

ADHD perceived partner to like them significantly more than did comparison boys; Diener and Milich 1997), and external criteria (Swanson et al. 2012). Children with ADHD have been found to demonstrate PB in the social and behavioral domains; children with social PB overestimate their social skills, number of friends, and the extent to which they are liked by peers, whereas those with behavioral PB overestimate the extent to which they follow rules, behave appropriately, and comply with adults' instructions (Evangelista et al. 2008; Owens and Hoza 2003; Swanson et al. 2012).

In the present study, we aim: (a) to investigate the relationship between PB (in social and behavioral domains) and maladjustment in children with ADHD, with a particular focus on whether PB predicts poor functional outcomes above that accounted for by actual impairment; and (b) to explore potential differences in the associations between overly positive self-perceptions and adjustment in children with ADHD compared to TD children.

Predicting Maladjustment: PB Versus Impairment

Past investigations suggest that PB is associated with maladjustment for children with ADHD (Kaiser et al. 2008; Linnea et al. 2012). In a study of 194 boys with ADHD and 41 non-referred boys, behavioral PB was associated with conduct problems (e.g., swearing, interrupting, noncompliance) during a summer treatment program (Kaiser et al. 2008). Similarly, a study of 87 children with ADHD and 38 comparison children (i.e., without ADHD or PB) showed that children with ADHD and social PB displayed less prosocial (e.g., less responsive, friendly, and engaged) and effortful behaviors in interactions with other children during a laboratory task compared to both those with ADHD, but without PB as well as comparison children (Linnea et al. 2012). Potentially more concerning, children with ADHD and PB have been shown to be less responsive to behavioral treatment when the outcome variables relate to conduct problems, aggressive behavior, and peer relationships compared to children with ADHD, but without PB (Mikami et al. 2010). Taken together, it appears that social and behavioral PB predict poor peer relationships and behavioral conduct.

Despite the evidence reviewed above, an important question is whether a child's *overly positive self-perceptions* (i.e., PB) offer unique contributions to the development of negative outcomes beyond those provided by the child's initial objective levels of impairment. Indeed, objectively poor social and behavioral competence itself may be more important in predicting subsequent maladjustment than the accuracy of children's perceptions of their own competence. However, most existing studies are unable to address this question because they calculated PB by creating a discrepancy score between self-perceptions and the measure considered to be the objective criterion (typically adult informant ratings of children's competence), and then used this difference score as a predictor of adjustment outcomes (e.g., Kaiser et al. 2008; Linnea et al. 2012). As such, significant associations between PB and low adjustment could result from either initial objectively poor competence or from an overestimation of this competence because the former serves as a component in the discrepancy score (Laird and Weems 2011). Also, because children with ADHD tend to have lower actual levels of competence compared to TD children, it is, by definition, easier for them to overestimate their abilities (i.e., the "gap" between actual and perceived competence appears larger; Owens et al. 2007). Studies that provide a more detailed analysis of the relationship between components of difference scores and adjustment are needed to elucidate the relative contributions of objective competence versus PB in predicting future outcomes.

There are theoretical reasons why PB may prospectively predict future maladjustment, above and beyond the contribution of initial objective impairment. First, PB may impede children's awareness of how their own negative behaviors contribute to interpersonal conflicts. Interestingly, children with positively biased self-perceptions tend to have poorer social skills (as rated by teachers) compared to children without positively biased self-perceptions (Gresham et al. 2000), a finding that has been replicated in young adults (i.e., those with positively biased self-perceptions display more negative social behaviors such as bragging, showing off, and interrupting in social interactions; Colvin et al. 1995). Children with ADHD and PB may be unaware of (or unwilling to self-monitor) their negative effect on others. Without acknowledgment of their own deficits, children may lack motivation to change and may be likely to continue their maladaptive behaviors; this is theorized to be the reason why children with PB are less responsive to behavioral treatment (Mikami et al. 2010).

Second, PB may not only impede behavioral improvements in children with ADHD, but also increase their level of negative behaviors. Highly inflated self-perceptions may lead children to be defensive in response to negative feedback and to respond aggressively to slights to their self-image (Baumeister et al. 1996). Consistent with this view, the self-protection theory of the PB has received some empirical support (Diener and Milich 1997; Ohan and Johnston 2002). For example, children with ADHD have been shown to lower their own performance estimates after receiving positive feedback (Diener and Milich 1997), suggesting decreases in their defensive self-views in less self-threatening situations. However, children with ADHD often receive a plethora of negative feedback from both adults and peers as a result of their social and behavioral problems (Cunningham and Siegel 1987; Mash and Johnston 1982; Whalen and Henker 1985), and those with PB may experience particular difficulty in

coping with this negative feedback. Thus, PB may exacerbate negative behaviors beyond actual impairment as children may react to perceived attacks on their high self-perceptions through increased oppositionality toward adults and aggression toward peers.

Only two studies have directly investigated PB versus actual impairment in predicting subsequent maladjustment (Mikami et al. 2010; Swanson et al. 2012). A longitudinal study of girls with and without ADHD (ages 6 to 12 years at baseline) showed that more objective measures of competence (as measured by informant ratings and test scores), relative to PB, were stronger predictors of academic performance, peer preference, and behavioral conduct 5 years later, casting doubt on the incremental value of PB in understanding maladjustment (Swanson et al. 2012). Nonetheless, in this study, PB remained significantly predictive of most outcomes after controlling for informant ratings of actual competence. Results of this study may also have been influenced by its long-term nature as impairment may be more stable across time than PB. Of note, this study differed from other investigations of PB and maladjustment (e.g., Kaiser et al. 2008; Linnea et al. 2012) because it used the discrepancy score and ratings of competence from a *different* rater (than that whose report contributed to making up the discrepancy score) as predictors of outcomes. This methodology allowed for investigation into the predictive ability of discrepancy scores relative to initial impairment on maladjustment (Swanson et al. 2012).

In contrast, a short-term longitudinal study of children with ADHD attending a summer treatment program found that PB at the start of camp contributed uniquely to the prediction of poorer adjustment at the end of camp (8 weeks later) after statistical control of baseline social (peer preference and friendship) and behavioral (observations of conduct problems) functioning (Mikami et al. 2010). Specifically, behavioral and social PB predicted fewer improvements over the study period in conduct problems and peer relationships, respectively (Mikami et al. 2010). Although this study did not assess actual impairment via informant ratings of competence, it used baseline levels of peer rejection, friendlessness, and conduct problems (common impairments in children with ADHD; Barkley 1990) to predict end of camp adjustment in these same domains. These measures of baseline adjustment, considered to indicate actual initial impairment, were not components of the discrepancy scores representing PB.

However, both studies had methodological limitations. Swanson et al. (2012) investigated only social PB. Mikami et al. (2010) measured PB by comparing children's self ratings to ratings made by camp counselors who had only known the children for 1 week, making them potentially less reliable raters of children's competence than parents or teachers during the school year. Also, Mikami et al. (2010) measured impairment and adjustment within the same context of summer camp. Thus, baseline levels of adjustment may have influenced the counselors' ratings of competence at the start of camp, obscuring the directionality of the relationship between PB (child-counselor discrepancy) and maladjustment. More importantly, both studies had the same informants (teachers or counselors) rate initial impairment and various outcomes of maladjustment, which may have increased shared method variance. All in all, current evidence on the incremental validity of PB in predicting maladjustment is inconclusive. Studies involving different raters of impairment and adjustment within different contexts are highly warranted.

Overly-Positive Self Perceptions in Typically Developing Children

Overly positive self-perceptions are not unique to ADHD populations (Alicke and Govorun 2005). In particular, young children have been found to display unrealistic optimism in expectations of their own performance (Schneider et al. 1987; Stipek and Iver 1989). Younger children also tend to be poorer at using prior negative feedback to inform predictions of future performance compared to older children (Stipek 1984). However, there is evidence to suggest that positive self-perceptions in TD children can be adaptive in that they motivate children to attempt difficult tasks and to take risks in experimenting with new behaviors (Bjorklund and Green 1992). In contrast, PB in children with ADHD has been found to be unrelated to and, at times negatively related to, persistence and task performance (Hoza et al. 2001; Milich and Okazaki 1991). One study found that children with ADHD, compared to nonreferred children, were more optimistic in their predictions of performance on puzzle tasks, yet more likely to display giving-up behavior and decrements in performance (Milich and Okazaki 1991). Overly positive self-perceptions have also been associated with high peer preference in TD children (Kistner et al. 2007), as opposed to low prosociality with peers in children with ADHD (Linnea et al. 2012).

In general, relative to the positive self-perceptions of TD children, PB of children with ADHD appears to be more extreme in terms of the magnitude between self-perceived competence versus actual competence (Owens and Hoza 2003), counterintuitive in light of the repeated negative feedback that children with ADHD receive (i.e., should encourage more negative self-perceptions; Hoza et al. 2002) and not positively related to motivation, persistence, and performance (Hoza et al. 2001). Thus, PB in children with ADHD may exert different influences on adjustment compared to the overly positive self-perceptions in TD children.

Present Study

The current study examined the predictive value of PB beyond objective measures of competence for peer preference and

oppositionality among children attending a summer camp with previously unacquainted peers and counselors. Thus, it was possible to explore how PB (measured before camp) related to peer relationships and behavior problems in an entirely new setting with unfamiliar peers and adults. This longitudinal study addressed some of the limitations of previous studies by measuring PB (and competence ratings) and outcomes via different raters and in different contexts (specifically, outcomes were measured in a setting that was novel for the children). Also, this study investigated PB via methodology that allows for better understanding of the relative contributions of component scores to outcomes (by assessing discrepancy scores in conjunction with related but unique measures of impairment; Swanson et al. 2012). Of note, the present study referred to greater overestimations of competence as "higher PB" as PB is often measured as a continuous variable (Owens et al. 2007). Given previous research findings that PB predicts less prosocial behavior with peers (Kaiser et al. 2008) and more conduct problems (Linnea et al. 2012) in ADHD samples, we hypothesized that, for children with ADHD, higher PB would predict (a) lower peer preference and (b) more oppositionality, after accounting for objective measures of competence. However, we did not expect these patterns for TD children, given prior studies demonstrating positive or nonexistent relationships between overly positive self-perceptions and outcomes in TD samples (Bjorklund and Green 1992; Bohrnstedt and Felson 1983).

Method

Participants

Participants were 85 children (24 children with ADHD [11 girls], 61 TD children [31 girls]; 74 % Caucasian, 9 % African American, and 17 % of more than one ethnicity), ages 6.8–9.8 years, who had completed grades 1–3 before the start of the summer program (see Procedure). Among the children with ADHD, 18 participants were classified as ADHD-Combined Type and 6 as ADHD-Inattentive Type. Five participants had comorbid Oppositional Defiant Disorder (ODD), 4 had comorbid internalizing disorders (i.e., depressive and/or anxiety disorders), and 7 had a comorbid internalizing disorder as well as ODD. Ten children were receiving stimulant medication for ADHD which remained stable throughout the study. Children with ADHD and TD children did not differ in demographic characteristics (e.g., age, grade, family income; see Mikami et al. 2013). Please see Procedure section for study eligibility and diagnostic classification information.

Measures

Self-Perception Profile for Children (SPPC) The SPPC assesses children's self-perceptions of competence in various domains (Harter 1985). This measure was used as a predictor in the current study (and as part of the calculations of PB). The present study employed the Social Acceptance and Behavioral Conduct subscales of the SPPC because these domains were best fit for investigation during the summer camp program (see below) and children with ADHD commonly demonstrate impairment in these areas (Barkley 1990). Children with ADHD may also display impairment and PB in the academic domain (Hoza et al. 2002), but academic PB and outcomes were not assessed because of the lack of academic demands at camp.

Research assistants administered the Social Acceptance and Behavioral Conduct subscales of the SPPC by reading each item to children in individual private interviews. Each subscale contains six items. Each item describes different children ("Some kids have a lot of friends, but other kids don't have very many friends"), and participants first indicate which description is most like themselves, and then whether that description is very much or somewhat like themselves, yielding a score for the item on a 4-point metric (1=*first description is very much like themselves*, 2=*first description is somewhat like themselves*, 3=*second description is somewhat like themselves*, 4=*second description is very much like themselves*). Scores for children's self-perceptions of social and behavioral competence were calculated based on the mean of the questions on that subscale, with some items reverse scored, such that higher scores indicated more positive self-perceptions. Alphas for children's self-reports were 0.70 for social competence and 0.85 for behavioral competence, similar to those reported by Harter (1985).

Of note, the SPPC was used in the present study despite its development for children who have completed grade 2. This was because we wished to assess children's self-perceptions of their social and behavioral competence, as these are both clear domains of impairment among children with ADHD and have been most consistently investigated in the PB literature (e.g. Kaiser et al. 2008; Mikami et al. 2010; Swanson et al. 2012). Unfortunately, the Pictorial Scale of Perceived Competence and Social Acceptance for Younger Children (version of the SPPC for children yet to complete grade 2; Harter and Pike 1984) does not include a behavioral competence scale. In the present sample, only 27 out of the 85 children had yet to complete grade 2 (ten of whom were nearly finished with grade 2 when the SPPC was administered) and a similar pattern of results were found after excluding these children from the analyses. Thus, the SPPC for older children was administered in order to ensure consistent testing materials for all participants.

Teacher's Rating Scale of Child's Actual Behavior (TRS) The TRS (Harter 1985) has parallel questions to the SPPC and measures parents' and teachers' perceptions of children's competence (used as predictors and as part of the calculations

of PB). Parents and children's teachers from their school year classrooms completed the Social Acceptance and Behavioral Conduct of the TRS, comprised of three items per subscale. As in other studies of PB (Hoza et al. 2002, 2004), these parent and teacher ratings were considered to be the objective standards of competence to which children's self-perceptions were compared (higher scores indicate greater competence in children). Alphas for parent and teacher reports were 0.88 and 0.95 for social competence and 0.90 and 0.90 for behavioral competence respectively, similar to those reported in other studies (Hoza et al. 2004; 2002).

Peer Sociometric interviews To assess children's peer preference at the end of camp (outcome variable), in individual interviews with research assistants, children nominated an unlimited number of summer camp classroom peers whom they liked and disliked (Coie et al. 198282). Children were provided with the photos and names of classmates to assist with recall. Peer preference proportion scores were calculated for each child by subtracting the number of "dislike" nominations from the number of "like" nominations received, and then dividing that number by the number of classroom peers providing nominations.

Teacher-Child Rating Scale (TCRS) The TCRS (Hightower et al. 1986) was used to assess oppositionality in the summer program classroom (outcome variable). Both summer program counselors in each classroom made daily ratings of oppositional behavior ("got into fights or conflicts", "said mean things", and "is obstinate/defiant/stubborn"). Each of the three items on this scale (α=0.84) is rated on a 5-point metric (1=*not a problem*, 3=*moderate problem*, 5=*very serious problem*). The average rating received across the 2-week summer program was calculated for each child. The TCRS has been found to have good test-retest reliability (r=0.83) and validity (e.g. able to discriminate between groups known to differ in adjustment; Hightower et al. 1986).

Child-Behavior Checklist (CBCL) and Teacher-Report Form (TRF) Parent and school-year classroom teacher reports on the externalizing and internalizing broadband scales of the CBCL and the TRF, respectively (Achenbach and Rescorla 2001), obtained before camp, were averaged to create one externalizing score and one internalizing score for each child. We considered these scores as covariates. The internalizing and externalizing broadband scales of the CBCL and TRF have good test-retest reliability (CBCL: r= 0.91 and 0.92; TRF: r=0.86 and 0.89), internal consistency (CBCL: α=0.90 and 0.94; TRF: α=0.90 and 0.95), and validity (e.g., can accurately classify groups of children with different diagnoses; Achenbach and Rescorla 2001).

Procedure

For full details regarding participant selection and study procedures, see Mikami et al. (2013). Children were recruited through advertisements, family events, schools, and clinical sources. Consent was provided by the parents (children's primary caregiver) and assent was provided by the children for the study, which was approved by the institutional review board.

For study eligibility, children with ADHD were required to meet diagnostic criteria for ADHD on a parent semi-structured interview (Kiddie Schedule for Affective Disorders and Schizophrenia; Kaufman et al. 1997), to have at least 6 of 9 symptoms of inattention or 6 of 9 symptoms of hyperactivity/impulsivity rated as occurring "often" or "very often" by *both* parents and classroom teachers during the school year (Child Symptom Inventory; Gadow and Sprafkin 1994), and to demonstrate peer impairment by having at least three of seven items on a peer impairment measure endorsed as occurring "often" or "very "often" by *both* parents and teachers (Dishion and Kavanagh 2003). Comorbid conditions common with ADHD and psychotropic medication use were not exclusionary criteria. However, children were excluded if they had autism spectrum disorders or a current condition (e.g., suicidality) that immediately required other interventions. Potential comorbid conditions were assessed before the next phase of the study, summer program participation. TD children were required to not meet diagnostic criteria for any disorder and to not show significant peer relationship problems, as reported by parents and teachers. All children were required to have a Full Scale IQ of at least 80 on the Wechsler Abbreviated Scale of Intelligence (Wechsler 1999).

Eligible children and parents completed the SPPC (Harter 1985) to report on children's competence, and the CBCL (Achenbach and Rescorla 2001). In addition, the classroom teachers of these children during the school year completed the SPPC as well as the TRF (Achenbach and Rescorla 2001), which were returned by mail. The SPPC, CBCL, and TRF were completed approximately 2 to 4 months prior to the start of the summer camp.

After the completion of all baseline measures, children were enrolled in a 2-week, summer day program (9 a.m. to 3 p.m.) where they were grouped into classrooms. Each summer program classroom had an average of approximately 3 children with ADHD (SD=0.52) mixed with 7 TD children (SD=1.00), to yield a total of 10 children (SD=0.93). To minimize previous interactions, classrooms were organized such that all children within a classroom attended different schools. The children within each summer program classroom were of the same gender and were within a 1-year age span. Two summer program counselors, who were teacher education students, led each classroom. Children remained with their classroom peers and counselors throughout the day and did not

interact with peers and counselors from other classrooms. Children were involved in art, music, drama, and physical education classes, as well as recess/lunch breaks. To maximize interactions between children, activities consisted largely of nonacademic and unstructured tasks and counselors typically spent only 5 min out of every hour of class time to provide directions for each activity, after which children were allowed to freely socialize while completing the activity (e.g., an art project). Altogether, this created ample opportunities for children to establish peer relationships and to display problems in behavioral conduct. Parents were provided a stipend for transportation costs to camp at a rate of $10 per day that the child attended as well as an assessment report about their child at no charge.

The analyses in the current study took place in the context of a larger investigation testing the efficacy of classroom interventions in improving behavioral problems and peer relationships in children with ADHD. Summer program classrooms were randomly assigned to one of two behavioral interventions, both of which are described in detail by Mikami et al. (2013).

Data Analytic Plan

To calculate PB, standardized difference scores were created by subtracting standardized parent- or teacher-reported SPPC scores from standardized child-reported SPPC scores on the Social Acceptance subscale and the Behavioral Conduct subscale, yielding four types of discrepancy scores (child-parent social PB, child-teacher social PB, child-parent behavioral PB, child-teacher behavioral PB), with higher scores indicating greater overestimations of competence. As with previous studies (Owens and Hoza 2003; Swanson et al. 2012) and based on recommendations by De Los Reyes and Kazdin (2004), standardized difference scores were used in the measurement of PB as this method does not assume lower actual competence levels in children with ADHD compared to control groups and equalizes the variances of the two component scores, decreasing the potential influence of differential variances on the correlation between difference scores and a third variable (De Los Reyes and Kazdin 2004). Also, standardized difference scores have been shown to be uniformly correlated with the ratings from which they were computed, unlike raw discrepancy scores, which alleviates concerns about construct validity (De Los Reyes and Kazdin 2004).

To examine the incremental validity of discrepancies in predicting adjustment, regressions were conducted using a discrepancy score (e.g., child–parent social PB) and a different informant rating of actual competence that was not a component of the discrepancy score (e.g., teacher ratings of social competence). Four different comparisons were tested via regressions (child-parent social PB versus teacher ratings of social competence; child-teacher social PB versus parent ratings of social competence; child-parent behavioral PB versus teacher ratings of behavioral competence; child-teacher behavioral PB versus parent ratings of behavioral competence) on the outcome variables of peer preference and oppositionality at summer camp. To explore whether the discrepancy score predicted functional outcomes after accounting for informant ratings of actual competence, the discrepancy score and the alternate informant rating of actual competence as well as ADHD status were entered together at Step 1. To explore potential differences in the pattern of results for ADHD and TD samples, the cross-products between ADHD diagnostic status and the discrepancy score as well as that between ADHD diagnostic status and the alternate informant rating were entered together at Step 2. All significant interactions were probed via simple slope analysis (Aiken and West 1991). Of note, three-way interactions between ADHD status, informant ratings, and discrepancy scores were not examined due to limitations in power.

We considered before-camp ratings of internalizing behavior and externalizing behavior, and camp intervention condition as potential covariates in the analyses. Previous literature suggests that PB may be differentially associated with comorbid depressive and aggressive symptoms, such that, in general, internalizing comorbidities are associated with diminished PB and externalizing comorbidities are related to exacerbated PB in children with ADHD (Hoza et al. 2004; Jiang and Johnston 2013; McQuade et al. 2011a). Although we did not expect the associations between PB and maladjustment to differ depending on intervention condition (Mikami et al. 2010), we considered intervention condition as a potential covariate because of the possibility that interventions may have impacted outcome variables. Analyses were conducted in which internalizing behavior, externalizing behavior, and treatment condition were entered as covariates at Step 1 in hierarchical regressions, and all other predictors remained the same. All significant results remained significant and no other significant results emerged, therefore these covariates were dropped from final models.

Results

Descriptive Statistics

Table 1 displays descriptive statistics of, and correlations between, study variables. For children with ADHD, self-perceptions of competence in both social and behavioral domains were significantly more positive than that reported by their parents and classroom teachers during the school year ($p<.05$), providing numeric evidence for PB in this population. In contrast, in TD children, self-perceptions of competence in both domains were significantly more negative than that reported by their parents and teachers ($p<.05$).

Table 1 Descriptive statistics and correlations

	Mean (Standard deviation)														
	ADHD		TD		1	2	3	4	5	6	7	8	9	10	11	12
1. Child social	2.75 (0.65)		2.78 (0.78)		–	0.18	−0.02	0.36	0.04	−0.11	0.59*	0.75**	0.24	0.37	−0.27	0.44*
2. Parent social	2.32 (0.82)		3.55 (0.52)		0.20	–	−0.16	0.29	0.55**	−0.01	−0.69**	0.24	−0.14	0.24	0.19	−0.06
3. Teacher social	1.93 (0.77)		3.48 (0.66)		0.23	0.20	–	−0.18	0.18	0.56*	0.13	−0.67**	−0.24	−0.59*	0.32	−0.12
4. Child behavioral	3.03 (0.65)		3.36 (0.66)		0.04	−0.18	0.14	–	−0.21	0.20	0.05	0.39	0.81**	0.64**	−0.17	0.24
5. Parent behavioral	2.28 (0.75)		3.81 (0.36)		0.22	0.38**	0.08	0.13	–	0.26	−0.43*	−0.09	−0.76**	−0.38	0.20	−0.55**
6. Teacher behavioral	2.10 (0.93)		3.64 (0.61)		0.07	−0.06	0.28	0.33**	0.16	–	−0.07	−0.45*	−0.03	−0.63**	0.19	−0.25
7. CP social PB	1.04[a] (1.20)	0.43[b] (0.95)	−0.41[a] (1.11)	−0.77[b] (0.84)	0.80**	−0.42**	0.09	0.15	−0.04	0.11	–	0.35	0.30	0.08	−0.36	0.37
8. CT social PB	1.09[a] (1.20)	0.80[b] (1.02)	−0.42[a] (1.11)	−0.65[b] (0.90)	0.70**	0.03	−0.54	−0.07	0.13	−0.14	0.63**	–	0.32	0.67**	−0.41	0.41
9. CP behavioral PB	0.94[a] (1.45)	0.76[b] (1.09)	−0.37[a] (1.02)	−0.45[b] (0.71)	−0.07	−0.36**	0.08	0.87**	−0.38**	0.23	0.15	−0.13	–	0.66**	−0.24	0.49*
10. CT behavioral PB	0.73[a] (1.20)	0.90[b] (1.02)	−0.29[a] (0.97)	−0.28[b] (0.73)	−0.03	−0.11	−0.11	0.63**	−0.01	−0.53	0.04	0.05	0.59**	–	−0.29	0.39
11. Peer preference	0.02 (0.29)		0.45 (0.23)		0.18	0.11	0.32*	−0.04	−0.08	0.12	0.10	−0.08	−0.00	−0.14	–	−0.24
12. Oppositional behavior	1.63 (0.71)		1.12 (0.27)		−0.42	0.11	−0.08	−0.17	−0.01	0.30*	−0.46**	−0.30*	−0.15	0.04	−0.45**	–

PB positive bias, *CT* child-teacher, *CP* child-parent

*$p<.05$. **$p<.01$

[a] standardized PB scores

[b] raw PB scores

PB Versus Actual Competence as Predictors of Adjustment in the Summer Camp Setting

Peer Preference Table 2 displays findings that TD children, and children with higher social competence ratings from classroom teachers during the school year, displayed higher peer preference in the summer camp setting. Neither behavioral competence ratings, nor PB predicted peer preference as a main effect. However, there was a significant interaction between child-teacher social PB and ADHD diagnostic status. Probing revealed that the relationship between child-teacher social PB and peer preference was negative for children with ADHD (β=−0.50, $t(80)$=−2.68, p=.009), but not present for TD children (β=−0.03, $t(80)$=−0.25, p=.805). There was also an interaction between child-parent social PB and ADHD diagnostic status such that the relationship between child-parent social PB and peer preference was negative for children with ADHD (β=−0.40, $t(80)$=−2.36, p=.021), but again, not present for TD children (β=0.06, $t(80)$=0.56, p=.575).

Oppositionality Also shown in Table 2, ADHD diagnostic status and lower behavioral competence ratings from classroom teachers during the school year predicted counselor-rated oppositionality in the summer camp setting. Neither social competence ratings, nor PB, predicted oppositionality as a main effect. However, several significant interaction effects were found, as displayed in Table 2. First, there was an interaction between parent behavioral competence ratings and ADHD diagnostic status. Probing revealed that the relationship between parent behavioral competence ratings and oppositionality was negative for children with ADHD (β=−0.75, $t(80)$=−3.71, $p<.001$), but not present for TD children (β=−0.01, $t(80)$=−0.03, p=.975).

There were also several interaction effects between PB and ADHD status. For instance, there was an interaction between child-teacher social PB and ADHD status, such that the relationship between child-teacher social PB and oppositionality was positive for children with ADHD (β=0.71, $t(80)$=3.55, p=.001), and not present for TD children (β=−0.24, $t(80)$=−1.85, p=.068). In addition, there was an interaction between child-parent social PB and ADHD status such that the relationship between child-parent social PB and oppositionality was positive for children with ADHD (β=0.60, $t(80)$=3.16, p=.002), but negative for TD children (β=−0.30, $t(80)$=−2.38, p=.020). Lastly, there was an interaction between child-parent behavioral PB and ADHD status such that the relationship between child-parent behavioral PB and oppositionality was positive for children with ADHD (β=0.63, $t(80)$=4.18, $p<.001$) but not present for TD children (β=−0.06, $t(80)$=−0.47, p=.639).

Table 2 Predicting adjustment during camp: PB versus parent and teacher ratings of competence

		Peer preference			Oppositionality		
Step	Predictor	β	t	p	β	t	p
1	ADHD Status	−0.42	−3.20	0.002	0.45	2.95	0.004
	CT Social PB	−0.16	−1.60	0.113	0.03	0.27	0.786
	Parent Social	0.18	1.53	0.129	0.01	0.04	0.967
2	ADHD Status*CT Social PB	−0.30	−2.13	0.037	0.57	3.99	<0.001
	ADHD Status*Parent Social	0.11	0.66	0.509	−0.26	−1.46	0.149
1	ADHD Status	−0.32	−2.48	0.015	0.39	2.50	0.015
	CP Social PB	−0.08	−0.82	0.414	−0.03	−0.22	0.829
	Teacher Social	0.36	3.07	0.003	−0.12	−0.84	0.403
2	ADHD Status*CP Social PB	−0.28	−2.27	0.026	0.54	3.95	<0.001
	ADHD Status*Teacher Social	0.07	0.40	0.691	−0.19	−1.04	0.300
1	ADHD Status	−0.53	−3.55	0.001	−0.16	−0.10	0.917
	CT Behavioral PB	−0.15	−1.60	0.115	0.14	1.43	0.158
	Parent Behavioral	0.04	0.28	0.783	−0.52	−3.29	0.001
2	ADHD Status*CT Behavioral PB	−0.07	−0.53	0.595	0.17	1.33	0.189
	ADHD Status*Parent Behavioral	0.18	0.78	0.439	−0.55	−2.35	0.021
1	ADHD Status	−0.44	−3.37	0.001	0.10	0.69	0.494
	CP Behavioral PB	−0.11	−1.11	0.272	0.24	2.33	0.022
	Teacher Behavioral	0.18	1.52	0.133	−0.37	−2.80	0.006
2	ADHD Status*CP Behavioral PB	−0.10	−0.76	0.452	−0.46	3.44	0.001
	ADHD Status*Teacher Behavioral	0.01	0.08	0.938	−0.09	−0.43	0.631

PB positive bias, *CT* child-teacher, *CP* child-parent

Discussion

The present study investigated overly positive self-perceptions (PB) and actual impairment as predictors of maladjustment in children with ADHD and TD children. The results showed that after controlling for informant ratings of competence, PB in children with ADHD (relative to parent/teacher ratings of competence) predicted subsequent low peer preference and high oppositionality in a novel summer camp setting with previously unacquainted peers and counselors. For TD children, PB did not predict any outcome during camp after controlling for informant ratings of competence. For both children with ADHD and TD children, after controlling for PB, lower teacher ratings of social and behavioral competence significantly predicted low peer preference and more oppositionality, respectively. For children with ADHD, lower parent ratings of behavioral competence also significantly predicted more oppositionality. Taken together, results suggest that PB may be an important and unique predictor of maladjustment, over and above initial impairment, in children with ADHD, but not TD children.

Possible Mechanisms Between PB and Maladjustment

Our results suggest a distinct pattern of associations between PB and maladjustment depending on children's ADHD diagnostic status. There are several reasons why this may have occurred. First, TD children tend to display less extreme overestimations of competence relative to the PB typically present in ADHD populations (Owens and Hoza 2003). There may be an optimal amount of moderately inflated self-perceptions that encourages persistence on difficult tasks and willingness to attempt novel behaviors and skills; maladaptive consequences may become apparent only when positive self-perceptions are extremely overinflated (Baumeister et al. 1996), such as is found in some children with ADHD. Second, owing to their objectively lower levels of competence, children with ADHD may receive more negative feedback than TD children, leading PB to serve a self-protective function whereby children with ADHD respond defensively to others' suggestions for improvement (Diener and Milich 1997). Also, children with ADHD may face stigma from peers and adults (e.g. negative attitudes towards ADHD may negatively influence teachers'

evaluations of children's academic abilities; Lebowitz 2013) which may expose them to more negative feedback than that accounted for by their level of actual impairment. Accordingly, positive self-perceptions in TD children may not result from self-protection and thus may not impede motivation for change or receptiveness to feedback.

We offer speculation about a few other potential mechanisms between PB and maladjustment in children with ADHD. First, above and beyond the frustrating effects of children's objectively low competence, others may find the lack of self-awareness in children with PB particularly aversive. If children appear unaware of (or in denial about) the extent of their social and behavioral deficits, this lack of awareness may cause additional conflict in their relationships with adults and peers which can lead to children's increased peer rejection and oppositionality. In support of this, discrepancies between parent and child estimates of emotional and behavioral problems have been associated with negative parenting practices and mother-child conflict (Pelton and Forehand 2001). The quality of parent-child and teacher-child relationships can then impact children's motivation for change (Hinshaw et al. 2000), oppositionality (Silver et al. 2005), and peer preference (Hughes and Kwok 2006; Taylor 1989). This mechanism may be more pronounced for children with ADHD as they may already have negative reputations in the classroom. For instance, children with ADHD are often disliked by their peers (Hoza et al. 2005), making it more likely that others may display attributional biases towards them, such as selectively remembering their unskilled behaviors, and making internal, stable, and global attributions for their negative behaviors (Hymel et al. 1990). In contrast, similar problematic behaviors displayed by well-liked children may be perceived as benign (Peets et al. 2008). Thus, TD children with positive self-perceptions may be given more benefit of the doubt when it comes to their lack of awareness and peers and adults may be less frustrated with them as a result.

Another possibility is that PB may indicate greater neuropsychological deficit in children with ADHD. Some children with ADHD demonstrate problems in executive functioning (McQuade et al. 2011b) which, when found in patients with frontal lobe injury, lead to overestimations of competence of the self but not others (Duke et al. 2002). Interestingly, children with ADHD and PB have also been shown to be able to accurately estimate the competence of others (Evangelista et al. 2008), suggesting that their positive views are not attributable to a lack of ability to evaluate competence in general. Accordingly, children with ADHD and PB may have more deficits in self-regulation, self-monitoring, or self-awareness compared to children with ADHD but without PB as well as TD children (Owens et al. 2007). In support of this, executive functioning processes have been found to mediate the relationship between ADHD status and PB (McQuade et al. 2011b). Thus, children with PB may have executive functioning deficits in planning and analyzing social situations, which may lead to difficulty in structuring their social environments to avoid negative feedback (e.g., continuously attempting to befriend peers who dislike them; Anderson 2002; Frederick and Olmi 1994). In addition, these deficits may hinder children's ability to learn new social skills and to utilize others' feedback to correct negative behaviors, leading to maladjustment beyond the contributions of initial impairment. As such, problems in executive functioning may lead both to the maintenance of PB over time and to the exacerbation of maladjustment.

PB Domain Specificity

In the current study, social PB was more often predictive of maladjustment (i.e., both child-parent and child-teacher social PB predicted low peer preference and oppositionality) than behavioral PB (i.e., only child-parent behavioral PB predicted oppositionality) in children with ADHD. Interestingly, there is evidence to suggest that children with social PB experience greater neuropsychological deficits (e.g., planning, fluency, and working memory) than children with behavioral PB (McQuade et al. 2011b). This may be because executive functioning relates to various social abilities, serving as prerequisites for skills such as detecting verbal cues, remembering conversations, and incorporating others' feedback (Bellanti and Bierman 2000; Clark et al. 2002). Thus, the domain in which children with ADHD display PB may be an important predictor of the type of maladjustment that they may experience.

Strengths and Limitations

The strengths of the present study lie in its longitudinal nature and use of a previously unacquainted sample (consisting of a roughly even distribution of boys and girls), which allowed for investigations into how both social and behavioral PB predicted maladjustment in an entirely new context. Also, ratings were collected from multiple informants, allowing for a more detailed analysis of the components that make up discrepancy scores. Lastly, the present study was able to investigate potential differences in the relationships between discrepancy scores, informant ratings of competence, and adjustment in children with ADHD compared to TD children, yielding interesting results which suggest that PB may have specific value in predicting future maladjustment in children with ADHD.

However, no study is without limitations. First, summer camp classrooms differed from classrooms during the school year in their small class sizes, heavy supervision, and lack of academic demands, factors which may have decreased the occurrence of oppositionality. These differences, along with the short duration of camp (2 weeks), may also limit the generalizability of the results to more naturalistic environments.

Related to this, the present study required all children with ADHD to demonstrate peer impairment and all TD children to demonstrate little to no peer impairment. Thus, findings may not generalize to children with ADHD who do not have peer impairment, or to TD children with peer impairment. Second, although the study was longitudinal, there was no random assignment of predictors which prevents inferences on the causal influences between variables. In addition, only social and behavioral PB were assessed. It remains unknown how academic or athletic PB may be associated with maladjustment. Fourth, the present results should be interpreted with caution as the SPPC was administered to 27 (out of the 85 children) who had yet to complete grade 2 (Harter 1985). Lastly, there are some methodological limitations associated with the use of difference scores in measuring PB (e.g., lower reliability; Laird and Weems 2011). However, the current method of analysis allowed investigation into the utility of difference scores in predicting maladjustment, despite statistical limitations, and permitted for comparison to the vast majority of previous studies that have used difference scores (Owens et al. 2007).

A final issue is that investigators have questioned whether PB is driven by adults' underestimation of children's competence as opposed to children's overestimation of their own competence (Hoza et al. 2010; Swanson et al. 2012). Although the present study cannot address this question, it does demonstrate that overly positive self-perceptions relative to adult informant perceptions of the child's competence provide unique insight into functional outcomes in children with ADHD, and are therefore important in their own right.

Clinical Implications and Future Directions

The present results demonstrated that PB may predict maladjustment for children with ADHD, but not TD children. This suggests that PB, measured via difference scores, may have specific clinical utility in predicting outcomes for this at-risk population. Indeed, PB may be a cause for concern in children with ADHD, beyond their objective level of impairment. As such, interventions that decrease the level of PB or diminish the negative impact of PB on behavioral change may be useful in improving adjustment in this population. One possible way to lessen PB may be to help children increase their actual level of competence, thereby decreasing the gap between their perceived competence and objective performance. Paradoxically, PB makes this difficult to achieve as PB may decrease their receptivity to corrective feedback (Diener and Milich 1997). Interventions that target socio-contextual factors (e.g., increasing inclusivity and cooperation in the classroom; decreasing negative feedback from peers/adults; Mikami et al. 2013) may be more viable in this regard as they endeavor to increase competence in children with ADHD without posing a direct challenge to the children's positive self-perceptions.

Second, the present study investigated the relationships between PB and maladjustment in previously unacquainted children within a novel social environment. Thus, the results may be particularly applicable to children with ADHD and PB who are undergoing periods of transition (e.g. changing schools). Specifically, children with ADHD and PB may experience difficulties with peer preference and oppositionality upon entry into new peers groups. This suggests that intervention may be most pertinent for this population during periods of environmental change. Lastly, more research is needed on the mechanisms between PB and subsequent maladjustment. No study (that we know of) has directly investigated neuropsychological deficits or decreased relationship quality as potential mediators between PB and various outcomes.

In conclusion, this study is the first of its kind to investigate the short-term impacts of PB among children in a novel setting with previously unacquainted peers and counselors. Overall, PB appears to have unique associations to subsequent maladjustment, beyond adult informant ratings of actual impairment, for children with ADHD, but not TD children.

Acknowledgments This research was supported by National Institute of Mental Health Grant 1R21 MH091486

Conflict of Interest The authors declare that they have no conflict of interest.

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