

Mother–Child Relationships of Children With ADHD: The Role of Maternal Depressive Symptoms and Depression-Related Distortions

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We investigated the *Depression*→*Distortion* hypothesis by examining the effects of maternal depressive symptoms on cross-informant discrepancies in reports of child behavior problems and several measures of parent–child relationship. The sample included ninety-six 6 to 10-year-old children diagnosed with ADHD-Combined Type, and their mothers, who provided baseline data before participating in a randomized clinical trial. Measures incorporated child characteristics, self-reports of maternal depressive symptoms, parenting practices, and laboratory mother–child interactions. Elevations in maternal depressive symptoms were associated with maternal reports of negative parenting style but not with observed laboratory interactions. Mothers' levels of depressive symptoms predicted negative biases in their reports of their child's ADHD symptoms, general behavior problems, and their own negative parenting style. Whereas levels of depressive symptoms did not predict observed parenting behaviors, maternal distortions did predict problematic parent–child interactions. Exploratory analyses showed a marginally significant mediation effect of the relationship between maternal depressive symptomatology and reports of negative parenting by depressive distortions. We discuss implications of linkages between depressive symptoms in mothers, depression-related distortions, and mother–child relationships for research and intervention in developmental psychopathology.

KEY WORDS: attention-deficit hyperactivity disorder; depression-related distortions; parenting styles; parent–child interactions.

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is perhaps the most prevalent mental disorder of childhood, affecting 3–7% of school-aged children in the United States (Barkley, 1998). It is highly heritable (Tannock, 1998) and is characterized by hyperactivity, impulsivity, and inattention (American Psychiatric Association [APA], 1994)—symptoms that deleteriously affect the child's school, social, and home environments, yielding serious impairments in academic attainment, peer relations, and parent–child interactions (Hinshaw, 2000). Although formerly conceptualized as a disorder that would remit by

adolescence (Laufer & Denhoff, 1957), ADHD almost always persists beyond childhood (Biederman et al., 1998), with a subgroup showing continuing impairment into adulthood (Mannuzza & Klein, 1999). In addition to its chronicity, the comorbidity of ADHD with externalizing and internalizing disorders is quite significant (Jensen, Martin, & Cantwell, 1997) and such comorbidities decrease treatment efficacy and increase the chance of negative outcomes (Pliszka, Carlson, & Swanson, 1999). Rates of comorbidity of ADHD with the disruptive behavior disorders of oppositional defiant disorder (ODD) and conduct disorder (CD) are far above chance levels (Biederman, Newcorn, & Sprich, 1991). With respect to internalizing disorders, rates of comorbidity between ADHD and depressive and anxiety disorders have been shown to be as high as 38% (Jensen, Shervette, Xenakis, & Richters, 1993). Children with such comorbidity are often not as impulsive or hyperactive as children with ADHD alone,

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have parents with anxiety and mood problems, and may show a different pattern of response to psychosocial interventions (Jensen et al., 1997; MTA Cooperative Group, 1999b).

Parent–Child Relationships of Children With ADHD

Disruption in parent–child relationships is a crucial area of study regarding ADHD, given the importance of parental discipline practices in the psychosocial development of children (Baumrind, 1971; Maccoby, 2000) and the active role of parents as participants in both pharmacological and behavioral treatments (Patterson, 1995). Although the incidence of conflictual family interactions in children with ADHD is high (Cunningham, Benness, & Siegel, 1988; Fletcher, Fischer, Barkley, & Smallish, 1996), the underlying mechanisms are not fully known (Johnston & Mash, 2001). Certainly, the noncompliant nature of the child with ADHD is pertinent, as acute trials of stimulant medication reveal that parental negativity decreases when the child with ADHD is medicated. On the other hand, parental positivity does not as consistently increase with decrements in child negativity (Barkley & Cunningham, 1979). Importantly, Barkley, Fischer, Edelbrock, and Smallish (1991) showed that, for families of children with ADHD, coercive parent–child interactions were better accounted for by the presence of comorbid ODD symptoms than by ADHD alone. Such research shows that externalizing behaviors of children are potential explanatory mechanisms of negative parent–child interactions; investigations of factors related to negative parent–child interactions must take externalizing behaviors and comorbidities into consideration.

Depressed Mothers and Their Perceptions

Investigations reveal that mothers of children with ADHD experience higher levels of depressive symptomatology than do mothers of comparison children (Nigg & Hinshaw, 1998). In addition, parental depression has also been shown to predict family discord and behavior problems in children with ADHD (Cunningham et al., 1988). If a parent is depressed, with distorted perceptions and cognitions and with difficulties in communication (McDermut, Haaga, & Bilek, 1997), she/he may have problems with objective evaluations of child behavior, which would appear to increase the likelihood of conflictual and/or negative parent–child interactions. Because parents are often the primary (if not the exclusive) informants about children's emotional and behavioral distur-

bance, the possibility of depression-related distortions in perceptions of child behavior is important clinically as well as conceptually.

Indeed, several investigators (Boyle & Pickles, 1997a; Chilcoat & Breslau, 1997) have noted positive associations between levels of maternal depressive symptomatology and mothers' ratings of child behavior problems, such that children of mothers with elevated levels of depressive symptoms are usually rated as more behaviorally disturbed than children of nondepressed parents. In a prospective longitudinal study, Najman et al. (2000) showed that, compared to nondepressed mothers and other informants, depressed mothers' child ratings yielded disproportionate rates of false positives in predicting future psychopathology. Such findings have led to claims that depressed mothers may not be accurate informants, with their depression leading to negative bias.

The Depression→Distortion Hypothesis

In fact, according to the *Depression→Distortion* hypothesis (Richters, 1992), mothers who are experiencing depressive symptomatology will rate their children's behavior in exaggerated fashion. Reciprocal processes may then ensue subsequent to the initial maternal negative bias: The initial maternal distortion may fuel negativity in the mother's response to the child, who may respond, in turn, with aggression. This self-fulfilling prophecy of increasing conflict may escalate into coercive disciplinary practices and parent–child interactions (Patterson, 1995).

Richters (1992) concluded that researchers have yet to demonstrate depression-related distortions convincingly. He suggested improved methodology, including the availability of multiple informants to rate similar behaviors across different contexts and better statistical indices to evaluate distortion. One recent study (Youngstrom, Izard, & Ackerman, 1999) contrasted maternal ratings of videotaped child behaviors with ratings made by trained observers and showed that maternal dysphoria was predictive of more negative behavior ratings from the mothers when compared with the ratings of the observers. Also, Youngstrom, Loeber, and Stouthamer-Loeber (2000) showed that whereas other informants did rate children of depressed parents as problematic, depressed mothers appeared to rate their own children as especially troublesome. Overall, parental depression may predict higher ratings of problematic child behavior, with some of the effects mediated by actual increases in children's problem behavior and some related to negative distortion or bias in maternal ratings. In the current study, we examine *Depression→Distortion* linkages and expand upon the

usual criterion measure in such research (i.e., maternal ratings of child behavior, utilizing teacher ratings as the anchor) to the mother's ratings of her own parenting style (using child reports of her parenting as the anchor). In the current study, we expect that the levels of a mother's depressive symptoms will influence her perceptions of her parenting style as well as her ratings of her child's problem behavior.

Furthermore, we take the additional step of using cross-informant discrepancies in reports of child behavior problems to predict self-reports of maternal discipline. We also use discrepancies in self-reports of (a) child behavior problems and (b) parenting styles to predict observations of maternal interaction style with her child. This latter step of analysis is unusual in traditional tests of the *Depression*→*Distortion* hypothesis because distortion has usually been investigated as a criterion variable (e.g., Najman et al., 2000; Youngstrom et al., 1999) and not as a predictor or mediator. However, because recent research has shown that discrepant perception is predictive of child adjustment problems (Pelton, Steele, Chance, & Forehand, 2001) and family conflict (Pelton & Forehand, 2001), we included this step in order to see if depressive-distortions were predictive of parent-child relationships.

Current Investigation

The current study has three primary objectives. First, we examine the relationship between maternal depressive symptoms and (a) her reports of maternal discipline styles and (b) her laboratory interactions with her child. Here,

the predictor variable is the measure of maternal depressive symptomatology, with the criterion variables comprising self-reports of maternal discipline strategies and laboratory observations of parent-child interactions. Our second objective is to test for the *Depression*→*Distortion* hypothesis. We examine this objective by establishing a link between maternal depression symptoms and maternal biases in reports of her discipline styles and child behavior problems. The criterion measures in these analyses are (a) mother-teacher discrepancies in ratings of children's externalizing problems and (b) mother-child discrepancies in ratings of maternal discipline styles. Third, in an original set of analyses, we examine whether cross-informant discrepancies predict self-reports and observations of parent-child relationship while adjusting for the effects of maternal symptoms of depression and child behaviors during the observations. We focus on children with ADHD because parental (especially maternal) reports of child functioning are central in the diagnosis of ADHD and depression-related distortions may be more relevant in clinical populations than in normative samples (e.g., Sawyer, Streiner, & Baghurst, 1998). Furthermore, the *Depression*→*Distortion* hypothesis has not been evaluated with this clinical population.

Finally, we conducted a mediator analysis (Baron & Kenny, 1986; Holmbeck, 1997), examining whether depression-related distortions would mediate the relationship between maternal depressive symptomatology and measures of negative parenting (see Fig. 1). Although empirical evidence has demonstrated that maternal depression is predictive of negative parent-child relationships

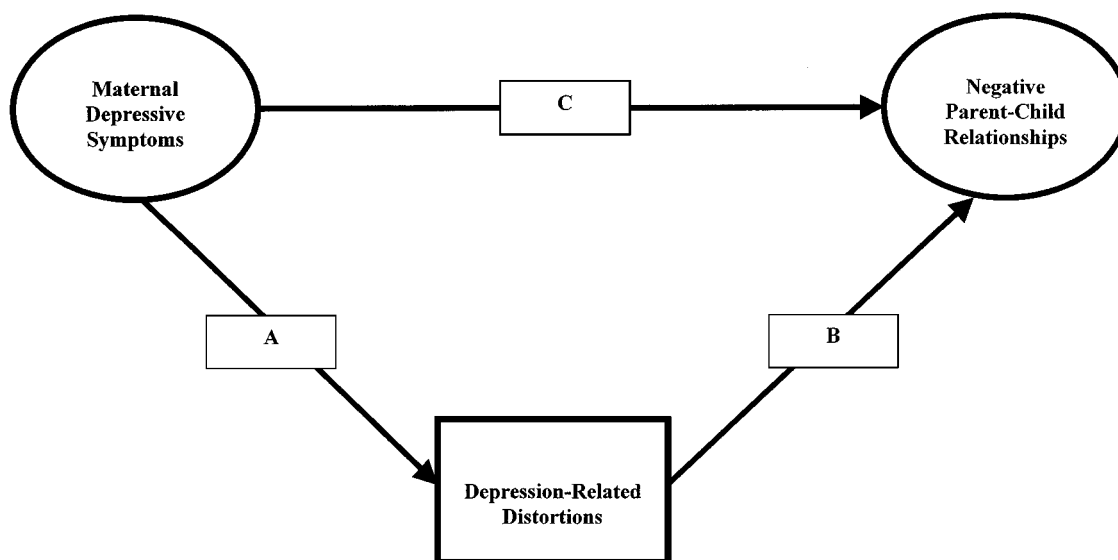


Fig. 1. Conceptualization of *Depression*→*Distortion* Mediator Model.

(Cunningham et al., 1988) in families with a child diagnosed with ADHD, the putative mechanisms explaining this relationship are still unclear. If our study does show depressive-distortions in mothers, it is conceivable that such depressive-distortion may be one of the mechanisms through which depressive symptomatology of mothers affects parent-child relationships.

Research Questions and Hypotheses

Research Question 1: What is the relationship between maternal depressive symptomatology and maternal discipline strategies/parent-child interactions of children with ADHD? We hypothesize that the severity of depressive symptoms in mothers will predict negative maternal discipline strategies/parent-child interactions even with the effects of child ADHD symptoms and other externalizing problems statistically controlled.

Research Question 2: Does the level of depressive symptoms in mothers of children with ADHD predict exaggerated or distorted ratings of ADHD symptoms, general behavior problems, and self-reports of maternal discipline strategies? After controlling the effects of SES and child VIQ, we hypothesize that the severity of maternal depressive symptomatology will be positively correlated with cross-informant discrepancies in reports of ADHD symptoms, general behavior problems, and maternal discipline strategies, such that higher levels of depressive symptomatology will predict more negative biases in maternal reports when compared to others' reports.

Research Question 3: Do depression-related distortions predict self-reports of maternal discipline styles and parent-child interaction behaviors? We hypothesize that discrepancies in reports of child psychopathology will be predictive of self-reports of maternal discipline styles and maternal interaction behaviors even after controlling the effects of maternal depressive symptoms and child interaction behaviors. We also contend that discrepancies in reports of maternal discipline styles will predict parent-child interaction, controlling for both maternal depressive symptomatology and child interaction behaviors. Finally, we explore whether depression-related distortions mediate any associations found between the severity of maternal depressive symptoms and negative parent-child relationships.

METHOD

The current investigation was conducted as part of the Multimodal Treatment Study of Children with ADHD

(MTA³), a multisite, randomized clinical trial (MTA Cooperative Group, 1999a). In this investigation, an ethnically and sociodemographically diverse sample of 579 children diagnosed with ADHD was randomly assigned to one of three intensive treatment modalities (medication management, intensive behavioral intervention, medication management + intensive behavioral intervention) or community referral for 14 months. The study described herein includes *only* the baseline, pretreatment data collected at the University of California, Berkeley site of the MTA.

Participants

The 96 participants and their families were recruited through clinical and school referrals and via advertisement and contacts with parent support groups. Regardless of the child's history, diagnostic status was reevaluated upon entry into the MTA to insure ascertainment homogeneity (see Hinshaw et al., 1997, for details). Inclusion criteria for the MTA included a diagnosis of ADHD-Combined type, based on criteria in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (*DSM-IV*; APA, 1994) and significant impairment as indicated by teacher and parent ratings, and Verbal or Performance IQ score of at least 80. The ethnically diverse sample included 76 boys and 20 girls aged 6–10 years ($M = 7.73$, $SD = 0.89$). We tested for general intelligence with the third edition of the Wechsler Intelligence Scale for Children (*WISC-III*; Wechsler, 1991). The sample scored well within the normative range in intellectual functioning in

³The MTA is a cooperative treatment study performed by six independent research teams in collaboration with the staff of the Division of Clinical and Treatment Research of the National Institute of Mental Health (NIMH), Rockville, Maryland and the Office of Special Education Programs (OSEP) of the U.S. Department of Education (DOE). The NIMH Principal Collaborators are Peter S. Jensen, MD, L. Eugene Arnold, MEd, MD, John E. Richters, PhD, Joanne B. Severe, MS, Donald Vereen, MD, and Benedetto Vitiello, MD. Principal Investigators and Coinvestigators from the six sites are as follows: University of California at Berkeley/San Francisco (UO1 MH50461): Stephen P. Hinshaw, PhD, Glen R. Elliott, MD, PhD; Duke University (UO1 MH50447): C. Keith Conners, PhD, Karen C. Wells, PhD, John S. March, MD, MPH; University of California at Irvine/Los Angeles (UO1 MH50440): James M. Swanson, PhD, Dennis P. Cantwell, MD, Timothy Wigal, PhD; Long Island Jewish Medical Center/Montreal Children's Hospital (UO1 MH50453): Lily Hechtman, MD; New York University School of Medicine, NYU Child Study Center: Howard B. Abikoff, PhD; New York State Psychiatric Institute/Columbia University/Mount Sinai Medical Center (UO1 MH50454): Laurence L. Greenhill, MD, Jeffrey H. Newcorn, MD; University of Pittsburgh (UO1 MH50467): William E. Pelham, PhD, Betsy Hoza, PhD, Helena C. Kramer, PhD (Stanford University) is statistical and design consultant. The OSEP/DOE Principal Collaborator is Ellen Schiller, PhD.

Verbal IQ (Range = 67–134; $M = 101.14$, $SD = 14.42$), Performance IQ (Range = 64–132; $M = 100.34$, $SD = 14.46$), and Full Scale IQ (Range = 71–130; $M = 100.72$, $SD = 13.81$). The sample's ethnic distribution was 55.2% Caucasian, 27.1% African American, 2.1% Latino, and 15.6% of the sample from other/multiethnic groups. The families were also diverse with regard to their income and parental education levels. Socioeconomic status (SES) in the current study represents both the ratings of individual family's income and maternal education. Families ranged from receiving public assistance (rating = 1) to those with over \$75,000 (rating = 9) in annual income (mean income rating = 5.47, $SD = 2.61$). Maternal education ranged from mothers who did not graduate from high school (rating = 1) to mothers with advanced graduate degrees (rating = 6; mean educational attainment = 4.54, $SD = 0.95$). Ratings of family income and maternal education were standardized (z scores) and the values summed into a SES composite.

Predictor Variable

Descriptive statistics for the key predictor, criterion, and covariate variables are shown in Table I. Maternal

Table I. Descriptive Statistics of Key Variables

Variables	N	M	SD
Age	96	7.73	0.89
Child VIQ	96	101.14	14.42
Child PIQ	96	100.34	14.46
Child FSIQ	96	100.72	13.81
BDI	96	7.73	6.84
TRF Ext	94	68.34	8.94
TRF Tot	94	68.68	6.92
CBCL Tot	94	66.43	8.96
CTRS	96	49.13	16.08
CPRS	96	81.47	30.42
Positive Discipline (M)	96	97.82	9.97
Positive Discipline (C)	96	90.08	18.18
Negative Discipline (M)	96	76.51	12.43
Negative Discipline (C)	96	69.15	17.87
Setting Stage	95	3.03	0.61
Behavior Management	95	4.57	0.69
Maternal Warmth	95	2.96	0.79
Reinforcement	95	1.56	0.56
Maternal Anger	95	5.81	0.33
Overall Competence	95	3.06	0.49
Child Compliance	95	4.65	0.96
Child Negative Behavior	95	4.39	0.97

Note. BDI = Beck Depression Inventory; TRF Ext/Tot = Teacher Rating Form Externalizing Scale T Score/Total T Score; CBCL Tot = Child Behavior Checklist Total T Score; CPRS/CTRS = Conners Parent/Teacher Rating Scale; VIQ = Verbal IQ; PIQ = Performance IQ; FSIQ = Full Scale IQ; M = Mother; C = Child.

depressive symptomatology was measured by the total score from the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), an extensively used self-report that assesses affective, cognitive, and physical symptoms of depression. We used the BDI as an index of depression instead of a discrete diagnosis because we wanted to assess the effects of present level of depressive symptomatology on parenting practices and potential biases. The BDI is correlated with psychiatric ratings of patient and student samples, and has good test-retest reliabilities ($r_s = .60-.83$) among nonpsychiatric samples (Beck, Steer, & Garbin, 1988).

Covariates

In order to investigate the effects of depressive symptomatology independent of other confounding variables, all the analyses for Research Question 1 (*What is the relationship between maternal depressive symptomatology and maternal discipline strategies/parent-child interactions of children with ADHD?*) were conducted with child age, verbal IQ, gender, general externalizing problems (Teacher Report Form), and ADHD symptoms (Conners Teacher Report Scale) partialled. When mothers' laboratory behaviors were the criterion variables, observations of child behaviors were also included as additional covariates; our intent here was to examine effect of maternal depression on her parenting style, covarying the child's level of noncompliance and negativity during the observed laboratory parent-child interaction. We used the teacher measures of childhood externalizing psychopathology in order to avoid shared-method variance. The TRF is a widely used teacher-report that assesses a wide range of child behavior problems. The Conners Teacher Rating Scale (CTRS; Conners, Sitarenios, Parker, & Epstein, 1998b) was used as the teacher-reported measure of ADHD symptoms. Both scales include subscales specifically relevant for ADHD (e.g., hyperactivity, restless-impulsive, emotional lability, inattentive; Conners, 1997, p. 13).

Criterion Variables

Self-Reports of Discipline Strategies

Ratings of maternal discipline strategies were obtained from mother- and child-versions of the Parent-Child Relationship Questionnaire (PCRQ; Furman & Giberson, 1995) and the Alabama Parenting Questionnaire (APQ; Shelton, Frick, & Wootton, 1996), both of which used a 5-point Likert scale. Each questionnaire included subscales that examined positive discipline strategies such as the Personal Closeness scale of the PCRQ,

and the Involvement and Positive Parenting scales of the APQ. Examples from the PCRQ include “How much do you and this child care about each other?”; an example from the APQ includes, “You let your child know when he/she is doing a good job with something.” Negative discipline strategies were measured by the Power Assertion scale of the PCRQ, and the Poor Monitoring/Supervision, Inconsistent Discipline, and Corporal Punishment scales of the APQ. Examples include, “How much do you yell at this child for being bad?” from the PCRQ and “The punishment you give your child depends on your mood” from the APQ. Both parents and their children were asked the identical questions with wording modified for each informant as necessary.

These positive and negative scales of discipline strategies formed the composites of self-reported parenting in the current study. These included the Positive Discipline Strategy composites (child composite $\alpha = .80$; maternal composite $\alpha = .74$) and the Negative Discipline Strategy composites (child composite $\alpha = .57$; maternal composite $\alpha = .55$). We created these composites on rational/conceptual grounds and because of their similarity to empirically established composites with the same measures (Hinshaw et al., 2000). Because of our emphasis on the theoretical constructs of positive/supportive and negative/punitive parenting practices, we decided to use the Negative Discipline Strategy composite despite its modest internal consistency.

Mother–Child Interactions

Laboratory observations of mother–child interactions were included to assess mother–child relationships and to make available data on family interactions and maternal discipline that may not be captured in self-reports. The entire task consisted of four separate segments that included 4 min of free play, 3 min of child sitting quietly while the mother was working, 5 min of homework assignment, and 5 min of playroom clean-up. Prior to the start of the interaction, a research assistant gave directions to the mother instructing her to play with her child with the toys in the room. After 4 min of free-play, another research assistant entered the room and handed the mother a work packet to complete in the next 3 min. At that time, the mother was instructed to tell the child to stop playing, sit on a chair in the corner quietly without interrupting the mother. After the 3 min, the child was escorted out of the room and the mother was given further instructions about the last 10 min (5 min of homework and 5 min of clean-up) of the interaction. The mother was instructed to give the child a work packet (consisting of either spelling or math questions)

and assist the child (if necessary) for the next 5 min. After the homework segment, upon hearing a signal (slight tapping on the 2-way mirror), the mother was instructed to ask the child to stop working and start cleaning the room.

Except for the free-play segment, all other segments were coded with a global coding system. Trained research assistants who were blind to both the diagnostic status of the participants and the hypotheses of the study rated laboratory behaviors of the mother–child dyad. The research assistants used a 6-point Likert metric (1 = *Very Poor*, 6 = *Excellent*) to measure the quality of the interaction. Raters' inter-rater reliability was measured by the average intraclass correlation (ICC) coefficients for each behavior across the three parts of the observational measure. The six maternal behaviors included *Setting Stage* (prepare the child for upcoming events; average ICC = .71), *Behavior Management* (set limits when child negative behavior is high and “back off” when child is behaving appropriately; average ICC = .73), *Maternal Anger* (reversed scored; level of anger and annoyance; average ICC = .54), *Positive Reinforcement* (rate of positive reinforcement; average ICC = .59), *Maternal Warmth* (warmth in behavior; average ICC = .77), and *Overall Competence* (general skill as a parent; average ICC = .57). The child behaviors included Child Compliance (rate of compliance with commands; average ICC = .86) and Child Negative Behaviors (rates of complaining, whining, and verbal abuse; average ICC = .87). These behaviors were chosen because research has shown the importance of (a) balancing both limit-setting and positive reinforcement with hyperactive–aggressive children (Patterson, 1995), (b) the effects of depression on positive and negative parental behaviors (Stark, Schmidt, & Joiner, 1996), and (c) the centrality of child defiance in parent–child discord in ADHD children (Barkley et al., 1991). The ICC's showed that the inter-rater reliability ranged from moderate to high (Landis & Koch, 1977) across all observed behaviors.

We averaged the six categories of maternal interaction behaviors across the three different segments of the interaction in order to decrease the chance of Type I errors. Statistical analysis demonstrated that ratings of all 6 maternal behaviors and both child behaviors were internally consistent across these segments (α s = .74–.87). The sole purpose for the child behaviors was their use as covariates to control for child effects (e.g., Barkley & Cunningham, 1979) on observations of mothers' behaviors; we performed no predictive analyses with them.

Cross-Informant Discrepancies

We defined such discrepancies as the standardized residual scores (SRs) from regression models in which

(a) teacher ratings were used to predict maternal ratings of both child ADHD symptoms and overall behavior problems and (b) child ratings were used to predict maternal ratings of both positive and negative discipline styles. We used SRs instead of raw mathematical difference scores because of the potentially low reliability of raw difference scores (Cohen & Cohen, 1983). Each SR is the standardized mathematical difference between the actual values of maternal reports (what mothers actually endorsed) and the predicted values of maternal reports (derived from regression models with teacher/child reports as predictors) such that $SR = z$ scores of (actual maternal reports – predicted maternal reports). Working from the theoretical assumption that mothers who are depressed will show negative biases (e.g., their reports will be more negative than teacher/child self-reports) in their ratings, we made the teacher and the child as the standards from which maternal ratings were predicted. The second research question (*Does the level of depressive symptoms in mothers of children with ADHD predict exaggerated or distorted ratings of ADHD symptoms, general behavior problems, and self-reports of maternal discipline strategies?*) tests how much of the discrepancy (expressed as a SR) between maternal ratings (assumed to be the biased informant) and teacher or child ratings is accounted for by mothers' depressive symptoms.

Four SRs were constructed. First, for ADHD symptoms (ADHD SR), we used the Conners Teacher Rating Scale (CTRS; Conners et al., 1998b) scores to predict the Conners Parent Ratings Scale (CPRS; Conners, Sitarenios, Parker, & Epstein, 1998a) scores. Both scales include subscales specifically relevant for ADHD (e.g., hyperactivity, restless-impulsive, emotional lability, inattentive; Conners, 1997, p. 13). Internal consistency ranges from $\alpha s = .65$ to $.99$ (Conners, 1997, p. 112) for both scales and scores on them are stable across time (test-retest $r s = .47$ – $.88$). Both construct validity and discriminant validity have been strongly established (Conners, 1997, pp. 119–136). We included the Conners scales to test the *Depression*→*Distortion* hypothesis (e.g., how depression influences maternal reports of child symptoms) because they specifically assess the presence and severity of ADHD symptoms. Second, for general behavior problems (General Problems SR), we used the TRF Total Behavior Problem scores (Achenbach, 1991b) to predict parallel maternal CBCL Total Behavior Problem scores (Achenbach, 1991a). Third, child reports of positive discipline styles were used to predict maternal reports of her positive discipline (Positive Discipline Strategy SR); and fourth, child reports of negative discipline were used to predict maternal reports of her own negative discipline (Negative Discipline Strategy SR).

Data Analytic Plan

For Research Question 1, in order to test whether severity of maternal depressive symptomatology uniquely predicted negative discipline strategies and observations of maternal behaviors above and beyond child externalizing psychopathology and other child demographic variables, we performed four sets of hierarchical regressions. After entering SES, child VIQ, gender, and age in one block, we entered CTRS scores at the second step, followed by TRF Ext. as the third step, and BDI as the fourth and final step, predicting separate criterion variables of self-reports of maternal discipline strategies and observations of maternal behaviors (when observations of maternal behaviors were the criterion, observations of child behaviors were also statistically controlled).

For Research Question 2, pertaining to the *Depression*→*Distortion* hypothesis, we examined whether maternal BDI scores would predict cross-informant discrepancy (SRs). The positive prediction from BDI scores to SR scores would support the *Depression*→*Distortion* hypothesis, given that positive SR scores indicate more negative reports from mothers than from teachers' or children's reports. Similarly, for Research Question 3, in tests of the extent to which cross-informant discrepancies (SRs) predicted self-reports of discipline styles and observations of maternal behaviors with her child, positive prediction from SRs to self-reports/observed maternal behaviors would indicate that higher levels of discrepancies were associated with more negative self-reports of discipline and more negative maternal behaviors during the laboratory mother-child interaction. Finally, as shown in Fig. 1, depressive-distortion can serve as a mediator if four preconditions are met (Baron & Kenny, 1986). First of all, maternal depressive symptoms must be associated with negative parent-child relationships (Path C of Fig. 1). Next, maternal depressive symptoms must be related to depression-related distortions (Path A of Fig. 1). Third, depression-related distortions must be predictive of negative parent-child relationships (Path B of Fig. 1). Finally, when Paths A and B are statistically controlled, the predictor-criterion relationship (Path C of Fig. 1) must either be eliminated (a full mediator) or significantly decreased (a partial mediator). To do so, we followed the authoritative conceptual guidelines of Baron and Kenny (1986) and Holmbeck (1997), and incorporated statistical methods offered by Kenny (2001). In brief, following tests of the initial conditions for mediation, we conducted a two-step hierarchical regression equation predicting parent-child relationship by entering the mediator (depressive-distortion) in the first step and the predictor (maternal depressive symptoms) as the second step. If there is a mediating

process, controlling the depressive-distortions should decrease (partial mediation) or eliminate (full mediation) the predictive relationship between maternal depressive symptoms and parent-child relationships. If full mediation of the model is not supported, we tested for partial mediation effects using the unstandardized coefficients and standard error of the coefficients from the three paths in the model (see Kenny, 2001, for a detailed description) to derive a test for the significance of the decrement in predictive power.

RESULTS

Associations Between Key Variables

Table II shows that the BDI is significantly associated only with maternal self-reports of negative parenting strategies and not observed maternal behaviors. Teacher reports of ADHD symptoms (CTRS) showed that maternal anger was associated with greater ADHD severity. General externalizing behavior problems (TRF Ext) were associated with both maternal and child reports of negative parenting strategies and more negative maternal behaviors during observations of mother-child interactions (Setting Stage, Maternal Anger, and Overall Competence). Maternal reports of her own negative discipline style were associated with observed negative parenting behaviors.

Effects of Maternal Depressive Symptoms on Observations and Reports of Discipline

The key findings regarding Research Question 1 are presented in Table III. First, none of the background or demographic variables or CTRS scores predicted self-reports of discipline strategies. As shown in Table III, only BDI scores predicted maternal reports of negative discipline strategies ($\beta = 0.29, p < .01$). For child reports of Negative Discipline Strategy, TRF Ext was the only significant predictor ($\beta = .29, p < .05$). Severity of maternal depressive symptomatology did not predict observed maternal behaviors, but child negative behavior and noncompliance during the interaction predicted maternal Behavior Management and child externalizing behavior problems predicted Overall Competence ($\beta = -.29, p < .05$). Thus, a mother's level of depressive symptoms was associated with her own reports of negative discipline style, whereas the child's level of externalizing behavior (measured by teacher self-reports or observed directly) was associated with the child's report of negative parenting or observed negative maternal behavior.

Effects of Maternal Depressive Symptoms on Cross-Informant Discrepancies

Regarding the *Depression*→*Distortion* hypothesis (Research Question 2), the data supported our contention

Table II. Associations Amongst Predictor and Criterion Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. BDI																
2. CTRS	-.11															
3. TRF Ext	.03	.71**														
4. Positive Discipline (M)	-.08	-.08	-.09													
5. Positive Discipline (C)	.01	.01	.08	.15												
6. Negative Discipline (M)	.28**	.12	.21*	-.21*	-.11											
7. Negative Discipline (C)	.04	.18	.25*	.16	.09	.23*										
8. Setting Stage	-.16	-.15	-.23*	.14	-.06	-.37**	-.12									
9. Beh. Management	-.19	-.14	-.20	.06	.06	-.20	-.21*	.45**								
10. Maternal Warmth	-.15	-.16	-.17	.07	-.14	-.35**	-.11	.70**	.19							
11. Reinforcement	-.03	.01	-.08	.12	-.01	-.15	.00	.55**	.12	.67**						
12. Maternal Anger ^a	-.11	-.21*	-.22*	-.15	-.15	-.22*	-.27**	.40**	.62**	.34**	.12					
13. Overall Competence	-.16	-.17	-.24*	.14	-.12	-.34**	-.16	.85**	.51**	.82**	.71**	.48**				
14. ADHD SR	.26*	.00	.21*	-.08	-.08	.17	.12	-.26*	-.04	-.06	-.07	-.05	-.11			
15. General Problems SR	.30**	.02	.17	-.16	.03	.27**	.24*	-.25*	-.07	-.14	-.07	-.05	-.17	.71**		
16. Positive Discipline SR	-.09	-.08	-.10	n.a.	.00	-.20	.15	.15	.05	.09	.12	-.13	.16	-.06	-.16	
17. Negative Discipline SR	.28**	.08	.16	-.25*	-.14	n.a.	.00	-.35**	-.16	-.33**	-.15	-.16	-.32**	.14	.23*	-.23*

Note. ADHD SR = Mother-teacher discrepancies in reported ADHD symptoms from Conners scales; General Problems SR = Mother-teacher discrepancies in reported general symptoms from CBCL/TRF scales; Positive/Negative Discipline SR = Mother-child discrepancies in self-reported maternal discipline styles.

^aNegatively scored such that higher score = less anger.

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

Table III. Maternal Depressive Symptomatology as Predictor of Self-Reports of Maternal Discipline Strategies

Step	Predictor	Positive Discipline (M)			Positive Discipline (C)			Negative Discipline (M)			Negative Discipline (C)		
		R ²	ΔR ²	β	R ²	ΔR ²	β	R ²	ΔR ²	β	R ²	ΔR ²	β
1	Background and Demo	.03	—	—	.04	—	—	.06	—	—	.10	—	—
2	CTRS	.04	.01	-.08	.04	.00	-.01	.06	.00	.06	.12	.02	.14
3	TRF-Ext	.04	.00	-.05	.05	.01	.16	.09	.03	.24	.16*	.04*	.29*
4	BDI	.05	.01	-.08	.05	.00	-.00	.17**	.08**	.29**	.17	.01	.10

Note. M = Maternal Ratings; C = Child Ratings; Background and Demo = Child verbal IQ, age, ADHD symptoms, gender, and Family SES level; CTRS = Conners Teacher Rating Scale; TRF-Ext = Teacher Report Form—Externalizing Scale.

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

that mothers with elevated levels of depressive symptoms would show negative biases in their ratings when compared to teacher and child reports (see Table IV). First, neither child verbal IQ nor SES was related to cross-informant discrepancies. BDI scores predicted mother–teacher discrepancies in reports of ADHD symptoms (ADHD SR; β = .28, *p* < .01) and general behavior problems (General Problems SR; β = .30, *p* < .01). BDI scores also predicted mother–child discrepancies in reports of negative discipline strategies (Negative Discipline Strategy SR; β = .27, *p* < .01). These results showed that mothers with higher levels of depressive symptoms reported more child externalizing problems than teacher reports. Also, mothers with elevated depressive symptoms rated themselves as using more negative discipline strategies than what was reported by their children.

Effects of Cross-Informant Discrepancies on Observations and Reports of Discipline

Regarding Research Question 3, mother–teacher discrepancy in reports of ADHD symptoms (ADHD SR) was not predictive of self-reports but did predict behavior ratings of maternal Setting Stage (β = -.28; *p* < .05). Next, mother–teacher discrepancies in reports of general behavior problems (General Problems SR) predicted Setting Stage (β = -.23; *p* < .05) as well as both maternal (β = .21; *p* < .05) and child (β = .25; *p* < .05) reports of negative discipline style. Finally, higher levels of

mother–child discrepancies in reports of maternal negative discipline style predicted more problematic Setting Stage (β = -.30; *p* < .01), less Maternal Warmth (β = -.30; *p* < .01), and less Overall Competence (β = -.28; *p* < .01) after controlling for background and demographic variables, maternal depressive symptoms, observations of child behaviors, and self-reports of child externalizing behaviors (see Table V).

Testing for Mediation

Because (a) maternal BDI scores predicted maternal self reports of negative discipline strategy, (b) BDI predicted General Problems SR, and (c) General Problems SR predicted maternal self reports of negative discipline strategy, the initial conditions for a mediator model were met (Baron & Kenny, 1986). In the crucial test for mediation, we found first that the zero-order correlation between BDI and maternal self-reports (*r* = .28, *p* < .01) decreased when the General Problems SR was controlled in the partial correlation (*r* = .22, *p* < .05). Second, a hierarchical regression controlling for the putative mediator (General Problems SR) showed that although the BDI still was a significant predictor of maternal self-reports (4.4% incremental variance; β = .22, *p* = .033), the strength of prediction was decreased from the original prediction (8% variance, β = .28, *p* = .005). However, significance-testing of this difference using a modified Sobel test (Sobel, 1982) showed that the decrement in prediction was not

Table IV. Effects of Maternal Depressive Symptomatology on Cross-Informant Discrepancies

Step	Predictor	ADHD SR			General Problems SR			Positive Discipline SR			Negative Discipline SR		
		R ²	ΔR ²	β	R ²	ΔR ²	β	R ²	ΔR ²	β	R ²	ΔR ²	β
1	SES and VIQ	.02	—	—	.01	—	—	.00	—	—	.02	—	—
2	BDI	.10**	.08**	.28**	.09**	.09**	.30**	.01	.01	-.09	.09**	.07**	.27**

Note. SES = Socioeconomic composite; VIQ = Child verbal IQ from WISC-III; BDI = Beck Depression Inventory.

***p* < .01.

Table V. Discrepancies in Self-Reports of Negative Discipline as Predictor of Observed Maternal Behaviors

Step	Predictor	Setting Stage			Beh. Management			Maternal Warmth			Reinforcement			Maternal Anger			Overall Competence		
		R ²	ΔR^2	β	R ²	ΔR^2	β	R ²	ΔR^2	β	R ²	ΔR^2	β	R ²	ΔR^2	β	R ²	ΔR^2	β
1	Background and Demo	.12	—	—	.05	—	—	.09	—	—	.15*	—	—	.07	—	—	.14*	—	—
2	BDI	.13	.01	-.14	.08	.03	-.18	.12	.03	-.16	.15	.00	.00	.09	.02	-.12	.16	.02	-.16
3	Obs Child Beh	.14	.01	—	.29**	.21**	—	.18*	.06*	—	.15	.00	—	.13	.04	—	.17	.01	—
4	TRF-Ext	.16	.02	-.23	.29	.00	-.12	.19	.01	-.14	.18	.03	-.24	.14	.01	-.10	.20	.03	-.27
5	Negative Discipline SR	.24**	.08**	-.30**	.30	.01	-.06	.27**	.08**	-.30**	.20	.02	-.17	.15	.01	-.14	.27**	.07**	-.28**

Note. Background and Demo = Child verbal IQ, age, ADHD symptoms, gender, and Family SES level; BDI = Beck Depression Inventory; Obs Child Beh = Observations of child's behaviors; TRF-Ext = TRF Externalizing Scales; Negative Discipline SR = Mother-child discrepancy in self-reports of maternal negative discipline.

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

statistically significant at $p < .05$ level (refer to Kenny, 2001 and Preacher & Leonardelli, 2001 for details). The z statistic required to reach significance at the $p < .05$ level is 1.96; the z statistic derived from the current model is 1.77, which was significant at $p < .08$ level.

DISCUSSION

Our three primary objectives were to elucidate the contributions of maternal depressive symptomatology to the parent-child relationship, to test the validity of the *Depression*→*Distortion* hypothesis (Richters, 1992) in mothers of children with ADHD, and to examine if depression-related distortions would be associated with negative discipline styles and parent-child interaction patterns. First, we found that a mother's level of depressive symptomatology was associated with her self-reported discipline style, even after controlling for her child's externalizing problems. Contrary to our predictions, maternal depressive symptomatology was not related to observational measures of maternal behaviors. Instead, maternal behaviors in the laboratory interaction were associated with child externalizing problems and the family's economic circumstances. These results point to the possibility that emotional distress and depressive symptomatology may have a stronger relationship with mothers' perceptions of their behaviors than with their actual parenting behaviors. A logical conclusion from this possibility is that elevated depressive symptomatology in mothers may predict the degree to which their judgment about themselves and others is consistent with that of other informants.

However, the null results can also be related to the inherent ambiguity and low variance of some of the observational codes. For example, although some of the ma-

ternal codes were conceptually relevant to our aims (e.g., Maternal Warmth, Behavior Management), these concepts often encompassed multiple constructs that may not be readily operationalized. Therefore, despite our attempts to improve inter-rater reliability (e.g., requiring coders to pass operational definition exams for all codes), the ICCs for the maternal behaviors were not as high as those for the more concrete and discrete child behaviors. Finally, low variance for some of the maternal behavior codes could also have contributed to some of the null results; this was especially true for Maternal Anger (see Table I). Although speculative, it is conceivable that the label "anger" could have been perceived by the coders as more infrequent out-of-control rage instead of a more common, low-grade annoyance/irritation.

We found support for our second research question, pertaining to the association between maternal depressive symptomatology and bias in her perceptions. Maternal BDI scores predicted mothers' negative biases regarding (a) reports of their children's ADHD-related symptoms and general behavior problems and (b) perceptions of their own negative parenting-style. This last finding is an unprecedented documentation of the *Depression*→*Distortion* phenomenon, transcending maternal reports of her child's symptoms or problem behavior and incorporating her views of her own parenting style. In supporting the *Depression*→*Distortion* hypothesis, our results call into question alternative explanations from other investigators of no distortion or even increased inter-rater agreement (e.g., depressive realism; Ackerman & DeRubeis, 1991) between ratings from depressed mothers and other informants (e.g., Lovejoy, 1991). Instead, mothers with elevated depressive symptoms endorsed more severe ADHD symptoms and general behavior problems in their children and perceived their parenting style as more negative, compared to teacher and child reports, respectively.

Third, after establishing the existence of depressive-distortions, we also tested how these distortions may be associated with maternal discipline styles and parent-child interactions. Whereas depressive symptoms were not predictive of how mothers behaved during the laboratory interaction task, maternal distortions about their children's ADHD symptoms, general behavior problems, and their own discipline styles predicted difficulties in preparing their children for upcoming demands as well as inadequate levels of warmth and overall competence in parent-child interactions. Possibly, maternal distortions compromise mothers' behavior with their children and their own judgments about their parenting style through the increased stress of parenting children with ADHD. Therefore, our findings show that not only does level of depressive symptoms distort a mother's perceptions of child behavior and her own parenting style, but such distortions are related to how she interacts with her child above and beyond the contributions of the child's observed behaviors and her own levels of depressive symptoms. Finally, in our preliminary and exploratory test, we found a marginally significant effect ($p < .08$) of partial mediation regarding the role of maternal distortions as a potential explanatory factor bridging maternal depressive symptoms and her own report of negative parenting style. In other words, we found preliminary evidence that the extent to which maternal depressive symptoms affect her own perceptions of her parenting style may be influenced by her (distorted) perceptions of her child's behavior problems.

Implications for Assessing Mother-Child Relationships in Children With ADHD

We showed that depressive symptoms in the mother and aggression and defiance in the child were each related to both informants' perceptions of elevations in negative and coercive disciplinary strategies, but they were not related to positive disciplinary strategies. This specificity of association between the influence of child/maternal psychopathology with child/maternal perceptions of mothers' discipline style may indicate that the use of positive versus negative discipline strategies may be independent of each other in terms of causal mechanisms and associated features. Although our cross-sectional data do not allow us to draw directional implications, the data seem to show that to decrease levels of negative disciplinary strategies, interventions should focus both on decreasing children's externalizing behaviors and on reducing maternal depressive symptomatology. On the other hand, it may be more important to emphasize improving parenting skills and educate parents on behavioral principles in efforts to increase more positive parent-child relationships.

The results from the behavioral observations, in contrast to maternal self-reports of discipline styles, point to the importance of child effects (e.g., Barkley & Cunningham, 1979) and the contribution of distortions (above and beyond depressive symptomatology per se) on a mother's actual behaviors with her child. The child's actual behavior during the laboratory interaction and his or her levels of externalizing symptomatology were more important than maternal BDI scores in predicting how mothers set limits and control negative child behaviors and her overall skill as a parent. However, distortions associated with depressive symptomatology may also play a role in mothers' behaviors with their children.

These results point to the importance of relying on more than one informant or one context as the sole source of information (Fletcher et al., 1996; Johnston, 1996; Stormshak, Speltz, DeKlyen, & Greenberg, 1997), placing a further premium on researchers to elucidate the most valid methods for combining data from various informants. However, this option may sometimes be impractical in clinical settings. Our findings suggest that if only one informant is available, it will be important to assess the informant's emotional well-being and if there are signs of elevated emotional distress such as elevated depressive symptoms, diagnostic information obtained should be evaluated with care. Furthermore, these results bring up the important issue of the clinical significance of depression-related distortions and how it relates to the diagnostic validity of information obtained from informants with elevated levels of emotional distress and/or depressive symptomatology. Although the current data cannot address this important issue, future studies incorporating prospective longitudinal analyses will be important in its elucidation. Finally, although the mediation model was only marginally significant, the Sobel test is a very conservative test for indirect effects (Kenny, 2001) and our sample size could have precluded an adequate test of our model. Our exploratory test showed that there is a possibility that depressive symptomatology may affect parenting behaviors less through the symptoms themselves, but through distorted perceptions that usually accompany depression.

Implications for Maternal Depressive-Distortions

Our results support past research showing that elevated level of maternal depressive symptoms is related to negatively biased reports of child symptomatology (Boyle & Pickles, 1997; Chilcoat & Breslau, 1997). The results indicated that mothers' levels of current depressive symptomatology were associated with maternal ratings of their

child as more hyperactive, inattentive, and generally more disruptive compared with teacher ratings of the same attributes. Also, as far as we know, this study was also the first of its kind showing that a mother's depressive symptomatology negatively biases her perceptions of her own discipline practices with her child, in comparison with the child's report of parallel discipline practices. Thus, our data provide important cross-validation of the *Depression*→*Distortion* phenomenon in an important domain of psychosocial functioning, in addition to validating the phenomenon in the traditional domain of ratings of the child's externalizing behavior.

Limitations

The results of the current study are tempered by several limitations. First, our sample was a clinical sample that did not include clinical controls or normal comparison families. Therefore, our results may be due to the unique nature of children with ADHD and their mothers or to this particular sample. However, past research on the *Depression*→*Distortion* hypothesis has not used defined clinical samples, and the consistency between the present results and past investigations suggests that our results are not simply artifactual. Second, although ADHD has strong genetic underpinnings (e.g., Tannock, 1998), we were not able to factor out potential genetic mediators of conflictual relationships. Genetically informed research (e.g., Reiss, Hetherington, Plomin, & Howe, 1995) that includes different degrees of genetic relatedness will be crucial to elucidate genetic/environmental mechanisms of parent-child conflicts.

Third, the cross-sectional nature of the current data constrains causal interpretations; examination of these issues from a longitudinal point of view is clearly needed. In fact, one recent longitudinal study (Najman et al., 2000) showed that mothers with elevated depression were overly sensitive (i.e., making more false positive errors) in predicting psychopathology of their offspring, evaluated prospectively during early adolescence, than were nondepressed mothers or than were child self-reports of pathology. However, the study did not evaluate either the short-term or long-term effects of maternal bias on other psychosocial domains of functioning.

Fourth, the *Depression*→*Distortion* phenomenon will not be clearly elucidated unless experimental manipulations are included in future investigations, so that a "Gold Standard" of what is accurate assessment can be more objectively determined. By utilizing teacher and child ratings as the criterion raters, we showed support for maternal bias. However, the bias assumption is ultimately

an inferential one because it was impossible to truly assess who was the accurate informant and child behaviors have been shown to be different across different contexts (Achenbach, McConaughy, & Howell, 1987). One study by Youngstrom and his colleagues (Youngstrom et al., 1999) show promising experimental evidence, in which mothers viewed videotaped behaviors of their child and behaviors of a control child. Results showed that dysphoria in mothers predicted ratings biases for both groups of children when compared to ratings from independent raters. However, given the potential artificiality of parents' viewing recorded samples of their child's behavior, results of true experiments need to be considered alongside those from more naturalistic studies that assesses bias in the real world in terms of comparing how parents and other informants recall the child's behaviors. Finally, although we found preliminary support for a distortion-mediated relationship between maternal depressive symptomatology and mothers' reports of parenting behaviors, shared-method variance of reports of depressive symptomatology (BDI) and reports of discipline strategy preclude conclusive interpretation of the results.

Future Directions

The MTA has recently completed coding of the laboratory mother-child interaction for the entire sample ($N = 579$). The inclusion of the entire sample across three time periods (pre-treatment, 14-month, and 24-month follow-up) will enable us to test how depressive-distortions may affect the treatment outcomes and to address the clinical significance of depression-related distortions by contrasting the predictive power of different raters' initial assessment for clinical outcomes in a more developmentally valid, longitudinal design. Finally, whether or not the negative biases truly mediate (Baron & Kenny, 1986) the relationship between maternal depressive symptomatology and increased parent-child discord in children with ADHD is still unclear. We hope to extend our mediator analyses in terms of both enhanced sample size (utilizing the entire MTA sample) and longitudinal analyses (examining baseline to posttreatment linkages) and with measures of depressive symptomatology, negative parenting, and distortion that do not share method variance in subsequent investigations.

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