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Maternal Depression History Moderates Parenting Responses to Compliant and Noncompliant Behaviors of Children with ADHD

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Abstract

Maternal depression and parenting are robust predictors of developmental outcomes for children with attention-deficit/hyperactivity disorder (ADHD). However, methods commonly used to examine parent-child interactions in these families do not account for temporal associations between child and parent behavior that have been theorized to maintain negative child behavior. Moreover, studies examining associations between maternal depression and parenting in families of children with ADHD have not compared mothers who were currently depressed, remitted, and never clinically depressed. This study utilized sequential analysis to examine how maternal reinforcement of compliant and noncompliant child behavior differs as a function of maternal depression history. Within the 82 participating mother-child dyads, 21 mothers were currently depressed, 29 mothers had a lifetime history of depression but were in remission for at least 1 month, and 32 mothers had never been clinically depressed. 24 girls (29.6%) and 57 boys (70.4%) between the ages of 6–12 year old ($M = 8.7$, $SD = 2.0$) and were diagnosed with ADHD. Results indicated that all mothers were less likely to respond optimally than non-optimally to child compliant and noncompliant behaviors during observed parent-child interactions; however, currently depressed mothers were least likely to reinforce child compliance and responded most coercively to child noncompliance relative to the other groups. Remitted mothers in this sample were more coercive than never clinically depressed mothers, but were more likely to follow through with commands than never clinically depressed mothers. Implications for behavioral parent training programs aimed at skill development for depressed mothers of children with ADHD are discussed.

Keywords

ADHD; Depression; Parenting; Sequential Analysis

Developmental outcomes for children with attention-deficit/hyperactivity disorder (ADHD) vary widely, with some children experiencing very serious negative outcomes into

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adolescence and adulthood, and others experiencing only mild impairment (Biederman, Clarke, Lomedico, & Faraone, 2011; Chronis-Tuscano et al., 2010; Mannuzza, Klein, Abikoff, & Moulton, 2004). Genetic variations may not fully account for differences in later functioning (Martel et al., 2011; Nigg et al., 2010). Indeed, environmental factors seem to at least partially contribute to the expression of ADHD symptoms, development of comorbid conditions, and functional impairment experienced by children with ADHD (Johnston & Chronis-Tuscano, 2014; Nigg, 2012).

Parenting and parental psychopathology are robust environmental predictors of developmental outcomes in children with ADHD (Deault, 2010). Maternal depression and early positive parenting each independently predict the course of child conduct problems over a period of 8 years (Chronis et al., 2007). Furthermore, negative parenting is associated with later child ADHD symptoms, above and beyond shared genetic effects and difficult child temperament (Harold et al., 2013). This has led researchers to conclude that there are multiple causal pathways to later outcomes in ADHD, with environment playing an important role (Biederman et al., 2011; Harold et al., 2013; Johnston & Chronis-Tuscano, 2014).

One pathway by which the environment can contribute to positive and negative developmental outcomes for genetically and temperamentally vulnerable children is through the nature and quality of parent-child interactions (Deault, 2010). Families of children with ADHD and disruptive behavior problems often engage in reciprocal coercive interactions (Johnston & Mash, 2001), which over time increases the child's risk for disruptive behavior problems (e.g., Harvey, Metcalfe, Herbert, & Fanton, 2011). Patterson's coercion theory holds that parents often withdraw demands or become increasingly harsh in response to their child's repeated noncompliance and other challenging behavior. The parent's withdrawal or harsh behavior is negatively reinforced through the (at least temporary) reduction in the child's aversive behavior (Patterson, 1982). At the same time, child misbehavior is negatively reinforced through the reduction of parental demands. The more frequently such patterns occur, the greater the likelihood that both parent and child will continue to engage in negative behaviors during parent-child interactions, placing the child at risk for the maintenance and/or escalation of conduct problems. Consistent with this theory, experimental and prospective longitudinal studies demonstrate that children with ADHD and disruptive behavior elicit harsh parenting behavior, feelings of incompetence, and negative affect from caregivers (Harold et al., 2013; Pelham et al., 1999).

Researchers have long examined observed parent-child interactions in families of children with ADHD (for a review, see Danforth et al., 1991). Existing methods of capturing observed parent and child behavior during parent-child interactions fall primarily into two categories: coding systems which involve frequency counts of discrete behaviors and those which use global/dimensional ratings. These approaches provide the foundation for understanding potentially problematic parent-child interactions within families of children with ADHD. Methodological factors, however, limit the ability of these approaches to detect dyadic behavior-consequence sequences that map onto coercive reciprocal interaction patterns, as theorized by Patterson (1982). More specifically, few studies establish true temporal contingencies between parent and child behavior such that specific child behavior

(e.g., compliance) significantly predicts subsequent maternal behavior (e.g., praise, negative talk). We can only conclude, then, that compared to controls, negative parent and child behaviors occur more frequently in interactions between children with ADHD and their parents relative to comparison families (Danforth et al., 1991; Johnston & Mash, 2001). Given that the principles of operant conditioning suggest that child behavior that is reinforced with a positive response (e.g., praise) is more likely to be repeated, it is critical to identify whether mothers respond in a reinforcing manner to child compliance. Furthermore, given that child noncompliance is only temporarily reduced but over time maintained and exacerbated by harsh parenting, it is also important to examine the degree to which mothers respond to child noncompliance with harsh or critical behavior (i.e., negative talk) or by withdrawing demands (i.e., ignoring). Finally, it is useful to understand characteristics of mothers who are at greater risk for responding more or less adaptively.

Analytic methods that address temporal processes within parent-child interactions map directly onto social learning theory and provide a direct test of coercive processes within parent-child interactions (Urquiza & Timmer, 2002). Furthermore, evidence-based behavioral parent training programs for children with ADHD and conduct problems serve to disrupt this coercive cycle by teaching parents to consistently reinforce positive behavior, ignore minor misbehavior, and punish serious misbehavior through time out and response cost procedures (Eyberg, Nelson, & Boggs, 2008; Pelham & Fabiano, 2008).

Maternal Depression

Approximately 40% of mothers of children with ADHD have a history of major depression, making them 2 to 3 times more likely to be depressed than women in the general population (Chronis et al., 2003; Kessler, 2006). Maternal depression predicts poor child outcomes in clinical and community samples, including increased rates of child internalizing and externalizing symptoms (e.g., Goodman et al., 2011). For children with ADHD, maternal depression history predicts the development of later conduct problems, depression, and suicidal ideation/attempts (Chronis et al., 2007; Chronis-Tuscano et al., 2010).

One possible mechanism linking maternal depression to poor child outcomes is parenting (Lovejoy et al., 2000). Indeed, findings indicate that depressed mothers are more negative, less positive, more disengaged, and have greater difficulty managing their children's behavior than non-depressed mothers (e.g., Johnston & Mash, 2001; Lee et al., 2013). Parenting differences may be directly linked to depressive symptoms wherein harsh discipline or lack of positive parenting may be associated with fatigue, low mood, or irritability (Goodman et al., 2011). Additionally, depressed mothers may lack the energy or coping skills to effectively manage child misbehavior and may therefore withdraw demands, give in to child misbehavior, provide inadequate supervision, or become increasingly coercive in response to difficult child behavior (Chronis-Tuscano & Clarke, 2008).

The majority of research on maternal depression in the context of child ADHD has typically examined either continuous maternal depressive symptoms using self-report scales (Mash & Johnston, 1982; Lee et al., 2013) or dichotomous (ever/never) groupings (Chronis et al., 2003, 2007). Yet, there is some evidence to suggest that parenting difficulties may persist

even after a mother's depressive episode has remitted (Foster et al., 2008a). One or more major maternal depressive episodes within a child's lifetime have been associated with more negative and less positive maternal parenting (Foster et al., 2008b). Furthermore, although remission of maternal depression has been associated with increased warmth and acceptance as reported by the child, remitted mothers continue to engage in psychologically controlling parenting relative to mothers without a history of depression (Foster et al., 2008). These findings suggest that, although current maternal depression is most strongly related to parenting (Murray et al., 2006), mothers whose depressive symptoms have remitted may continue to exhibit less adaptive parenting than mothers without a history of depression. Thus, taking into account current as well as past depressive episodes may provide a more complete and accurate picture of the association between maternal depression and parenting behavior among mothers of children with ADHD (Foster et al., 2008b; Lovejoy et al., 2000). To date, no study has examined associations between parenting and maternal depression status in this refined manner.

Additionally, although links between maternal depression, maternal parenting behavior, and childhood ADHD have been examined in multiple studies, methods used to establish these links do not specifically describe how patterns of maternal response to positive and negative child behavior vary as a function of maternal depression. Moreover, as noted previously, with few exceptions, most studies investigating parent-child interactions and child ADHD have examined either dimensional levels of depressive symptoms or maternal depression history without fully exploring potential differences between mothers who are currently depressed, remitted or have no prior clinical depression history (Foster et al., 2008b; Goodman et al., 2011). Additional research is therefore needed to examine how moment-to-moment parenting responses to child positive and negative behavior vary as a function of maternal depression history. This research has the potential to inform behavioral parenting interventions, for which maternal depression predicts poor response (Owens et al., 2003).

Current Study

The current observational study utilized multi-level, sequential analysis to examine differences in maternal responses to child noncompliant and compliant behavior as a function of maternal depression history in families of 6–12 year old children with ADHD. Importantly, we examined maternal responses to both child positive and negative behavior, as both could vary as a function of maternal depression history. We hypothesized that currently depressed mothers would exhibit the highest frequency of negative parenting and lowest overall frequency of positive parenting, followed by remitted mothers, and finally never clinically depressed mothers (regardless of child behavior). Next, using sequential analysis, we hypothesized that currently depressed mothers would be least likely to reinforce child compliance with praise, followed by remitted mothers, and finally never clinically depressed mothers, who would be most likely to positively reinforce child compliance. Finally, we hypothesized that currently depressed mothers would be most likely to engage in coercive responses (e.g., responding negatively, withdrawing demands) following child noncompliance, more so than remitted mothers, and finally never clinically depressed mothers, who were expected to be least likely to engage in coercive responses following child noncompliance. This is the very first study to utilize sequential analysis to test

Patterson's model. This is also the very first study to contrast parenting responses of mothers who are currently, previously, or never clinically depressed in families selected on the basis of child ADHD.

Methods

Participants

Participants were recruited from the Washington, DC metropolitan area to participate in a larger treatment study (Chronis-Tuscano et al., 2013). Participants were provided with a detailed explanation of the procedure and provided written informed consent. The baseline assessment included diagnostic measures of maternal and child psychopathology and an observed parent-child interaction. Upon arrival at the assessment session, participants were provided with a detailed explanation of the procedure and provided written informed consent. Participants were included if they were biological mothers, reported at least minimal depression indicated by at least a score of 10 or greater on the Beck Depression Inventory-II¹ (BDI-II; Beck, Steer, Ball, & Ranieri, 1996), and had a child between the ages of 6–12 years who met DSM-IV criteria for ADHD. Children were excluded if they had an estimated IQ of 70 or below using the Vocabulary and Block design subtests of the Wechsler Intelligence Scale for Children, 4th Ed. (WISC-IV; Wechsler, 2003). Mothers were excluded if they currently met criteria for any Axis I psychopathology that would require alternative treatment (i.e., substance abuse, psychosis, or bipolar disorder), due to the aims of the larger study. Approval was obtained by the University of Maryland, College Park Institutional Review Board.

The larger study included 105 mother-child dyads that completed the baseline assessment and met eligibility criteria. Twenty-three families were excluded due to missing or unusable observational data; therefore, a subset of 82 dyads was included in the current study. Results of analyses comparing this subsample to the full study sample indicated that mothers who had useable observational data were more likely to be married, $\chi^2(1) = 5.77, p = .02$. No other significant differences were observed. Participant characteristics are presented in Table 1.

Measures

ADHD—Child ADHD was assessed by combining information from multiple informants using multiple methods (Pelham, Fabiano, & Massetti, 2005). Under the supervision of a licensed clinical psychologist (the senior author), doctoral students in clinical psychology administered the Schedule for Affective Disorders for School-Aged Children (K-SADS; Orvaschel & Puig-Antich, 1995). The KSADS is a semi-structured DSM-IV diagnostic interview that assesses current and lifetime symptoms of child clinical disorders and associated impairment. Parents and teachers also completed the Disruptive Behavior Disorders Rating Scale (DBD; Pelham et al., 1992). On the DBD, informants are asked to rate the degree to which ADHD, oppositional defiant disorder (ODD), and conduct disorder

¹Per inclusion criteria of the larger study, mothers in this group were required to have at least a 10 or greater on the BDI-II. Although mothers were selected on the basis of at least minimal depressive continuous symptoms, we refer throughout this manuscript to mothers who have never met DSM-IV criteria for a mood disorder as Never Clinically Depressed.

(CD) symptoms describe the target child on a Likert scale ranging from *not at all* to *very much*. The alpha for the parent DBD in the current study was .89. Impairment and need for treatment across multiple domains were assessed with the parent and teacher versions of the Children's Impairment Rating Scale (CIRS; Fabiano et al., 2006). On the CIRS, scores above the midpoint (on a 6-point Likert scale) indicate clinically significant impairment. Symptom presence was derived using the "or" rule, counting a symptom as present if endorsed by the parent or the teacher (Lahey et al., 2004; Rowland et al., 2008). A diagnosis of ADHD was given if DSM-IV symptom criteria for these disorders were met (with some symptoms present in each setting) and if ADHD symptoms resulted in cross-situational impairment (American Psychiatric Association, 2000). Inter-rater reliability was calculated on 20% of KSADS interviews randomly selected and coded by an independent evaluator. The kappa for ADHD diagnoses was 0.86. Sixty-one children (74.4%) met criteria for DSM-IV ADHD Combined Type, 19 children (23.3%) met criteria for the Predominately Inattentive type, and 2 (2.4%) met criteria for the Hyperactive/Impulsive subtype. Thirty-seven children (45%) met DSM-IV criteria for ODD and 19 children (23%) met criteria for CD. Child diagnostic symptoms by maternal depression group are presented in Table 1.

Maternal Depression—Maternal depression was assessed using the Structured Clinical Interview for the DSM-IV, Non-Patient Edition (SCID; First et al., 1996) Mood Disorders Module. The SCID is a widely-used diagnostic interview that has been well-validated in research studies (First et al., 1996). Inter-rater reliability was calculated on 20% of SCID interviews randomly selected and coded by an independent evaluator. Mothers who met DSM-IV diagnostic criteria for a Major Depressive Disorder (MDD) or Dysthymia within the last month were considered the currently depressed group. Mothers who had a lifetime history of depression but did not meet DSM-IV criteria for a mood disorder within the past month were considered the remitted group. Mothers who never met diagnostic criteria for a mood disorder within their lifetime were considered the never clinically depressed group. Thirty-two mothers (38.7%) were classified as currently depressed, 29 mothers (36.3%) were classified as remitted, and 21 mothers (25%) were classified as never clinically depressed. The kappa for MDD diagnoses was 1.00.

Maternal depressive symptoms were measured dimensionally using the BDI-II, a 21-item self-report measure of depression symptoms (Beck et al., 1996). Overall, the sample reported current depressive symptoms in the moderate range, $M = 22.62$, $SD = 10.53$. BDI-II scores were in the mild range for the never clinically depressed group, $M = 16.4$, $SD = 6.5$, moderate range for the remitted group, $M = 22.6$, $SD = 9.0$, and severe range for the currently depressed group, $M = 31.5$, $SD = 10.6$. Internal consistency of the BDI-II in the current sample was .91.

Procedure

Observed Parenting Behavior—Mothers and children completed three tasks in the laboratory: (1) a five-minute clean-up task in which the parent was instructed to direct the child in cleaning up a messy room; (2) five minutes of free play during which the parent was instructed to follow the child's lead in play; and (3) a ten-minute homework task in which the parent was instructed to provide assistance 'as they saw fit' while their child completed

an age-appropriate math worksheet. Parent-child interactions were coded continuously using the Dyadic Parent-Child Interaction Coding System, Third Edition (DPICS; Eyberg, Nelson, Duke, & Boggs, 2005), a well-validated coding system designed to capture discrete parent and child behaviors.

Maternal parenting behaviors were grouped into composite categories of positive parenting (included behavioral descriptions, labeled and unlabeled praise, positive touch, and verbal reflections), negative parenting (included negative talk and negative touch), neutral talk (included neutral statements and information questions) and commands (included direct and indirect commands; Eyberg et al., 2005). Child behaviors included compliance (complying with command within 5 seconds), noncompliance (not complying with commands within 5 seconds) and deviance (e.g., negative talk, touch, whining, yelling). Maternal responses to child behavior were defined as any maternal discrete behavior occurring within 5 seconds following the initiation of child compliance or noncompliance (Borrego, Timmer, Urquiza, & Follette, 2004). Maternal non-response (i.e., ignore) was coded if the mother did not respond within 5 seconds to the initiation of child compliance or noncompliance. Coders were trained to 80% reliability by a master coder (the third author) and 20% of the recordings were double coded by blind raters for reliability purposes. Inter-class correlation coefficients for parent and child behavior across tasks were .81 for positive parenting, .78 for negative parenting, .97 for commands, .96 for neutral statements, .85 for child compliance, and .75 for child deviance.

Sequential Analysis

Sequential analysis of interactions is a statistical inference method that allows researchers to test probabilistic patterns within social interactions (Bakeman & Gottman, 1997). After contingent sequences of behavior are discovered, researchers attempt to estimate the association between interaction patterns and explanatory factors (such as group membership)—in this study, maternal depression status. Sequential analysis presents several strengths as a method of understanding parent-child interactions (Borrego et al., 2004). It takes into account discrete behaviors rather than global ratings of parenting behaviors and provides contextual information regarding parenting behavior beyond the more static representations of frequency counts and dimensional ratings (Borrego et al., 2004; Urquiza & Timmer, 2002). Second, sequential analysis allows for the examination of specific parental responses to individual dimensions of child behavior (e.g., compliance, noncompliance) and how those maternal response patterns may reinforce or exacerbate negative child behaviors. Finally, sequential analysis takes into account base rates of behavior by establishing a significant contingency (behavior at time 2 is dependent on behavior at time 1) based on behaviors of a single dyad, reducing measurement error among depressed mothers who vocalize less during parent-child interactions compared to non-depressed mothers (Bettes, 1988; Howe et al., 2005). Based on Patterson's theory, a positive maternal response to child compliance was considered optimal; issuing a follow-up command (vs. responding negatively or ignoring) was considered the optimal response to child noncompliance.

Statistical plan

To format the data for sequential analysis, child and maternal behavior within each dyad was condensed into a single stream of behaviors. These streams were appended into 656 lines of data, representing the 8 possible child behavior-maternal response sequences for each dyad. SAS version 9.1 was used to calculate each of the 8 cell counts for each dyad using the LAG and PROC FREQ functions to create contingency tables (Howe et al., 2005). The frequency and proportion of maternal responses to child compliance and noncompliance are presented in Table 3.

Generalized linear models with negative-binomial probability distributions using a log-link function were used with depression grouping as dummy coded predictors to determine significant group differences in overall frequencies of maternal parenting responses, that is, specific positive and negative parenting regardless of child behavior. Given that maternal depression and child behavior are considered the result of transactional processes wherein both exert reciprocal influences on one another (Nicholson, Deboeck, Farris, Boker, & Borkowski, 2011), observed child deviance during the laboratory interaction and child age were included as covariates in all analyses to account for the effects of child behavior on observed parenting.

Multilevel modeling using MPlus statistical software was used to determine the association between maternal response patterns (i.e., cell counts of sequences) and maternal depression status. Multi-level modeling is the most appropriate method when parent and child behavior are nested within dyads (Muthén, & Muthén, 1998; Dagne, Howe, Brown, & Muthén, 2002). Within-dyad (Level 1) analyses assessed behavioral patterns at the individual dyad level. Level 1 random slope models were used to compare the likelihood of optimal versus less effective maternal responses given compliant and noncompliant child behaviors. Four dummy-coded contrast variables ($k-1$) compared negative, neutral, command, and ignore responses (less effective) to positive maternal responses (optimal response) following child compliance.² Two dummy-coded contrasts compared negative and non-response (i.e., ignore; deemed less effective) to commands (deemed the optimal response) following child noncompliance³. The resulting beta coefficients provided a linear estimation of the size and direction of the differences in probability of two maternal responses (Howe et al., 2005). Between-dyad (Level 2) analyses were then conducted to determine if maternal depression status was associated with Level 1 interaction patterns (Howe et al., 2005). Dummy coded predictors contrasted pairwise comparisons of the three maternal depression groups (i.e., currently depressed, remitted, never clinically depressed).

Exploratory analyses were conducted by including dimensional measures of maternal depression symptoms (BDI-II scores) as a Level 2 predictor of Level 1 interaction patterns (in place of maternal depression categorical groupings). Resulting coefficients estimate the strength of the association between current maternal depression symptoms measured

²Positive parenting was deemed the optimal response compared to other possible responses in accordance with social learning theory which states that behavior will be repeated if reinforced (Chronis et al., 2007).

³Commands were deemed the optimal response compared to withdrawing demand (ignore) or becoming increasingly harsh (negative parenting) in accordance with Patterson's coercive process theory (Patterson, 1982).

dimensionally and the probability of optimal versus non-optimal maternal responses. We also conducted exploratory analyses to examine subsequent child compliance or noncompliance in response to maternal commands, providing a three-step description of mother-child coercive behavior patterns.

Results

Preliminary Analyses

Contingency table analyses and one-way ANOVAs showed no significant differences between the three maternal depression groups on most demographic and clinical measures (see Table 1). As expected, mothers' current depressive symptoms (reported on the BDI-II) differed significantly between groups, $F(2, 79) = 21.24, p < .001$. Currently depressed mothers reported significantly higher BDI-II scores than remitted mothers, $t(79) = 3.88, p < .001$, and never clinically depressed mothers, $t(79) = 6.10, p < .001$. Remitted mothers reported significantly higher BDI-II scores than never clinically depressed mothers, $t(80) = 11.48, p < .001$.

Correlational analyses were conducted to examine associations between demographic characteristics and overall parenting behavior frequencies (see Table 2). Child age was significantly negatively associated with the frequency of observed positive parenting, commands, and neutral talk. Positive parenting was significantly positively associated with maternal education. Maternal ethnicity was significantly related to positive behavior and commands, such that Caucasian mothers gave fewer commands and displayed more positive parenting overall than non-Caucasian mothers. Maternal education, ethnicity, and child age were thus entered as covariates in subsequent analyses; only the inclusion of child age and observed child deviance resulted in improved model fit as indicated by the lowest QIC values. Thus, to ensure estimation of parsimonious models, child age and observed child deviance were included as covariates in the analyses described below.

Frequencies of Positive and Negative Parenting

First, frequency counts of discrete positive and negative parenting (irrespective of subsequent child behavior) were analyzed. Currently depressed and remitted mothers did not differ significantly from never clinically depressed mothers in the overall frequency of negative, $\beta = .122, p = .16$; $\beta = .387, p = .16$; respectively, or positive parenting, $\beta = -.102, p = .75$; $\beta = -.390, p = .17$; respectively, behaviors. Moreover, currently depressed and remitted mothers did not differ significantly from one another in their overall frequency of negative, $\beta = .28, p = .85$, or positive, $\beta = .126, p = .66$, parenting. Frequency of maternal parenting behaviors by depression group are presented in Table 3.

Maternal Depression and Response to Child Compliance

Using sequential analysis, estimates of within-level (Level 1) comparisons of maternal responses to child compliance showed that all mothers (regardless of depression status) were more likely to ignore, respond negatively, respond neutrally, or give a command, following child compliance than to respond positively (i.e., with praise; Table 4). Within-level residual

variance estimates were also significant, indicating sufficient variability in maternal responses to estimate cross-level group moderators.

Results partially supported the cross-level moderating effect of maternal depression on the differences in maternal responses to child compliant behavior. Currently depressed mothers were significantly more likely than never clinically depressed mothers to ignore, respond neutrally, respond negatively, or give another command, rather than respond with praise to child compliance. Remitted mothers were significantly more likely than never clinically depressed mothers to give another command rather than respond positively to child compliance. However, contrary to expectations, remitted mothers were less likely than never clinically depressed mothers to ignore, respond neutrally, or respond negatively, rather than positively, to child compliance.

Maternal Depression and Response to Child Noncompliance

In response to child noncompliance (Table 5), estimates of within-level associations showed that all mothers were more likely to ignore (i.e., withdraw demand) than give a follow-up command (the optimal response) in response to child noncompliance. Alternatively, all mothers were more likely to give a follow-up command (the optimal response) than to respond negatively. Within-level residual variances were significant (Table 5), indicating sufficient variability for estimation of cross-level predictors.

In support of our hypothesis, currently depressed mothers were more likely than never clinically depressed mothers to respond negatively, or to ignore, rather than follow through with another command, in response to child noncompliance. Remitted mothers were less likely than currently depressed mothers to respond negatively, or to ignore, than give another command following child noncompliance. That is, currently depressed mothers were more likely to withdraw their command or respond negatively to child noncompliance than remitted mothers. When comparing remitted and never clinically depressed mothers, remitted mothers were more likely than never clinically depressed mothers to respond negatively (i.e., with negative talk or touch) to child noncompliance than to give another command. However, never clinically depressed mothers were more likely than remitted mothers to ignore child noncompliance (i.e., withdraw demand) than to give another command. That is, never clinically depressed mothers were less likely to follow through with commands than remitted mothers.

Exploratory Analysis

In response to child compliance, higher maternal BDI-II scores were associated with a greater likelihood of responding neutrally, $\gamma_{11} = .007, p < .000$, negatively, $\gamma_{41} = .020, p < .001$, and by giving commands, $\gamma_{31} = .013, p < .000$, rather than positively (optimal response). Contrary to our hypothesis, higher BDI-II scores predicted a reduced likelihood of ignoring, $\gamma_{21} = -.004, p < .001$, rather than praising child compliance, although the overwhelming maternal response to child compliance in the sample on the whole was ignoring.

In response to child noncompliance, higher BDI-II scores were associated with a decreased likelihood of giving a command (optimal response) rather than ignoring, $\gamma_{21} = -0.079$, $p = 0.015$, or responding negatively, $\gamma_{11} = -0.035$, $p = 0.006$. As BDI-II scores increased, mothers were less likely to give a command than to ignore or respond negatively to child noncompliance, although the overwhelming maternal response to child noncompliance in the sample on the whole was giving a command.

Discussion

This study utilized multi-level sequential analysis to examine how, in families of children with ADHD, maternal parenting responses to child compliant and noncompliant behavior varied as a function of maternal depression history. This study extends the literature by providing an empirical comparison of the likelihood of coercive versus optimal maternal responses to child compliant and noncompliant behavior within families of children with ADHD, consistent with Patterson's theory. Our study was also the very first within the ADHD literature to examine how these interaction patterns vary as a function of both current and remitted maternal depression relative to mothers who have never had a major depressive episode.

Multilevel analyses demonstrated that, regardless of depression history, mothers were unlikely to provide contingent positive reinforcement (i.e., praise) of child compliance. These results are consistent with prior research suggesting that mothers of children with ADHD are less responsive to their children's positive behavior than mothers of comparison children (Mash & Johnston, 1982). In accordance with social learning theory, the lack of reinforcement for child compliance decreases the likelihood that children will comply in the future (Patterson, 1982; Urquiza & Timmer, 2002). Indeed, longitudinal studies have shown that positive parenting has long-term protective effects in the development of later conduct problems among children with ADHD (Chronis et al., 2007). Thus, the lack of positive reinforcement of child compliance observed in this sample may have implications for the long-term outcomes of children with ADHD. Our interpretation of these findings is limited however, as our study did not include a comparison group of children without ADHD, which would allow us to determine if the patterns herein observed are specific to families of children with ADHD or reflect mothers in general.

All mothers were more likely to ignore child noncompliance than follow through with another command, thereby negatively reinforcing the child's noncompliance (i.e., removing the demand and allowing the child to successfully avoid doing what they were told to do). These results are consistent with previous findings that mothers of children with ADHD tend to respond inconsistently to child noncompliance (Drabick et al., 2006). Results also showed that, regardless of depression history or current depression status, all mothers were more likely to give another command (considered the optimal response) than to respond negatively (e.g., negative talk, negative touch) following child noncompliance.

This study also demonstrated that maternal depression history significantly moderated maternal response to child compliant and noncompliant behavior. Consistent with our hypotheses, less effective responses to child compliant behavior (i.e., commands, ignore,

negative talk, neutral talk) were most common among currently depressed mothers relative to remitted or never clinically depressed mothers. Currently depressed mothers were also more likely than mothers in the other groups to respond coercively (i.e., by ignoring or responding negatively) to child noncompliance. Indeed, others have reported that less positive parenting and more negative parenting was most common among mothers currently experiencing a major depressive episode relative to mothers whose depression had remitted (Foster et al., 2008b; Murray et al., 2006).

Comparisons between remitted and never clinically depressed mothers were mixed, however. As hypothesized, remitted mothers were more likely to give a command (rather than praise) following child compliance (i.e., the less effective response), whereas never clinically depressed mothers were more likely to be negative, neutral, or ignore (rather than praise) child compliance. This may be partially attributed to the overwhelming tendency to use commands (non-optimal response) among mothers with a history of depression relative to mothers without a history of clinical depression, who used more varied (but still not optimal) responses such as neutral statements or ignoring. Remitted mothers were also more likely than never clinically depressed mothers to respond coercively (i.e., with negative talk or touch) following child noncompliance. Contrary to expectations, however, remitted mothers were more likely to follow up child noncompliance with commands (optimal response) rather than withdrawing demands compared to never clinically depressed mothers. These mixed findings regarding the association between remitted maternal depression and parenting responses reflect conflicting evidence in the existing literature. For example, Foster and colleagues (2008) found that remission of maternal depression following a 3-month treatment with antidepressants was associated with increased expressions of warmth and acceptance. On the other hand, Murray and colleagues (2006) found that mothers who experienced current or recent (within past year) depression displayed greater coercive control, less emotional support, and less cognitive support during homework tasks than mothers who experienced postpartum depression 8 years prior. Foster and colleagues (2008) also found that remission of depression was associated with increased psychologically controlling behavior relative to mothers without a history of depression. Thus, discrepancies in quality of parenting observed among remitted mothers may suggest that while mothers whose depression has remitted may demonstrate more adaptive parenting when compared to currently depressed mothers, remission may not be sufficient to fully normalize parenting such that remitted mothers look no different than comparison mothers of children without ADHD (Garber et al., 2011). More research on the topic of remitted maternal depression and parenting is needed to resolve these conflicting reports. Unfortunately, in the current study we did not collect standardized data on the length of maternal depression remission or a comparison group of mothers of children without ADHD. Future studies should consider whether the length of remission of maternal depression is associated with differences in parenting quality (Lovejoy et al., 2000).

Results of our exploratory analysis demonstrated that maternal current depressive symptoms measured dimensionally were associated with a tendency to respond neutrally, negatively, or with a command rather than to praise following child compliance. That is, mothers with greater current depressive symptoms were less likely to positively reinforce child compliance. Contrary to our hypothesis, BDI-II scores were negatively associated with the

tendency to ignore, rather than praise, child compliance, although ignoring remained the predominant maternal response to child compliance among these mothers on the whole. In response to child noncompliance, higher BDI-II scores were associated with an attenuated likelihood of giving a command rather than ignoring or responding negatively to child noncompliance, although the overwhelming tendency among all mothers was to respond with a command. This is in line with our categorical findings wherein current depression was associated with a greater tendency to ignore and respond negatively rather than give a command following child noncompliance.

Finally, maternal BDI-II scores were positively associated with issuing follow-up commands in response to child noncompliance (the optimal response). The use of commands was positively associated with depression status, such that depressed mothers relied on commands to manage child behavior in the context of both compliance and noncompliance.

Interestingly, sequential analyses and frequency counts of parenting behaviors yielded different associations with maternal depression history in our study. Whereas maternal depression history was related to maternal response patterns, there were no significant group differences in the overall frequency of positive and negative parenting behaviors between depression groups (when child compliant/noncompliant behavior was not considered as an antecedent). Given that theory and behavioral treatments for families of children with ADHD are grounded in Patterson's coercive process model, sequential analytic methods have the potential to elucidate maternal parenting response patterns in the context of maternal depression.

Our findings must be considered in light of a number of limitations. First and most importantly, mothers were recruited to participate in a treatment study for at least mildly depressed mothers. As such, the never clinically depressed group currently had at least minimal depressive symptomology ($\text{BDI-II} \geq 10$), despite never meeting DSM-IV diagnostic criteria for major depression. Thus, it is possible that elevated BDI-II scores among the never clinically depressed group accounted for the unexpected findings wherein mothers in the never clinically depressed group were more likely to ignore child noncompliance than mothers in the remitted group. Nevertheless, the average BDI-II score of the never clinically depressed group was significantly lower than the remitted group, which was significantly lower than the currently depressed group. Furthermore, this study was able to demonstrate significant differences in maternal responses to child behavior among mothers with and without a history of major depression, despite this limitation. Future studies should include a comparison group of mothers of children without ADHD unselected on the basis of depressive symptoms (as well as a comparison group of children without ADHD) in order to compare maternal response rates to a normative sample. As another major limitation, we also did not collect standardized data regarding the length of remission among mothers in the remitted depression group. We were thus unable to determine if differences in length of depression remission were associated with parenting responses. This is a very important consideration, and future studies should collect more detailed information regarding the severity, timing and length of depressive episodes, length of remission, as well as whether the depressive episodes occurred within the child's lifetime. Next, detailed analysis of child responses to maternal behavior was beyond the scope of this

study. Future studies should more fully examine the downstream effects of optimal and non-optimal maternal responses to subsequent child behavior. Finally, despite accumulating research on depression in fathers (Wilson & Durbin, 2010), little has been done examining depression in fathers of children with ADHD. Future studies should use sequential analysis to examine the association between paternal depression history and parenting among fathers of children with ADHD.

Despite these limitations, this research contributes uniquely to the literature in many important ways. First, these findings speak to the importance of considering the impact of remitted maternal depression status (rather than simply maternal depression history or continuous depressive symptoms) on parenting, in both research and clinical practice. Remitted mothers displayed fewer positive parenting responses in this study, which may impact the course of conduct problems in children with ADHD (Chronis et al., 2007; Harvey et al., 2011). Moreover, remitted mothers are at higher risk for experiencing subsequent depressive episodes despite successful treatment response (Garber et al., 2011). This risk may be exacerbated in the context of environmental stressors such as parenting a child with ADHD (Johnston & Jassy, 2007). Therefore, researchers and clinicians should monitor the course of maternal depression symptoms as an ongoing risk factor for maladaptive parenting and poor adjustment for children with ADHD, even after maternal depression has remitted.

These findings have potential implications for intervention. Our use of sequential analysis to examine maternal response patterns is consistent with the goals of evidence-based behavioral treatment approaches for children with ADHD, which seek to disrupt coercive parenting and improve positive parenting by teaching parents to reinforce child compliance and provide consistent, immediate consequences for child noncompliance. Our findings suggest that currently depressed (and to a lesser extent, remitted mothers) of children with ADHD may face particular parenting challenges relative to never clinically depressed mothers. These mothers may therefore require tailoring of evidence-based parent training programs to address their specific difficulties reinforcing complaint behavior, effectively using commands, and withdrawing demands following child noncompliance. Programs may address depressive cognitions, irritability, fatigue, and low mood which might contribute to the unique parenting difficulties experiences by mothers who struggle with clinical depression (Chronis-Tuscano et al., 2013).

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Table 1
Baseline Demographic and Clinical Characteristics by Maternal Depression Group

	Never Clinically Depressed ^d (<i>n</i> = 32)	Remitted (<i>n</i> = 29)	Currently Depressed (<i>n</i> =21)	Total (<i>n</i> =82)	Test Statistic	<i>p</i> -value
<u>Child Characteristics</u>						
Child Gender <i>n</i> (%)					0.84	0.66
Female	8 (25.0)	10 (35.7)	6 (28.6)	24 (29.6)		
Male	24 (75.0)	18 (64.3)	15 (71.4)	57 (70.4)		
Child Age <i>M</i> (<i>SD</i>)	8.8 (2.0)	8.4 (1.9)	8.9 (2.2)	8.7 (2.0)	0.36	0.70
<u>Parent/Teacher Reported Child Symptoms (<i>SD</i>)</u>						
ADHD-Inattentive	7.8 (1.6)	7.4 (1.6)	7.8 (1.8)	7.7 (1.6)	0.71	0.49
ADHD-H/I	12 (37.5)	3 (10.3)	4 (19.0)	19 (23.2)	0.80	0.45
ODD/CD	5.8 (2.7)	6.6 (2.5)	6.4 (2.8)	6.2 (2.6)	0.20	0.82
Child Impairment	31.7 (15.0)	27.2 (12.9)	36.5 (15.9)	31.2 (14.8)	2.27	0.11
<u>Maternal Characteristics</u>						
Married <i>n</i> (%)	20 (61.3)	15 (53.6)	30 (63.2)	46 (59.0)	0.77	0.68
Maternal Age <i>M</i> (<i>SD</i>)	41.7 (10.1)	37.2 (6.2)	41.8 (7.3)	40.2 (8.4)	2.73	0.07
Race <i>n</i> (%)					1.21	0.55
Caucasian	13 (40.6)	15 (51.7)	11 (52.4)	39 (47.6)		
African-American	12 (37.5)	7 (24.1)	8 (38.1)	27 (32.9)		
Hispanic or Latino	3 (9.4)	1 (3.4)	0 (0.0)	4 (4.9)		
Biracial	1 (3.1)	3 (10.3)	1 (4.8)	5 (6.1)		
Other	3 (9.3)	2 (6.8)	1 (4.8)	6 (7.3)		
Maternal Education <i>n</i> (%)					2.02	0.37
High School or Less	4 (12.5)	3 (10.7)	1 (5.0)	8 (10.1)		
Some College	6 (18.8)	8 (28.6)	6 (30.0)	20 (25.1)		
Bachelor's Degree	10 (31.3)	9 (32.1)	8 (40.0)	27 (33.8)		
Master's Degree	8 (25.0)	4 (14.3)	2 (10.0)	14 (17.5)		
Doctorate	3 (9.4)	1 (3.6)	1 (5.0)	5 (6.3)		
Other	1 (3.1)	3 (10.7)	2 (10.0)	6 (7.5)		
BDI <i>M</i> (<i>SD</i>)	16.4 (6.5)	22.6 (9.0)	31.5 (10.6)	22.7 (10.3)	20.3	0.00

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Note. M = Mean; SD = Standard Deviation; ADHD = Attention-Deficit/Hyperactivity Disorder; H/I = Hyperactive/Impulsive; PI = Predominately Inattentive; BDI = Beck Depression Inventory; DBD = Disruptive Behavior Disorder includes Conduct Disorder and Oppositional Defiant Disorder symptoms; Dx = Diagnosis Contingency table analyses and One-way ANOVAs were conducted.

⁴ Although mothers were selected for the larger treatment study on the basis of at least minimal depressive continuous symptoms on the BDI-II, we refer throughout this manuscript to mothers who have never met DSM-IV criteria for a mood disorder as "Never Clinically Depressed."

Table 2
Correlations Between Parent and Child Characteristics and Frequency of Observed Parenting Behavior

	Child Age	Gender	Ethnicity	Education	Marital Status	ADHD-PI	ADHD-HI	ODD/CD	BDI	Negative	Positive	Command	Neutral	Child Dev
Child Age	1													
Child Gender	-.022*	1												
Ethnicity	-.085	.295**	1											
Education	.005	.035	.142	1										
Marital Status	-.164	.161	.337**	.266	1									
ADHD-PI	.098	-.202	-.030	-.149	-.085	1								
ADHD- HI	-.306	.022	.125	-.109	-.114	.263*	1							
ODD/CD	-.353*	-.169	-.074	-.104	-.200	.222*	.435**	1						
BDI	.000	-.115	.133	-.016	.023	-.019	.107	.015	1					
Negative	-.184	-.002	-.192	-.060	-.023	.035	.101	-.018	.121	1				
Positive	-.0493**	.092	.232*	.278*	.191	-.036	.127	-.141	.149	-.029	1			
Command	-.026*	-.117	-.0236*	.076	-.075	.051	.199	-.030	.186	.712	.104	1		
Neutral	-.0392**	.098	.154	.180	.062	-.175	.278	-.093	.211	.247	.571	.271	1	
Child Dev	-.178	.106	.050	-.053	.082	-.042	.116	-.064	.434	.544	.055	.509	.131	1

Note. ADHD = Attention-Deficit/Hyperactivity Disorder; H/I = Hyperactive/Impulsive; PI = Predominately Inattentive; BDI = Beck Depression Inventory; CD = Conduct Disorder; ODD = Oppositional Defiant Disorder; Child Dev. = Child Deviance.

*
 $p < .05$.

**
 $p < .01$.

Table 3
Frequency and Rates of Maternal Responses to Child Compliant and Noncompliant Behavior

		Never Clinically Depressed		Remitted		Currently Depressed		Total	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
Child Compliance									
Positive	5		1.8	7	3.0	1	0.6	13	1.9
Negative	7		2.6	4	1.8	4	2.3	15	2.2
Command	20		7.3	29	12.8	18	10.4	67	20.0
Neutral	21		7.7	14	6.2	19	11.0	54	8.0
Ignore	220		80.6	173	76.2	131	75.7	524	77.9
Total	273		100	227	100	173	100	673	100
Child Noncompliance									
Negative	1		1.4	4	5.2	3	4.5	8	3.7
Ignore	53		74.7	52	67.5	52	78.8	157	73.4
Command	17		23.9	21	27.3	11	16.7	49	22.9
Total	71		100	77	100	66	100	214	100

Note. % = Percentage of all compliance or noncompliance sequences.

Table 4

Results of Multilevel analysis Of Cross-Level Moderation of Maternal Response to Child Compliance

		Estimate	SE
Intercept	(γ_{00})	4.882	1.048***
Contrast of Ignore and Positive Response Slope	(γ_{10})	3.696	0.288***
Contrast of Neutral and Positive Response Slope	(γ_{20})	1.346	0.313***
Contrast of Command and Positive Response Slope	(γ_{30})	1.600	0.333***
Contrast of Negative and Positive Response Slope	(γ_{40})	-0.168	0.506***
Child Age	(γ_{age})	0.005	0.002 †
Child Deviance	(γ_{dev})	-0.146	0.043**
Contrast of Ignore and Positive Response			
Remitted vs. Never Clinically Depressed	(γ_{12})	-0.606	0.000***
Currently vs. Never Clinically Depressed	(γ_{13})	0.916	0.001**
Remitted vs. Currently Depressed	(γ_{14})	-1.529	0.001**
Contrast of Neutral and Positive Response			
Remitted vs. Never Clinically Depressed	(γ_{22})	-0.687	0.000***
Currently vs. Never Clinically Depressed	(γ_{23})	1.143	0.000***
Remitted vs. Currently Depressed	(γ_{24})	-1.881	0.001**
Contrast of Command and Positive Response			
Remitted vs. Never Clinically Depressed	(γ_{32})	0.101	0.000***
Currently vs. Never Clinically Depressed	(γ_{33})	1.507	0.000***
Remitted vs. Currently Depressed	(γ_{34})	1.429	0.000***
Contrast of Negative and Positive Response			
Remitted vs. Never Clinically Depressed	(γ_{42})	-0.818	0.000***
Currently vs. Never Clinically Depressed	(γ_{43})	1.034	0.000***
Remitted vs. Currently Depressed	(γ_{44})	-1.876	0.000***

Note. SE = Standard error of estimate.

*
p < .05,

**
p < .01,

p < .001.

Table 5

Results of Multilevel analysis Of Cross-Level Moderation of Maternal Response to Child Noncompliance

		Estimate	SE
Intercept	(γ_{00})	-1.233	0.195***
Slope	(γ_1)	-1.725	0.394***
Child Age	(γ_c)	0.035	0.220***
Child Deviance	(γ_{cd})	12.278	1.441***
Residual Variance	(τ_2)	0.955	0.255***
Contrast of Negative or Command			
Remitted vs. Never Clinically Depressed	(γ_{12})	1.159	0.000***
Currently vs. Never Clinically Depressed	(γ_{13})	1.421	0.001**
Remitted vs. Currently Depressed	(γ_{14})	0.279	.000***
Contrast of Ignore or Command			
Remitted vs. Never Clinically Depressed	(γ_{22})	- 0.074	0.000***
Currently vs. Never Clinically Depressed	(γ_{23})	0.357	0.000***
Remitted vs. Currently Depressed	(γ_{24})	-0.218	0.000***

Note. SE = Standard error of estimate.

*
 $p < .05$,

**
 $p < .01$,

 $p < .001$.