Comorbid Oppositional Defiant Disorder and Anxiety Disorders in Boys and Girls: Relations to Perceptual Bias

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Abstract

The current study examined relations among perceptual bias, measured by comparing self performance ratings to those of an independent rater, and gender and comorbid Oppositional Defiant Disorder and Anxiety Disorder (ODD/AD) status in school-aged children with primary diagnoses of ODD. Specifically, perceptual bias of boys (*N*=61) and girls (*N*=39) with ODD with (*N*=43) and without comorbid AD (*N*=57) were examined after completing a problem solving activity with their parent(s). Measures of global functioning, executive functioning, and severity of the disorders were also examined. Based on previous findings, it was predicted that boys with ODD without AD would exhibit the greatest positive perceptual bias, followed by girls with ODD without AD, boys with ODD and AD, and, finally, girls with ODD and AD. No significant group differences emerged on the related dimensions of global functioning, executive functioning, or severity of behavioral problems. However, systematic differences in age, ADHD diagnosis, and intellectual ability were revealed among the groups, consequently they were controlled for in the final analyses. Overall, children in all groups displayed positive perceptual bias when compared to observer ratings. However, the main hypotheses were not supported. That is, children with ODD evaluated their performance higher than that of observers, independent of comorbid anxiety and gender, when controlling for the effects of age, ADHD, and intellectual ability. Implications and future directions in examining perceptual bias are discussed.

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1. Introduction

Considerable research has focused on self-perception and its role in psychopathology (e.g., David & Kistner, 2000). More recently, researchers have shown increased interest in perceptual biases (i.e. self-perception compared to some objective indicator of competence) and their role in both the onset and persistence of various child psychopathologies (Ohannessian et al., 1999; Owens et al., 2007). Perceptual biases can be either positive or negative. Individuals with a positive perceptual bias have an inflated view of their self competence. That is, they overestimate their competence when compared to objective criteria. On the contrary, individuals with a negative perceptual bias have a deflated view of their competence. Indeed, they underestimate their competence when compared to objective criteria.

ODD and AD are among the most common psychiatric problems among school-aged children and they commonly co-occur (Angold, Costello, & Erkanli, 1999). ODD is characterized by a developmentally inappropriate recurrent pattern of negativistic, disobedient, hostile, and defiant behaviors towards authority figures which lead to significant impairment in one or more domains (APA, 2000). The prevalence of ODD ranges from 2-16% among school-aged children (APA, 2000). Anxiety, on the other hand, is characterized by excessive fear or worry and affects 12-17% of children and adolescents (Lewinsohn, Gotlib, Steeley, & Allen, 1998). The frequency of comorbidity between ODD and AD ranges from 5-40% (Angold et al., 1999).

1.1 *ODD and Perceptual Bias.* Recent research suggests that children with externalizing disorders have unrealistically high views of their self competence when compared to objective external criteria (Owens et al., 2007; Webster-Stratton & Lindsay, 1999). However, few studies have been conducted examining perceptual bias in clinical samples of children with ODD. In one of these studies, Webster-Stratton and Lindsay (1999) found that clinic-referred children with ODD and/or conduct disorder who

were rated lower on social acceptance by parents and teachers had marginally higher self-reported perceptions of peer acceptance than their nonclinical peers. Additionally, the clinic-referred children displayed less positive affect and warmth and more defiant behaviors when interacting with their mothers than nonclinical peers, yet they reported marginally higher perceived maternal acceptance than the comparison group. Moreover, other studies with nonclinical samples have found that children with behavioral problems displayed significant positive perceptual biases (David & Kistner, 1999; Gresham et al., 2000; Pardini et al., 2006).

1.2 *Anxiety and Perceptual Bias.* Opposite to children with behavioral problems, studies have demonstrated that clinically anxious children tend to underestimate their own competence. That is, they have a negative perceptual bias (Chansky & Kendall, 1997; Cole et al., 1999). Chansky and Kendall (1997), for example, found that children with an AD perceived themselves as less socially competent and reported more negative expectancies about peer acceptance than non-impaired peers. However, there was no difference in the number of friendships rated by parents between the groups. Furthermore, other studies have suggested that symptoms of anxiety are positively associated with academic and social underestimation compared to external indices in nonclinical samples of children (Cole et al., 1999; Ohannessian et al., 1999).

1.3 *ODD and AD.* As noted above, ODD and AD commonly co-occur, however, studies on how AD affects the course and expression of ODD have been inconclusive (Ialongo et al., 1996; Woolston et al., 1989). Opposing theories have been put forth describing the relationship between ODD and AD. More precisely, some researchers propose that anxiety may exacerbate ODD symptoms whereas others have proposed that it mitigates ODD symptoms (Drabick, Ollendick, & Bubier, 2010; Frick et al., 1999; Gray, 1987). According to Gray's (1987) two-factor model of antisocial behavior, anxiety should

mitigate the expression of aggression. He proposed that anxiety and aggression are the result of an imbalance in two opposing neurological systems, the Behavioral Activation System (BAS) and the Behavioral Inhibition System (BIS). Specifically, the BAS activates behavior in the presence of cues of reward and the BIS produces anxiety and inhibits behaviors in response to novel stimuli and signals of punishment. According to the model, aggression or psychopathic features, such as ODD symptoms (O'Brien & Frick, 1996), is a function of excessive activity in the BAS, while anxiety is a function of excessive activity in the BIS.

Whereas Gray describes anxiety as a trait (Gray, 1987), other researchers have demonstrated that anxiety needs to be elicited in order to observe the mitigating effects of an anxiety disorder (Cartwright-Hatton, Hodges, & Porter, 2003; Cartwright-Hatton, Tschernitz, Gomersall, 2005). For instance, Cartwright-Hatton et al. (2005) found that highly socially anxious children reported higher ratings of appearing nervous (e.g., blushing, stuttering) during a conversation with an unfamiliar adult than low socially anxious children. Contrarily, there was no difference between groups on appearing nervous during the conversation based on objective ratings. Moreover, no group differences were noted on social skills ability or global performance based on self-report or objective ratings. The authors concluded that perceptual bias arose only in highly stressful situations which related to the child's fear, in this case appearing nervous when talking to others. Taken together, both Gray's model and Cartwright-Hatton and colleagues work suggest that anxiety may mitigate the expression of perceptual bias among aggressive children, however, a clear distinction between the model and the research findings must be made. As previously noted, in Gray's model anxiety is viewed as a trait which will always lead to the attenuated effect of the BAS (i.e., aggression). However, Cartwright-Hatton and colleagues work suggests that the mitigating effect is dependent on the child feeling anxious (Cartwright-Hatton,

Hodges, & Porter, 2003; Cartwright-Hatton, Tschernitz, Gomersall, 2005). In the context of the current study, it would be expected that the presence of an AD, measured as a broad trait, would mitigate perceptual bias among children with ODD.

1.4 *Gender, Perceptual Bias and Diagnoses.* Gender differences in perceptual bias have also been demonstrated. Among school-aged children, boys tend to overestimate their competence whereas girls tend to underestimate their competence in both academic and social domains (Cole et al., 1999; Eccles et al., 1993; Jacobs et al., 2002). Furthermore, the prevalence of internalizing and externalizing disorders also differs according to gender. Most studies indicate that the prevalence of ODD is higher among boys than girls (Loeber et al., 2000) and ADs are more common among girls than boys (Cohen et al., 1993).

1.5 *The Current Study.* In this study, Gray's (1987) two-factor model of antisocial behavior was applied to a new construct, i.e. perceptual bias in children with ODD with and without anxiety. Therefore, the purpose of the study was not to test Gray's model per se but rather to provide an extension of the model by applying it to a new area of research. That is, the study was intended to examine whether anxiety mitigates the expression of perceptual bias among children with ODD. Some support for this notion has been found in previous literature. For instance, at least one study examining perceptual bias in children with an externalizing disorder found that depressive symptoms mitigated perceptual bias (for review, see Owens et al., 2007). To the author's knowledge, no study has examined how comorbid AD or gender impact perceptual bias among children with ODD. However, given the relations between depression and anxiety (Seligman & Ollendick, 1998), it is proposed that similar findings to those with depression will be found. Although children with AD have been shown to display

negative perceptual bias, for the purpose of this study, a focus was placed on positive perceptual bias since all the children in the sample met DSM-IV criteria for ODD as well (APA, 2000).

Extant research on perceptual bias has mainly concentrated on perceptual bias in academic ability and indices of peer acceptance rated by parents, teachers, or independent raters (e.g., Cole et al., 1999; Gresham et al., 2000, Owens et al., 2007). The current study adds to the existing literature by measuring perceptual bias by comparing the child's self-rated performance during a social problem-solving interaction with one or both parents to the rating of an independent, "objective" observer. In this study, social problem solving refers to the ability to identify adaptive ways to solve or cope with everyday problem situations (D'Zurilla & Goldfried, 1971). In previous studies, peer nominated withdrawn boys and peer nominated aggressive boys generated fewer solutions to social problems and their solutions were less effective than the solutions generated by their peers. These findings have been replicated (Stewart & Rubin, 1995; Webster-Stratton & Lindsay, 1999), suggesting that children with either aggression or anxiety are prone to have social problem solving deficits. In regard to gender differences and problem solving skills, girls tend to generate more prosocial solutions than boys (Green et al., 2008).

Furthermore, previous studies have indicated that younger children tend to display an elevated view of self competence (i.e., positive perceptual bias; Jacobs et al., 2002) and extensive research has been conducted demonstrating that children with Attention-Deficit/Hyperactivity Disorder (ADHD) display positive perceptual bias (for review see Owens et al., 2007). Moreover, research has demonstrated that children with ODD have deficits in executive functioning (EF, e.g., working memory, planning, future-directed behavior, flexibility of action; Barkley, 1997). Problem solving abilities are considered higher cognitive processes that rely on EF skills (Sergeant, Geurts, Oosterlaan, 2002) and

intellectual ability (IQ; D'Zurilla & Maydeu-Olivares, 1995), thus, EF and IQ of the sample may contribute to completing the interaction task in a successful manner. In order to control for these potentially confounding variables (age, diagnosis of ADHD, IQ, and EF), systematic differences were explored within the sample and controlled for in the analyses as needed.

Lastly, given the controversy on how to appropriately measure informant discrepancies (Colvin et al., 1996; De Los Reyes & Kazdin, 2004), positive perceptual bias was operationalized in two ways; a raw difference score and a standardized residual difference score[1]. It should be noted that there are limitations to both methods. Edwards (2001) noted that difference scores tend to have low reliability and, consequently, an increased likelihood of Type II error is associated with them. Moreover, difference scores tend to systematically correlate with their components which may result in a significant relationship between the dependent variable and the difference scores. The significance then may reflect a correlation between the dependent variable and one of the difference score's component variables rather than a predictive ability of the actual discrepancy score (Cronbach, 1958). Conversely, advocates of the usage of difference scores argue that the conceptual validity and interpretability outweigh its statistical limitations (Colvin et al., 1996). An alternative method, the standardized residual difference score is by definition the composition of variance in the dependent variable (child rating) that is not related to the independent variable (independent rater's rating). As with the raw difference score, this method also has its drawbacks. For example, the data may be misrepresented since the best fitting regression line creates an equal distribution of under- and overestimators which poses difficulties when the whole sample may indeed be overestimators (De Los Reyes & Kazdin, 2004). These considerations notwithstanding, it is evident that the majority of perceptual bias studies have operationalized the

construct utilizing these methods. To sort this issue out further, in the present study, analyses were run using both operationalization definitions to clarify any ambiguities that might be found.

1.6 *Hypotheses*

The hypotheses were consistent with previous findings described above. As previously noted, perceptual bias was operationalized in two different ways and analyses conducted with each version of the construct. The following hypotheses were put forth.

1. Children with ODD without AD will display a greater positive perceptual bias, as measured by the difference between the child's self-report and objective ratings regarding performance on the Problem Solving Task than children with ODD and AD while controlling for the effects of age, executive functioning, intellectual ability and a diagnosis of ADHD.

2. Boys will have a greater level of positive perceptual bias than girls, as measured by the difference between the child's self-report and objective ratings regarding performance on the Problem Solving Task while controlling for the effects of age, executive functioning, intellectual ability and a diagnosis of ADHD.

3. The interaction between gender and group status with respect to perceptual bias will be tested. It is hypothesized that boys with ODD only will display the greatest positive perceptual bias, followed by girls with ODD only, thereafter boys with ODD and AD and, lastly, girls with ODD and AD while controlling for the effects of age, executive functioning, intellectual ability and a diagnosis of ADHD

2. Method

2.1 *Participants*

A sample of 100 children between the ages of 8–14 years *(M_{age}*=9.58, *SD*=1.77*)* referred to the Child Study Center (CSC) at Virginia Tech for the treatment of ODD was enlisted. The sample was composed of 61 (61%) males and 39 (39%) females (for demographic information see Table 1). In terms of ethnicity, 82 (82%) were white, 8 (8%) were African American, 2 (2%) Asian, 3 (3%) Hispanic, and 5 (5%) were of mixed-race. All participants were enrolled in a randomized clinical control trial of youth with ODD ("Mediators, Moderators, and Treatment Efficacy of Two Forms of Psychosocial Treatment for Oppositional Children," Ollendick & Greene, 2007). Participants were recruited from the New River Valley and Roanoke Valley areas from schools, churches, pediatricians, child psychiatrists, medical clinics, and the CSC and its outreach clinic in Roanoke. Children who met criteria for Pervasive Developmental Disorder or Conduct Disorder, possessed an estimated IQ below 80, or who did not meet criteria for a diagnosis of ODD or for whom ODD was not the primary, secondary or tertiary diagnosis were excluded from the study.

Only data from the pre-treatment session was used for the current study. After the parent(s) and children completed a semi-structured interview and clinical consensus ratings were obtained, each participant was classified into one of two groups: participants with ODD only and participants with comorbid ODD+AD. Only children who met diagnostic criteria for Generalized Anxiety Disorder (GAD), Separation Anxiety Disorder (SAD), and Social Phobia were included in the ODD+AD group (see Table 1 for the breakdown of ADs in the sample). The decision to include only these ADs was based on their widespread impact on the child's life, in comparison to other ADs, such as Specific Phobias, which tend to lead to anxiety in circumscribed situations[2]. Roughly 60% of the sample were in

the ODD only group (N= 57) and 40% in the ODD+AD group (N= 43). Sixty-four (64%) of the children had ODD as their primary diagnosis, twenty-four (28%) as a secondary diagnosis, and eight (8%) as a tertiary diagnosis. Of the 43 youth in the ODD+AD, 9 (9%) children had an AD as their primary diagnosis, twenty-eight (28%) as a secondary diagnosis, and fifty (50%) as a tertiary diagnosis. Some children met criteria for more than a single AD; hence the number of ADs exceeds 43. In the sample, seventy-nine (79%) children completed the interaction task with their mother only and twenty-one children (21%) completed that task with both parents.

A power analysis for the current study was conducted. With an alpha level of .05 and power of .80 and 100 participants, it was possible to detect a medium to large interaction effect size.

2.2 *Measures*

2.2.1 *Diagnostic Interview.* Anxiety Disorders Interview Schedule for DSM-IV, Child and Parent Versions (ADIS-C/P; Silverman & Albano, 1996) are parallel semi-structured interviews used to diagnose most psychiatric disorders present in children and adolescents between 6 and 17 years of age. The two versions assess the same disorders with the exception of Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD), which were solely assessed during the parent interview. During the interview, symptoms were assessed by the clinician and interference ratings (0-8) were obtained. The clinician used symptoms endorsed and interference ratings to identify diagnostic criteria and to offer a Clinician Severity Rating (CSR). The CSRs range from 0 to 8. A CSR of 4 and above was used to indicate a diagnosable condition (Silverman & Albano, 1996). The ADIS-C/P has acceptable to excellent 7 to 14-day test-retest reliability estimates with children (ages 7-16; $\kappa = 0.61–0.80$) and their parents ($\kappa = 0.65–1.00$) (Silverman et al., 2001). Acceptable inter-rater agreement has also been established for all specific diagnoses assessed by the ADIS ($\kappa = 0.35–1.00$) (Silverman & Nelles, 1988;

Rapee et al., 1994). For purposes of this study, group assignment was determined based on the diagnoses derived from the ADIS and a clinical consensus meeting at which information from both informants (parent and child) was used to arrive at the final diagnosis. Diagnostic inter-rater agreement was determined (κ = 0.351–1.00). Specifically, the ADIS was used to assess ODD, ADs, and ADHD. Gender and the diagnoses of ODD and AD served as the independent variables in this study. A diagnosis of ADHD served as a covariate in the analyses.

2.2.2 *Global Functioning.* The Child Global Assessment Scale (CGAS, Schaffer, et al., 1983) was used to assess global functioning. The CGAS is a 100-point rating scale measuring psychological, social, and school functioning in children. During the aforementioned consensus meeting a CGAS was assigned based on the child's overall functioning.

2.2.3 *Intellectual Ability*. The Peabody Picture Vocabulary Test, Fourth Edition (PPVT-4; Dunn & Dunn, 2007) is a standardized measure of receptive vocabulary in children and adults. The PPVT-4 was used as an approximation of intellectual ability in the study. Studies have indicated adequate test-retest reliability (test-retest correlation of 0.92-0.96) and internal consistency (α=0.94-0.95; Dunn & Dunn, 2007). The score on the PPVT-4 served as a covariate in the analyses.

2.2.4 *Executive Functioning*. The Behavior Rating Inventory of Executive Functioning (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000) was used to assess executive functioning in the home environment in children ages 5 to 18. The BRIEF is composed of 86 items rated by the child's parent. Studies have indicated adequate 14-day test-retest reliability (κ = 0.79-0.88) and internal consistency (α=0.80-0.98) of the scale (Gioia et al., 2000). For purposes of this study, only the maternal rating of

global executive functioning, the Global Executive Composite, was utilized. The score on the BRIEF served as a covariate in the study.

2.2.5 *Interaction Task.* For the Problem-Solving Task (Antony, Nelson, & McMahon, 1996), the parent(s) chose a problem from a list of common issues for families to discuss (see appendix B). Then, the child and parent(s) were instructed to discuss the problem for 7 minutes and to try to come up with at least one solution to the problem (see appendix A for instructions). After the discussion, the child completed the Problem Solving Discussion Rating Scale (PSDRS) about the discussion (see appendix C). The questionnaire was composed of four 5-point Likert scale questions (1=*not at all well* to 5=*very well*) inquiring about how well the individual understood the problem, whether a solution was agreed upon by the parent and child, whether the problem was solved, and whether action would be taken as a result of the discussion. As an objective index, the family interaction was coded by trained graduate and undergraduate students according to a coding system developed for the study. An independent observer completed a parallel version of the PSDRS (see appendix D).

To the author's knowledge, the psychometric properties of the Problem Solving Task have not been assessed. However, it has good face validity for assessing problem solving abilities. Furthermore, the item on the PSDRS were highly correlated (i.e., internally consistent); therefore, a composite score of the four items was computed (see Table 2). Internal consistency of the items from the child ratings was high (Cronbach α of .84).

2.2.6 *Coding System.* A coding system, developed to objectively assess problem solving abilities in the interaction task, included four items which paralleled the items of the PSDRS (see Appendix F). Like the PSDRS, items were rated on a 5-point Likert scale (1=*not at all well* to 5=*very well*). One third

of the interactions were recoded by a second coder for reliability purposes. The intraclass correlation coefficient was utilized to measure reliability for each item. Reliability for the items ranged from .72 to .77. Overall, the internal consistency of the items from the observer ratings was good (Cronbach α of .88).

2.2.7 *Computation of Perceptual Bias.* Due to the controversy of how to assess informant discrepancies (Colvin et al, 1996; De Los Reyes & Kazdin, 2004), perceptual bias was operationalized in two ways and analyses were run for each operationalization as the dependent variable. In the first operationalization, perceptual bias was measured as a simple raw difference score. Specifically, it was measured by subtracting the composite score derived from the objective ratings of the PSDRS from the composite score derived from the ratings of the child.

The second operationalization consisted of a standardized residual difference score. For the second operationalization, a regression analysis was conducted using the child rating to predict the observer rating. Then the congruence between the predicted child's score and the child's actual score was calculated (residual difference score) and standardized (Chi & Hinshaw, 2002; De Los Reyes & Kazdin, 2004).

2.3 *Procedure*

Approval for the study was sought from and given by the Virginia Tech Institutional Review Board (IRB). Participants came in for a two 2-hour assessment consisting of a semi-structured clinical interview, completion of questionnaires and various interaction tasks. Two assessors conducted each assessment, one clinician interviewed the parent(s) while another interviewed the child.

The diagnostic interviews were conducted by trained graduate-student clinicians enrolled in an American Psychological Association-approved doctoral program in clinical psychology at Virginia Tech. The ADIS was used for diagnostic purposes and the graduate clinicians were trained in conducting the clinical interview and supervised by a licensed psychologist.

Assessors administered the Problem-Solving Task to the families during the second session of the pre-treatment assessment. Afterwards, the child completed a post-task evaluation of his or her problem solving performance. Several other measures which were not considered further for this study were also administered in the session. A graduate student coded all the interaction tasks and two trained undergraduate level students independently coded the tapes for reliability purposes.

2.4 *Statistical Analysis*

Statistical software (PASWStatistics 18.0) was used to conduct all analyses. The following analyses were conducted with both operationalization measures of perceptual bias.

2.4.1 *Data Analyses.*

After operationalizing perceptual bias, a 3-step approach was implemented to test the hypotheses. First, systematic differences between the groups (i.e., group status and gender) were explored. More precisely, t-tests were conducted to determine differences on the covariates for each group. Secondly, the covariates (i.e., age, intellectual ability, executive functioning, and ADHD diagnosis) as a set were regressed onto perceptual bias to explore alternative explanations of perceptual bias and, if needed, controlled for. Only covariates that systematically differed across either group status or gender or related to the dependent variable were included in further analyses.

Finally, a between subjects factorial analysis of covariance (ANCOVA), with relevant covariates, was conducted to test the hypotheses. As previously mentioned, the independent variables were diagnoses (ODD vs. ODD + ADs) and gender (males vs. females) and the dependent variable was positive perceptual bias, measured as a raw difference score in the first set of analyses and as a standardized residual difference score in the second set of analyses. Gender, group status, and ADHD variables were dummy coded (1= male, 0= female; ODD=0, ODD+AD=1, 0 = no ADHD, 1 = ADHD). Covariates that were explored included intellectual ability, as measured by the PPVT-4, EF, as measured by the BRIEF, age, and ADHD diagnosis.

2.4.2 *Main Effect of Group.* To test the first hypothesis that the ODD group would have a higher rating of perceptual bias than the ODD + AD group when covariates were controlled, an analysis of covariance (ANCOVA) was conducted. The ANCOVA assessed the mean differences in perceptual bias between the ODD group and the ODD plus AD group, controlling for the effects of relevant covariates.

2.4.3 *Main Effect of Gender.* Thereafter, the second hypothesis stating that boys would have higher perceptual bias than girls, while controlling for the effects of the relevant covariates, was tested in the same manner. Specifically, the ANCOVA assessed gender differences in perceptual bias while controlling for the effects of relevant covariates.

2.4.4 *Interaction*. Lastly, the analysis assessed the hypothesis that perceptual bias was a function of both gender and diagnosis. In other words, the ANCOVA assessed the interaction effect of gender and diagnosis on perceptual bias.

3. Results

3.1 *Preliminary Analyses*

3.1.1 *Demographics for the Whole Sample.* Means and standard deviations on demographic and clinical characteristics for the full sample are presented in Table 1. As previously noted, the mean age of the sample was 9.58 (*SD*=1.77) and 82% were Caucasian. Moreover, 61% of the sample consisted of males. Additionally, 43% of the sample met DSM-IV criteria for at least one of the indicated ADs, leaving 57% of the sample in the ODD only group. As previously noted, Table 1 presents the breakdown of anxiety disorders in the sample. Descriptive indices for each variable for the overall sample are also presented in Table 1. As can be seen, the mean CSR rating was 6.01 (*SD*=1.06) and the mean score on the CGAS was 59.25 (*SD*=6.13), suggesting moderate to severe disorder and adjustment difficulties, respectively. Furthermore, the mean score on the PPVT-4 was 109.70 (*SD*=15.05) and the mean score on the BRIEF was 70.26 (*SD*=9.46). These scores suggest somewhat elevated levels of intellectual ability but, at the same time, elevated levels of executive functioning problems.

3.1.2 *Presence of Parent(s).* Since some of the children completed the interaction task with both parents whereas others completed it only with their mother, analyses were conducted to rule out systematic difference on race, age, intellectual ability, EF, and ADHD diagnosis between the different conditions (see Table 3). Additionally, analyses to ensure that the children did not differ in regard to global functioning and behavior problems between the conditions were conducted. The analyses consisted of independent sample t-tests and chi-squares, as appropriate. Children who completed the interaction task with only their mother were significantly older (M_{age}= 9.76, *SD*= 1.78) than those who completed the task with both parents (M_{age}= 8.90, *SD*= 1.58; $t(98)= 2.00$, $p<.05$). No systematic

differences on other potential covariates or the severity of behavior problems ($t(98)= .511$, $p>.05$) and global functioning ($t(98)= -1.44$, $p>.05$) between the presence of a parent or parents during the interaction task were evident (see Table 3).

3.1.3 *Group Differences.* To assess the need to include covariates, comparisons between the groups (ODD vs. ODD+AD) were conducted on age, intellectual ability, EF, and ADHD diagnosis using chi-square and independent sample t-test analyses (see Table 4). The analyses revealed that children in the ODD alone group ($M_{age}=9.89$, $SD=1.91$) were older than children in the ODD+AD group ($M_{age}=9.16$, $SD=1.48$, $t(98) = 2.16$, $p <.05$). Children in the ODD alone group were also likelier to have a diagnosis of ADHD than children in the ODD+AD group ($\chi^2(1) = 4.39$, $p <.05$). No group differences were noted on other proposed covariates, i.e., the PPVT-4 ($t(96) = .47$, $p >.05$) or the BRIEF ($t(89) = -.71$, $p >.05$). Likewise, there were no significant differences on sex ($\chi^2(1) = .26$, $p >.05$) or race ($\chi^2(4) = 4.42$, $p >.05$) between the two groups. To ensure that there were no group differences on severity of problem behaviors or global functioning, t-test analyses were conducted comparing the two groups on CSR of the ODD diagnosis and the CGAS rating. No group differences were observed on these variables ($t(98) = 1.62$, $p>.05$ and $t(98) = 1.08$, $p >.05$, respectively, see Table 4).

3.1.4 *Gender Differences.* Similarly, comparisons of males and females in the sample were conducted on race, age, intellectual ability, executive functioning, ADHD diagnosis, severity of problem behaviors and global functioning. In the sample, males scored higher on the PPVT than females ($t(96) =2.32$, $p<.05$). No other gender differences were noted (see Table 5). Therefore, age was carried as covariate.

3.1.5 *Problem Solving Discussion Rating Scales.* Table 2 presents the Spearman zero-order correlations for each of the items of the PSDRS-C and PSDRS-C, their composite scores, and the two different operationalizations of perceptual bias. As can be seen in the table, the significant correlations between the items on the PSDRS-C ranged from .39 to .68 (p<.05). Also, the items of the PSDRS-O were significantly correlated with correlations ranging from .45 to .81 (p<.05). Correlations for individual items on the PSDRS-C and PSDRS-O were significantly correlated (p<.05, correlations ranging from .10 to .51), with the exception of item 1 on the PSDRS-C and item 1 on the PSDRS-O. As expected, the composite scores, both created from the child ratings and observer ratings, were significantly correlated with each item of the respective PSDRS-C and PSDRS-O scales (p<.05), with correlations ranging from .23 to .90. Also as expected, the standardized residual difference score was significantly correlated with items of the PSDRS-O and the observer composite score (correlations ranging from .67 to .87, p<.05), which were used to predict the child ratings, but not the PSDRS-C and child composite score, which were used to form the residual score. Items of the child ratings and observer ratings and, accordingly, the child and observer composite score were significantly correlated with the raw difference score with correlations ranging from -.63 to .33 (p<.05).

3.2 *Primary Analyses*

3.2.1 *Child and Observer Analyses.* Using a single-sample paired t-test, differences between the child composite score and the observer composite score were tested. As can be seen in Table 6, the child composite score (M=14.60, SD=4.25) was significantly higher than the observer composite score (M=12.28, SD=4.89; t(99)= 4.90 p<.05; see Table 7 and Figure 1 for the distribution of the variables).

3.2.2 *Raw Difference Score.* As previously noted, in the first operationalization, perceptual bias was measured as the difference between the child rating and the observer rating. Figure 2 demonstrates the distribution of perceptual bias scores for the sample as a whole (*M*= 2.32, *SD*= 4.73; see Table 6). Broken down by subgroups, the mean score in the ODD only group was 3.11 (*SD*= 4.68) and 1.44 (*SD*= 4.72) in the comorbid group (see Table 6 and Figure 3 for distributions). Males had a mean score of 1.98 (*SD* = 4.68) and females a mean score of 2.85 (*SD* = 4.83). See Table 6 and Figure 4 for the distributions.

The raw difference score was regressed onto the covariates, as a set, to assess the relationship between the dependent variable and covariates. The covariates as a set did not relate to the dependent variable ($F(4, 85) = .71$, $p > .05$), or any individual covariate (*t*-values ranging from -1.22 to .29 and $p > .05$).

Since previous analyses revealed a systemic difference in age, ADHD and intellectual ability, these variables served as covariates in the following analyses. An ANCOVA was performed with gender and group status as the independent variables, intellectual ability and age as covariates and the raw difference score as the dependent variable. The main effects of group status ($F(1, 91) = 2.54$ $p > .05$) and gender ($F(1, 91) = .43$, $p > .05$) and the interaction group*gender term ($F(1, 91) = .00$, $p > .05$) were nonsignificant (see Table 8 and Figure 5).

3.2.3 *Standardized Residual Difference Score.* The standardized residual difference score was computed as described above. That is, a regression analysis was conducted using the observer rating to predict the child rating. Thereafter, the difference between the predicted child's score and the child's actual score was computed (residual difference score) and standardized. As expected, the whole sample

mean was 0.0 (*SD*=.99, see Table 6 and Figure 6 for the distribution). For the subgroups of the independent variables, males had *M*=.02 (*SD*=.98), females had *M*=-.04 (*SD*=1.04), ODD group *M*=-.14 (*SD*=.98), and ODD plus AD group *M*=0.19 (*SD*=.99). Figures 7 and 8 display the standardized residual difference score distribution broken down by group and gender.

As with the raw difference score, to assess the covariates relationship with the dependent variable, the standardized residual difference score was regressed onto the covariates as a set. The covariates as a set did not significantly predict the standardized residual difference score ($F(4, 85)=.48$, $p>.05$) and none of the covariates, when the effect of other covariates was partialled out, were significant predictors of perceptual bias.

Finally, an ANCOVA was conducted with gender and group status as the independent variables, intellectual ability and age as covariates and the standardized residual difference score as the dependent variable. The main effects of group status ($F(1, 91) =1.70$, $p>.05$) and gender ($F(1, 91) =.03$, $p>.05$) and the interaction group*gender term ($F(1, 91)=.03$, $p>.05$) were nonsignificant (see Table 9 and Figure 9).

4. Discussion

This study breaks new ground by examining perceptual bias among a clinical sample of children with ODD with or without an anxiety disorder, in addition to examining sex differences in this referred sample. At present, the majority of studies examining the accuracy of self perceptions among children have been conducted on children with ADHD or children with subclinical behavioral problems and, to the author's knowledge, no previous study has examined the effects of a comorbid anxiety disorder on these biases. Also, the study is the first of its kind to utilize a task which relies on problem solving

abilities. As previously stated, the extant literature on perceptual bias examines self perception in terms of scholastic, athletic, or social competence.

To summarize the results, for the full sample, children rated their performance on the problem solving task higher than the observer. In accordance with previous research, the current finding suggests that a clinical sample of children with ODD, independent of the presence of a comorbid AD, have an inflated view of their problem solving abilities. Furthermore, age, intellectual ability, and ADHD diagnosis systematically differed across conditions (presence of mother or both parents, group status, gender) and, accordingly, they were included in the analyses as covariates. Overall, contrary to the proposed hypotheses, the findings suggest that there was no difference in perceptual bias between ODD children with or without an AD or gender differences, independent of how perceptual bias was measured, when age, intellectual ability and ADHD diagnosis were partialled out. Specifically, children with ODD only, independent of gender, did not evaluate their performance as better than children in the ODD+AD group. Furthermore, independent of diagnosis, boys' ratings of their performance on the interaction task did not differ from the girls' ratings; in fact, girls tended to rate their performance marginally higher. Lastly, perceptual bias was not a function of diagnosis and gender. Based on the findings it can be concluded that anxiety did not mitigate the presentation of ODD in regard to perceptual bias in this clinical sample of children with ODD. Similarly, females displayed positive perceptual bias to the same extent, if not more so, than males do in a clinical sample of children with ODD.

In regard to the different operationalizations of perceptual bias, it should be noted that there was considerable variance in the composite scores, both for child and observer, and, consequently, the raw difference score alone may impact the measurement of a difference between groups. However, variance

to the degree observed is not uncommon when assessing complicated psychological constructs, such as problem solving abilities in children. Additionally, the same results were obtained when the variance was restricted through standardization in the latter operationalization of perceptual bias, suggesting that variance alone was not responsible for the findings.

Moreover, although the analyses conducted were based on a theoretical model and previous research findings, special caution must be exercised since numerous analyses were undertaken and the experiment-wise error rate was not controlled for. Still, it should be noted that after a Bonferroni correction, which entails a more conservative criteria than α .05, the finding that children in the sample rated their performance on the task higher than the observer continued to be significant.

There are several potential reasons why the findings did not align with previous findings in regard to group and gender differences. For one, the measure in the study was different from traditional studies of perceptual bias. Although some studies have examined pre- and/or post-task predictions, most perceptual bias studies utilize isolated events/tasks. Conversely, in the current study the child was asked to come up with solutions to an ongoing problem chosen by the parent(s). It may also be possible that the topic of discussion, a frequent problem area experienced by the parent in regard to the child's behavior, may pose difficulties when assessing perceptual bias. For instance, the dyad may have attempted to discuss the topic often outside the session and, as a result, the child may have incorporated previous discussions or arguments into their performance ratings. Alternatively, for similar reasons, the child – who by clinical diagnosis was oppositional and negativistic - may have been invested in not resolving the issue, thereby, affecting their performance ratings. In both situations, the child's ratings could be inflated or deflated based on past experiences and clinical presentation. Of interest, the child was also required to engage in the task with the parent(s) who chose the topic of discussion. Under such

circumstances, variables such as gender or the presence of an anxiety disorder may not impact performance ratings as they would with emotionally neutral tasks, especially among children brought into treatment for oppositional behaviors.

Additionally, as indicated earlier, the mitigating effect of AD may be dependent on eliciting anxiety in the individual. In the current study, an interaction task with a parent(s) may not be perceived as a high-stress situation, thereby not eliciting perceptual bias among the children with a clinical anxiety disorder. The outcome may have been different if the child was required to perform a task that did elicit more anxiety (e.g., giving a speech) and without the security of having a parent present.

As with all observational tasks, since the families were asked to engage in the task in a clinic setting external validity concerns arise (Borkovec et al., 1977). For instance, social desirability may have affected the behaviors observed during the interaction task. In the context of the study, children may change their behavior based on their expectations and/or the experimenter's expectations regarding their performance on the task (Borkovec et al., 1977). Likewise, studies have demonstrated that the nature of the instructions may affect the child's expectations regarding performance (Borkovec et al, 1977). As an example, the phrasing of instructions, parental involvement, and rewards offered to the child have all been shown to influence performance expectancies (Borkovec et al., 1977). Notably, participants in the larger study were provided with a $50 check for completing the pre-treatment assessments and many parents chose to share or give the monetary compensation to the child. Additionally, many children were provided with small prizes upon completing the assessment sessions. This may have served as a motivating factor for children to act differently than in the home setting. Also, it should be noted that the interaction task was among the first activities/measures administered upon arrival to the second pre-treatment assessment session. Thus, it may be “fresh” in the minds of the

participants that they were being monitored and videotaped. Also, despite intentions to produce an authentic conversation (e.g., parent(s) chose a common problem the family is faced with, assessors leave the room during the interaction), family members were constantly reminded of their surroundings by the environment in which the interaction took place.

Additionally, it should be noted that a large portion of the sample met diagnostic criteria for ADHD (65%), with a greater frequency of an ADHD diagnosis among the children in the ODD alone group than children in the comorbid group. As previously stated, many studies have demonstrated that children with ADHD display positive perceptual bias (see Owens et al., 2007). Hence the clinical presentation of ADHD may mask the effects of perceptual bias in the current study. Analyses were conducted to investigate the effect of ADHD on the results. No differences were evidenced between children with ODD with and without ADHD. The finding may indicate that children with disruptive behavior disorders - whether the diagnosis is ADHD, ODD or both - display positive perceptual bias. On the other hand, it may reflect the task's lack of sensitivity to perceptual bias rather than the presence of perceptual bias among children with disruptive behavioral disorders.

4.1 *Limitations*. Several limitations to the study should be noted. First, the task used in the study has not been assessed for its psychometric properties. Despite the good face validity and good internal consistency of the task and its rating scales, to ensure that the task's underlying construct is competence in regard to problem solving ability, further research must be conducted examining its construct validity comparing it to measures which psychometric properties that have been well established. Secondly, it is possible that the task and corresponding rating system may lack sensitivity to assess perceptual bias. As previously indicated, eliciting perceptual bias among anxious individuals may be dependent on perceiving the situation as threatening or stressful. Accordingly, it is unlikely that one task would elicit

anxiety among a sample of children with a range of anxiety disorders. Third, it should be noted that the primary coder of the interaction tasks was involved with conducting the clinical assessment of a portion of the sample, thus the coder was not blind to the child's group status (ODD vs. ODD+AD) or the objective of the study. However, a bias due to this seems unlikely since a third of the tasks were coded by coders blinded to group status and the study goals for reliability purposes and inter rater reliability was good. Fourth, the participants were largely Caucasian and from a relatively rural area in southwestern Virginia. Different outcomes may be obtained in a more culturally diverse sample. Finally, although we used a behavioral measure to assess problem-solving ability, as indicated above, all of the interactions were videotaped and obtained under controlled conditions and might not reflect the true occurrence of the behaviors under more normal circumstances.

4.2 *Implications*. Based on the findings, it appears that children with ODD display perceptual bias independent of the presence/absence of an anxiety disorder. However, conclusions based on the findings need to be interpreted with caution due to the limitations of the study. It is possible that anxiety plays less of a mitigating role among children brought into treatment for ODD by their parents. In the context of Gray's model, the finding may represent that the imbalance towards BAS may overpower activation in the BIS in a clinical sample of children with ODD. In other words, the mitigating effects of an anxiety disorder may be attenuated in children with clinical levels of ODD: if so, positive perceptual bias may persist in children with ODD and AD. There are several studies supporting this view (Garai et al., 2009; Ollendick et al., 1999), especially as the children evolve into preadolescence and the ODD features prevail.

4.3 *Future Directions.* Future research is needed to clarify the relationship between anxiety and ODD and differences in perceptual bias between boys and girls. It is recommended that the study be

replicated with validated measures of perceptual bias and a comparison group composed of a non-clinical sample to strengthen the design of the study. Additionally, to provide further support to the presence of perceptual bias, it is recommended that future studies include ratings from multiple informants (e.g., independent rater, parent and teacher). Moreover, the findings of the study only represent perceptual bias in terms of problem solving ability. Ergo, further research is needed to examine perceptual bias in a wider range of settings. With respect to better representing Gray's model of anxiety as a trait, another way of measuring the attenuating influence of the expression of ODD would have been utilizing a continuous measure of anxiety rather than the presence or absence of a clinical AD. Similarly, aggression, in this case ODD symptoms, could also be measured as a continuous variable to better understand how an increase in aggression impacts perceptual bias. Future research on anxiety and aggression as a traits may provide a clearer picture on how anxiety and aggression impacts the expression of ODD. Furthermore, for research in this area to progress, issues of terminology need to be addressed. At present, research on self perceptions is plagued with multiple definitions and terms of the same or similar phenomena (e.g., positive illusory bias, perceptual bias, self appraisal, self-competence).

Unfortunately, it was beyond the scope of the study to examine what underlying mechanisms contribute to perceptual biases. However, in their review article Owens et al. (2007) summarize proposed theoretical explanations for positive perceptual bias among children with ADHD. Common explanations include neurological deficits, cognitive immaturity, the self-protective hypothesis, and the ignorance of incompetence hypothesis. Given the limited existing data and similarities in regard to deficits (for review see Drabick, Ollendick, & Bubier; 2010), future research should evaluate whether the foregoing explanations shed light on perceptual bias among children with clinical levels of ODD

and other disorders. In regard to psychotherapy, studies have found that about a third of children receiving treatment for ODD are poor treatment responders (Beauchaine, Webster-Stratton, & Reid, 2005). Consequently, it is important to continue exploring the clinical presentation of the disorder and how it may affect treatment gains. In doing so, investigating perceptual biases and psychopathology may provide important information for developing more effective treatment for this population.

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6. Footnotes

[1] De Los Reyes and Kazdin (2005) recommend utilizing a standardized difference score when measuring informant discrepancies because it correlates equally with each informant rating used to create the measure, rather than view one informant as better than the other (i.e., a "gold standard" approach; De Los Reyes & Kazdin, 2005). The analyses were run with perceptual bias being operationalized as the standardized difference score and the results remained unchanged since the variances of the child and independent rater's ratings were equal.

[2] Analyses were run with the inclusion of children with a Specific Phobia in the ODD+AD group. Specifically, 18 children had a diagnosis of a Specific Phobia (but no other AD) were included in the ODD+AD group. However, the findings were the same as when children with a Specific Phobia were excluded.

7. Appendices

7.1 Appendix A.

Instructions for Problem Solving Task

For this next activity, we're going to ask you to have a short discussion with each other because we are interested in seeing how parents and children resolve issues together.

(*Target child*) I had your mom (*or dad, etc.*) look at a list of issues that are sometimes problems for parents and children. He/she chose to talk to you about (*issue*). For the next 7 minutes, I'd like the two of you to discuss what the issue is, why it's an issue for your family, and to try to come up with a solution, or solutions, to the problem. Try as hard as you can to make your discussion last the entire time. I/we (*assessors*) are going to leave the room and will return when you are finished.

Do you have any questions?

I'm going to let my stopwatch go for a full 7 minutes before returning. If you do finish your discussion, try to return to it and keep talking until we come back.

7.2 Appendix B.

Parent Issue Checklist

ID # _____ Relation to child: Mother Father Other

Directions

Please place a check mark in the box for topics you have discussed with your son/daughter the last week.

Have you discussed?	
Using the telephone	
Doing homework	
Cleaning up room	
Money issues	
Table manner	
Picking books	
Helping out	
Making noise	
Food at mealtimes	
How to spend free time	
Using the TV	
Friends	
Bothering family	
Bad attitudes	
Time for going to bed	
Lying	
Talking back	
Swearing	
Care of possessions	
Using the stereo/radio	
Fighting with siblings	
Bad attitudes at school	
Personal cleanliness	
Being on time	
Low grades	
Clothing	
Messing up the house	

7.3 Appendix C.

Problem Solving Discussion Rating Scale-Child

Child's ID # _____ Date_____

First Problem # _____

1. How well did you understand what the problem was?

Very well	Well	OK	Not very well	Not at all well
5	4	3	2	1

2. How much did you agree on a solution?

Very well	Well	OK	Not very well	Not at all well
5	4	3	2	1

3. Do you think you solved this problem during the discussion?

Very well	Well	OK	Not very well	Not at all well
5	4	3	2	1

4. Did you agree to take some action as a result of this discussion?

Very well	Well	OK	Not very well	Not at all well
5	4	3	2	1

7.4 Appendix D.

Problem Solving Discussion Rating Scale-Observer

Child's ID # _____ Date_____

First Problem # _____

1. How well did the child understand what the problem was?

Very well	Well	OK	Not very well	Not at all well
5	4	3	2	1

2. How much did the child agree with the solution?

Very well	Well	OK	Not very well	Not at all well
5	4	3	2	1

3. Do you think the child solved this problem during the discussion?

Very well	Well	OK	Not very well	Not at all well
5	4	3	2	1

4. Did the child agree to take some action as a result of this discussion?

Very well	Well	OK	Not very well	Not at all well
5	4	3	2	1

Table 1. Demographics and Clinical Characteristics of the Whole Sample

Demographics	N(%)M(SD)
Male	61(61%)
Age	9.58(1.77)
Caucasian	82(82%)
ODD + AD group	43(43%)
CGAS	59.25(6.13)
CSR	6.01(1.06)
Interaction with mother only	79(79%)
PPVT-4	109.70(15.05)
BRIEF	70.26(9.46)
Diagnosis	**N(%)**
Generalized Anxiety Disorder	20(20%)
Separation Anxiety Disorder	11(11%)
Social Phobia	13(13%)
ADHD	65(65%)

Note. ODD+AD group = children with comorbid ODD and AD, CGAS = Child Global Assessment Scale, CSR = Clinician Severity Rating, PPVT-4 = Peabody Picture Vocabulary Test, Fourth Edition, BRIEF = Behavior Rating Inventory of Executive Functioning, ADHD = Attention-Deficit/Hyperactivity Disorder.

Table 2. Spearman Correlations Among Items on the PSDRS-C, PSDRS-O, Composite Scores, Raw Difference Score, and Standardized Difference Score

	1	2	3	4	5	6	7	8	9	10	11	12
PSDRS-C 1	1											
PSDRS-C 2	.390**	1										
PSDRS-C 3	.423**	.684**	1									
PSDRS-C 4	.445**	.664**	.611**	1								
PSDRS-O 1	.150	.243*	.104	.207**	1							
PSDRS-O 2	.204*	.220**	.402**	.425**	.469**	1						
PSDRS-O 3	.260*	.392**	.374**	.396**	.487**	.760**	1					
PSDRS-O 4	.297**	.362**	.514**	.388**	.452**	.780**	.806**	1				
Composite score-Child	.630**	.870**	.838**	.854**	.231**	.470**	.434**	.519**	1			
Composite score-Observer	.262**	.415**	.408**	.428**	.692**	.898**	.989**	.892**	.492**	1		
Raw difference score	.291**	.305**	.273**	.279**	-.549**	-.542**	-.542**	-.504**	.325**	-.629**	1	
Standardized residual difference score	-.005	.005	.024	.032	.669**	.769**	.789**	.740**	.033	.874**	-.919**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).* Correlation is significant at the 0.05 level (2-tailed). PSDRS-C = Problem Solving Discussion Rating Scale-Child, PSDRS-O = Problem Solving Discussion Rating Scale-Observer rater.

Table 3. Differences on Means and Standard Deviations for Age, CGAS, CSR, BRIEF, PPVT, Group Status, ADHD diagnosis, Race, and Parent Present During Interaction Broken Down By Parent(s) Participating in the Interaction Task

	Mother (N=79)	Mother and father (N=21)	
	Mean(SD)N(%)	Mean(SD)N(%)	Statistics
Age	9.76(1.78)	8.90(1.58)	$t(98)= 2.00$, $p = .05$
CGAS	58.8(6.47)	60.95(4.36)	$t(98)= -1.44$, $p = .15$
CSR	6.04(1.09)	5.90(0.94)	$t(98)= .51$, $p = .61$
BRIEF	70.14(9.58)	70.14(9.26)	$t(89) = -.24$, $p = .81$
PPVT	109.42(13.61)	110.76(19.82)	$t(96) = -.36$, $p = .72$
Male	47(59.5%)	14(66.7%)	$\chi^2(1)= .36$, $p = .55$
ADHD	50(63.3%)	15(71.4%)	$\chi^2(1)= .48$, $p = .49$
Caucasian	62(78.5%)	20(95.2%)	$\chi^2(4)= 4.03$, $p = .40$
ODD+AD group	33(41.8%)	10(47.6%)	$\chi^2(1)= .23$, $p = .63$

Note. CGAS = Child Global Assessment Scale, CSR = Clinician Severity Rating, BRIEF = Behavior Rating Inventory of Executive Functioning, PPVT = Peabody Picture Vocabulary Test, Fourth Edition, ODD+AD group = children with comorbid ODD and AD, ADHD = children with an ADHD diagnosis, Mother = children completing the interaction task solely with their mother.

Table 4. Group Differences on Means and Standard Deviations for Age, CGAS, CSR, BRIEF, PPVT, Gender, ADHD diagnosis, Race, and Parent Present During Interaction

	ODD Group (N=57)	ODD+AD Group (N=43)	
	Mean(SD)N(%)	Mean(SD)N(%)	Statistics
Age	9.89(-1.91)	9.16(1.48)	$t(98)= 2.09$, $p = .03$
CGAS	59.82(6.48)	58.49(5.62)	$t(98)= 1.08$, $p = .28$
CSR	6.16(1.05)	5.81(1.05)	$t(98)= 1.62$, $p = .11$
BRIEF	69.65(9.59)	71.08(9.36)	$t(89)= -.71$, $p = .48$
PPVT	110.32(15.67)	108.88(14.32)	$t(96)= .47$, $p = .64$
Male	36(63.2%)	25(58.1%)	$\chi^2(1)= .26$, $p = .61$
ADHD	42(73.7%)	23(53.5%)	$\chi^2(1)= 4.39$, $p = .04$
Caucasian	47(82.5%)	35(81.4%)	$\chi^2(4)= 4.42$, $p = .35$
Mother	26(80.7%)	33(76.7%)	$\chi^2(1)= .23$, $p = .63$

Note. CGAS = Child Global Assessment Scale, CSR = Clinician Severity Rating, BRIEF = Behavior Rating Inventory of Executive Functioning, PPVT = Peabody Picture Vocabulary Test, Fourth Edition, ADHD = children with an ADHD diagnosis, Mother = children completing the interaction task solely with their mother.

Table 5. Gender Differences on Means and Standard Deviations for Age, CGAS, CSR, BRIEF, PPVT, Group Status, ADHD diagnosis, Race, and Parent Present During Interaction.

	Males (N=61)	Females (N=39)	
	Mean(SD)N(%)	Mean(SD)N(%)	Statistics
Age	9.61(1.68)	9.54(1.92)	$t(98) = 0.19$, $p = 0.85$
CGAS	59.34(5.36)	59.10(7.24)	$t(98) = .19$, $p = .85$
CSR	5.95(1.10)	6.10(0.99)	$t(98) = -.70$, $p = .49$
BRIEF	68.82(8.92)	72.68(9.98)	$t(89) = -1.91$, $p = .06$
PPVT-4	112.51(16.27)	105.46(11.96)	$t(96) = 2.32$, $p = .02$
ODD+AD group	25(41%)	18(46.2%)	$\chi^2(1) = .01$, $p = .93$
ADHD	38(62.3%)	27(69.2%)	$\chi^2(1) = .50$, $p = .48$
Caucasian	52(85.2%)	30(76.9%)	$\chi^2(4) = 2.20$, $p = .70$
Mother	47(77%)	32(82.1%)	$\chi^2(1) = .36$, $p = .55$

Note. CGAS = Child Global Assessment Scale, CSR = Clinician Severity Rating, BRIEF = Behavior Rating Inventory of Executive Functioning, PPVT = Peabody Picture Vocabulary Test, Fourth Edition, ODD+AD group = children with comorbid ODD and AD, ADHD = children with an ADHD diagnosis, Mother = children completing the interaction task solely with their mother.

Table 6. Means and standard deviations for the whole sample, group, and gender

Measure	Full Sample	ODD only	ODD + AD	Males	Females
Composite-Child	14.60(4.25)	14.72(4.03)	14.44(4.57)	14.08(4.25)	15.41(4.18)
Composite-Observer	12.28(4.89)	11.74(4.75)	13.00(5.02)	12.10(4.78)	12.56(5.09)
Raw Difference Score	2.32(4.73)	3.11(4.68)	1.44(4.72)	1.98(4.68)	2.85(4.83)
Standardized Residual Difference Score	.00(1.00)	-.14(.98)	.19(.99)	.02(.98)	-.04(1.04)

Table 7. One-sample Paired T-test of the Child Composite Scores and Observer Composite Scores

	M(SD)	Statistics	95% CI	
			LL	UL
Child Composite – Observer Composite	2.32(4.73)	$t(99) = 4.90$**	1.38	3.26

Note. CI = Confidence interval; LL = lower limit, UL = upper limit.**$p<.01$.

Table 8. Summary of the ANCOVA with the Raw Difference Score as the Dependent Variable

Variables	Sum of Squares	df	Mean Square	F
PPVT-4	19.52	1	19.52	0.86
Age	16.43	1	16.43	0.73
ADHD	2.6	1	2.6	0.12
Group	57.63	1	57.63	2.54
Gender	9.79	1	9.79	0.43
Group*Gender	0.02	1	0.02	0
Total	2706	98		

Note. R^2 = .04. PPVT-4 = Peabody Picture Vocabulary Test, Fourth Edition, ADHD = Attention-Deficit/Hyperactivity Disorder.

Table 9. Summary of the ANCOVA with the Standardized Residual Difference Score as the Dependent Variable

Variables	Sum of Squares	df	Mean Square	F
PPVT-4	0.54	1	0.54	0.53
Age	0.01	1	0.01	0.01
ADHD	0	1	0	0
Group	1.74	1	1.74	1.7
Gender	0.03	1	0.03	0.03
Group*Gender	0.03	1	0.03	0.03
Total	95.67	98		

Note. R^2 = .03. PPVT-4 = Peabody Picture Vocabulary Test, Fourth Edition, ADHD = Attention-Deficit/Hyperactivity Disorder.

Figure 1. Distribution of the Observer Composite Score and the Child Composite Score.

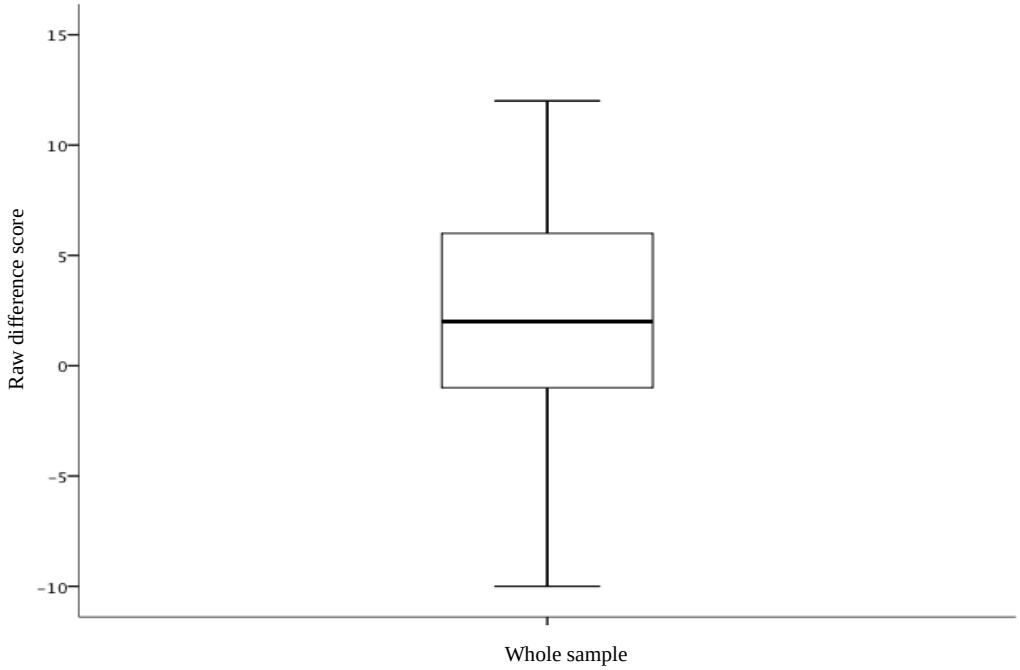

Figure 2. Distribution of Perceptual Bias Operationalized as a Raw Difference Score

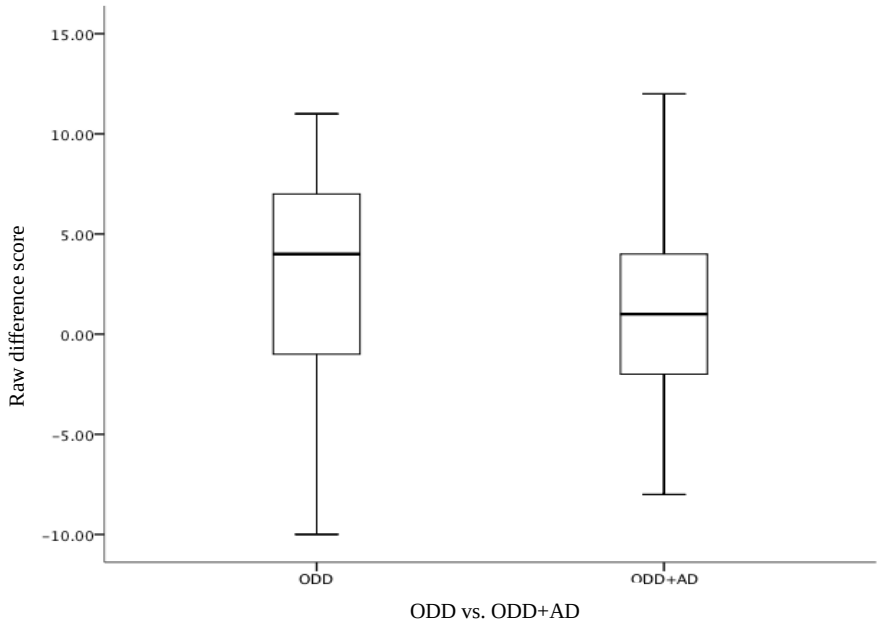

Figure 3. Distribution of Perceptual Bias, Measured as a Raw Difference Score, Broken Down by Group

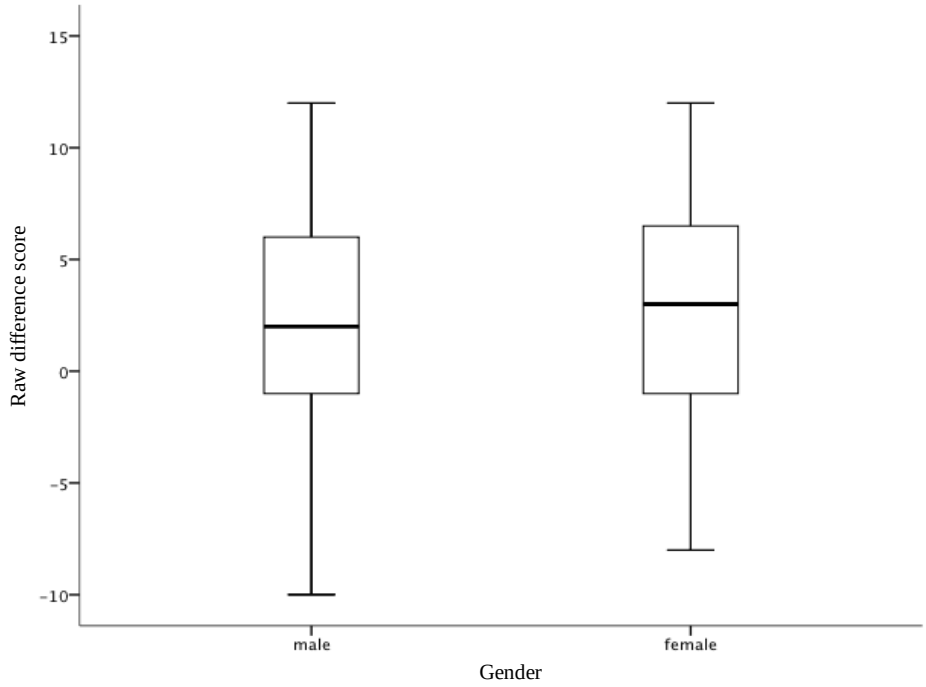

Figure 4. Distribution of Perceptual Bias, Measured as a Raw Difference Score, Broken Down by Gender

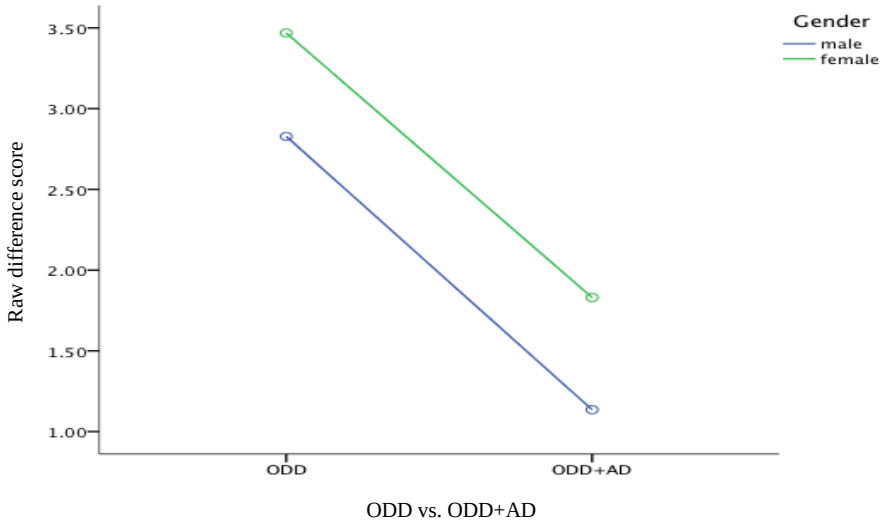

Figure 5. Perceptual bias, Measured as a Raw Difference Score, as a Function of Group Status and Gender When Partialling Out the Effect of Age and IQ

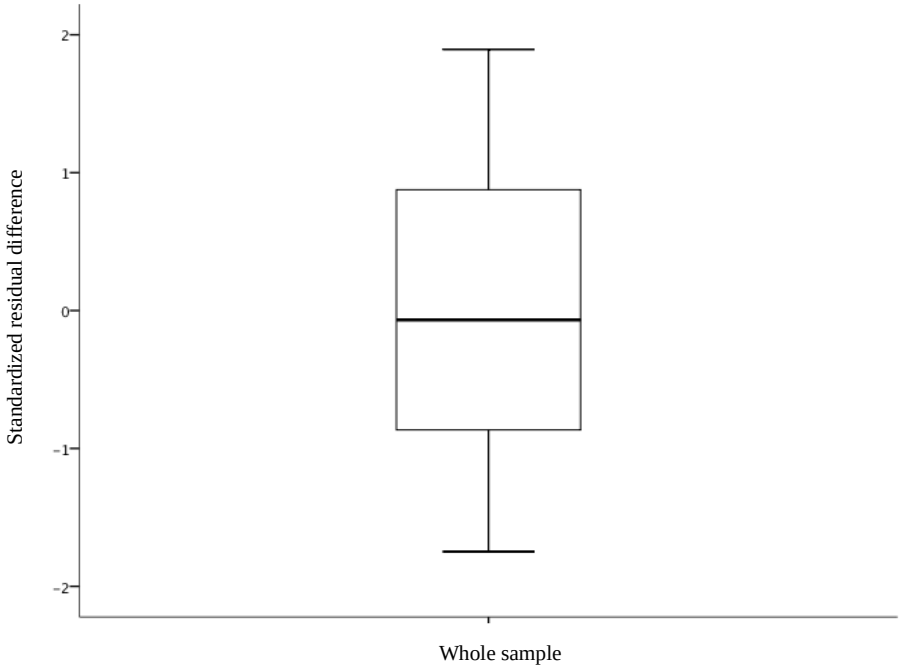

Figure 6. Distribution of Perceptual Bias Operationalized as a Standardized Residual Difference Score

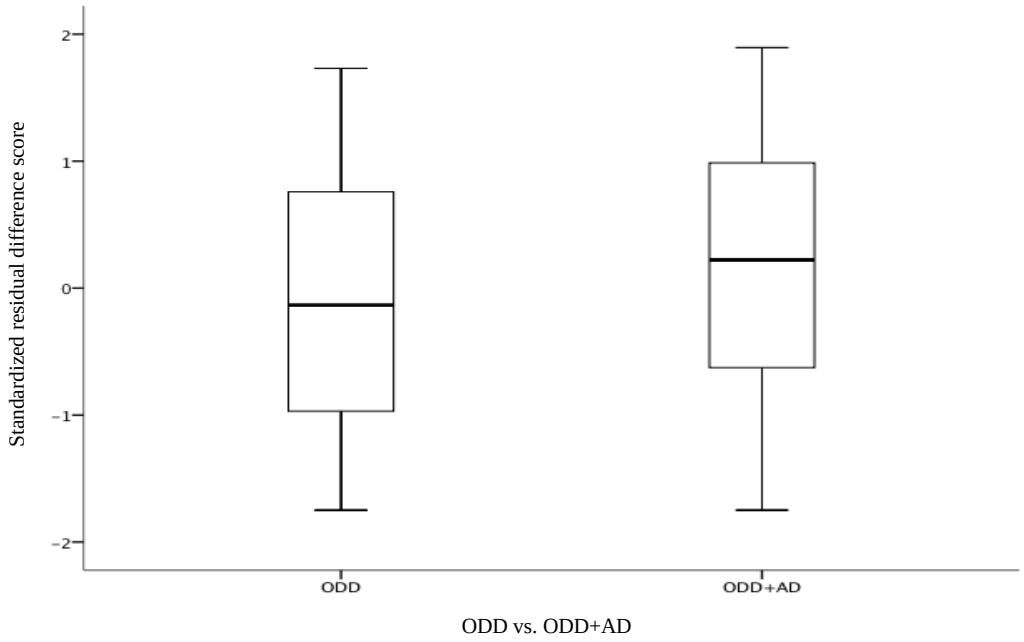

Figure 7. Distribution of Perceptual Bias Broken Down by Group

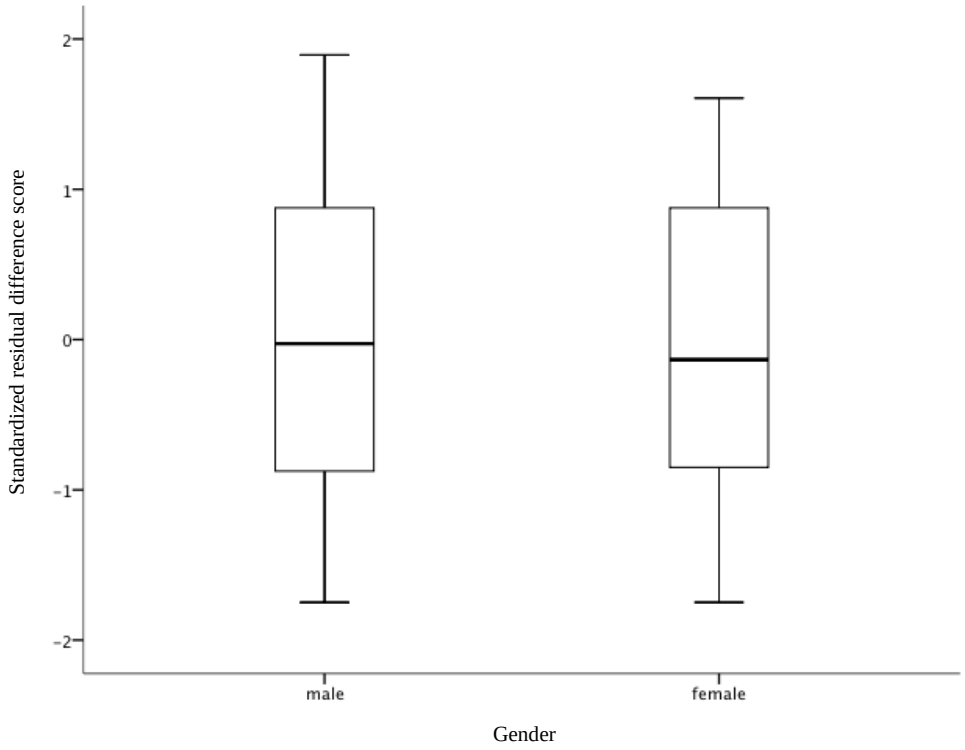

Figure 8. Distribution of Perceptual Bias Broken Down by Gender

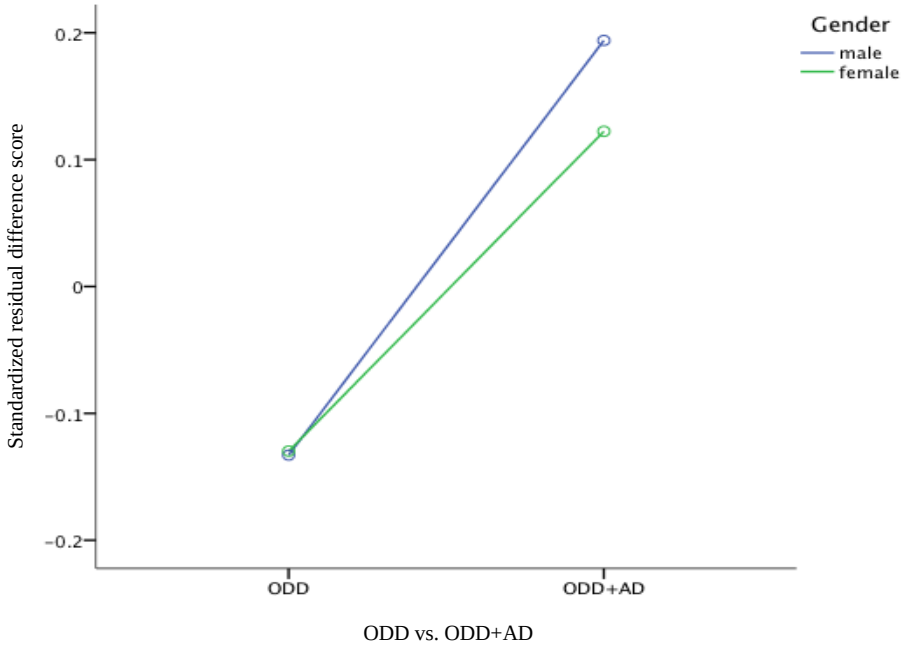

Figure 9. Perceptual Bias, Measured as a Standardized Residual Difference Score, as a Function of Group Status And Gender with the Effects of Age and IQ Partialled Out.