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ORIGINAL ARTICLE

Reciprocal Relations Between Parenting Behaviors and Conduct Disorder Symptoms in Preschool Children

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Abstract
Reciprocal relations between children's conduct disorder (CD) symptoms and parenting behaviors were examined across the preschool years. Participants were 199 children ($M = 44.26$ months, $SD = 3.37$; 92 girls) and their 199 mothers and 158 fathers. CD symptoms were assessed via structured interviews; parenting was assessed via observational and self-report measures. Fixed effects models were used to assess within-individual changes and traditional cross-lagged models were used to assess between-individual changes; comparisons by sex were also carried out. Increases in maternal overreactivity predicted increases in CD symptoms. During the later preschool years, decreases in maternal warmth predicted increases in CD symptoms and increases in CD symptoms predicted increases in paternal overreactivity. Reciprocal effects were found between girls' CD symptoms and paternal negative affect. Findings suggest maternal and paternal influence on the development of CD symptoms and suggest that CD symptoms influence fathers' parenting during the preschool years.

Keywords Conduct disorder · Parenting · Preschool · Reciprocal relations · Fixed effects

Introduction

Conduct disorder (CD) is characterized by a repetitive and persistent pattern of behavior in which the basic rights of others or major age-appropriate societal norms or rules are violated [1]. Some symptoms of CD emerge during the preschool years [2, 3], and it is estimated that approximately 3–7% of preschool children meet criteria for CD [4]. Moreover, CD diagnoses [5, 6] and CD symptoms [7] are relatively stable from preschool- to school-age. Because early onset (i.e., prior to 10 years of age) of CD is associated with worse clinical outcomes than adolescent onset of the disorder [8, 9], it is imperative to have a good understanding of the early emergence of CD symptoms.

Reciprocal relations between parenting and child behaviors have been proposed for several decades to explain the emergence of child behavior problems,[1] including CD symptoms [10, 11]. A considerable amount of research links parenting practices with CD [8, 12], but most of the literature has focused on parent-to-child effects in school-age boys [13]. More recently, research on reciprocal relations has emerged, but continues to be limited when it comes to examining the reciprocal relations between CD symptoms and parenting behavior during the preschool years. This line of research is also limited by not distinguishing within-individual from between-individual effects. Examining within-individual change can help rule out the possibility that time-invariant between-individual factors (e.g., genetic propensities) account for relations between children's symptoms and maladaptive parenting behaviors [14]. The goal of the current study was to explore whether reciprocal relations contribute to the early development of CD symptoms in boys and girls across the preschool years, looking at both within-individual change and between-individual change.

Theory and Empirical Evidence for Reciprocal Relations

Patterson's coercion theory [10, 11] posited a process of gradual escalation in parent–child conflict to explain the development of behavior problems. More specifically, he

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[1] The term behavior problems is used for purposes of consistency when referring to broadly defined measures of behavior problems, such as conduct problems, antisocial behavior, externalizing behavior, disruptive behaviors, etc.

proposed that a child is negatively reinforced for responding aversively to behaviors of parents (e.g., the parent gives up on enforcing a command when the child throws a tantrum), and parents are reinforced, in the short term, for lax or harsh discipline responses (e.g., the child stops his/her tantrum when the parent gives in or uses harsh punishment). As these dysfunctional interactions repeat, the pattern of aversive behaviors is strengthened, resulting in increased behavior problems and reduced positive interactions with parents.

Consistent with this theory, research suggests that parenting may play a role in the development of CD in school-age children and adolescents. Harsh discipline and poor supervision predict later CD diagnosis [15]. Similarly, controlling for demographic variables and baseline attention-deficit/hyperactivity disorder (ADHD) and CD symptoms, positive parenting predicted fewer future CD symptoms in a study of preschool and school-age children [16]. Treatment studies have also shown that systematic changes in parenting behaviors can lessen the frequency of a target child's and siblings' CD symptoms [12]. Moreover, research has demonstrated child-to-parent effects in school-age children [17–19]. However, longitudinal research examining reciprocal relations has found mixed results regarding these effects. Hipwell et al. [18] found that maternal harsh discipline predicted CD symptoms in school-age girls, and in turn CD symptoms predicted increases in harsh parenting over time. In contrast, CD has also been found to predict poor supervision in school-age boys, but not vice versa [20]. No studies have examined reciprocal relations between parent behaviors and CD symptoms early in development.

Reciprocal Relations in Preschool Children

Only a handful of longitudinal studies of parenting and behavior problems have focused on preschool children [21–27], with some support for reciprocal effects. However, these findings are limited in regard to CD because they have focused on behavior problems broadly [23–26] or have focused on ADHD or ODD [21, 22, 27]. ADHD and ODD are frequently comorbid with CD [28]; however, these conditions are distinct [29, 30] and appear to be differentially related to parenting behaviors. For example, in a cross-sectional study of at-risk first graders, parental aggression was only associated with children's aggression (a dimension of CD) and low parental warmth was only associated with children's oppositionality (a dimension of ODD) [31]. More recently, Burke et al. [20] examined the reciprocal relations between CD, ODD, ADHD, and five parenting behaviors in a referred sample of school-age boys. There was no evidence for parenting behaviors influencing ADHD symptoms or vice versa. Timid discipline predicted ODD, and timid discipline, parental involvement, and poor communication were predicted by ODD. After controlling for ODD, ADHD, and other covariates, CD symptoms predicted poor supervision, but parenting behaviors did not predict CD. Overall, the authors concluded that CD appears to have distinct relations with parenting behaviors from other disruptive behavior disorders, and also appears to be less susceptible to the influences of parenting behaviors than ODD. A different possible explanation, based on coercion theory, is that reciprocal effects between parenting and CD symptoms might be more pronounced early in development when they first emerge. Consequently, it is important to examine the reciprocal relations between parenting behaviors and CD symptoms in preschool children, when CD symptoms may be first developing.

The Role of Fathers

A significant limitation in the existing literature on reciprocal relations has been the focus on mothers, despite research suggesting that fathers also play an important role in the development of behavior problems [32, 33]. Only two studies examining reciprocal relations longitudinally have included fathers [22, 26]. More specifically, these studies have indicated child-to-father effects in the toddler years [26], and some bidirectional effects between behavior problems and fathers' parenting during the preschool years [22]. These studies did not examine CD symptoms. Given the lack of studies examining the reciprocal relations between paternal parenting behavior and CD symptoms, it is critical to advance the literature on the role of fathers in the early development of CD symptoms.

Sex Differences

The literature on CD symptoms has largely been derived from male samples, despite evidence suggesting sex differences in the development of this condition [34]. Research has shown that although boys and girls exhibit similar levels of behavior problems early in development, boys begin to exhibit higher rates of problem behaviors as early as 4 years of age [35]. With regards to parenting, cross-sectional research has found that inconsistent discipline and harsh discipline are associated with CD symptoms in both boys and girls, whereas overintrusive and overprotective parenting are associated with CD symptoms only in girls [36]. It is possible that parents interpret and react to CD symptoms differently in boys and girls [34], and consequently different relations may exist. Only one study on reciprocal relations between parenting practices and CD has focused on girls [18], and no studies have examined sex differences in the strength or pattern of parent–child relations.

Statistical Innovations

Analytic methods such as cross-lagged panel models and generalized estimating equations have long been used to examine reciprocal effects between parenting behaviors and behavior problems. Scholars have recently pointed out that these analytic methods do not differentiate between-individual change from within-individual change when examining reciprocal effects [37, 38]. Fixed effects regression models have been proposed to address the limitations of traditional analytic models [14]. Fixed effect models examine only within-individual change (i.e., at the level of the parent–child dyad). Fixed effects regression models are able to examine within-individual change by controlling for stable (i.e., time-invariant) variables such as genetic propensity and intelligence, while not controlling for time-varying variables such as ODD symptoms [37]. Although this approach can only be applied to data collected over more than two time points, its strengths are clear compared to traditional methods that cannot rule out the possibility that time-invariant between-subject factors may be driving the effects between parent and child behavior problems [37].

The Current Study

In the current study, reciprocal relations between children's CD symptoms and parenting behaviors were examined when children were age 3–6 years. This study focused on four key parenting variables that have been widely linked to child outcomes [39, 40]: overreactivity, laxness, positive affect/warmth, and negative affect. A sample of families with preschool children exhibiting significant behavior problems was chosen because of their risk for continued problems [41]. CD symptoms were examined dimensionally, because the structure of these behavior problems is dimensional rather than categorical and because dimensional measures of CD have been found to be better predictors than categorical diagnoses [42]. Cross-lagged panel models were used for parenting variables that were measured at only two time points (i.e., when children were 3 years old and then three years later), and fixed effects cross-lagged models were used for parenting variables that were collected at four annual time points. Parenting behaviors were examined separately as research suggests differential relations [31]. ODD symptoms were controlled for in the analyses because they have been associated with both maladaptive parenting behaviors [22] and CD symptoms [7], and therefore represent a potential confound. Analyses also controlled for parental education, a well-known risk factor for CD [43]. Based on Patterson's [10, 11] coercion theory that proposes that the coercion cycle often begins when children are young, we hypothesized that reciprocal mother–child and father-child effects would be evident in the early development of CD symptoms.

Method

Participants

Participants were 199 children (92 females) who were 3 years old at screening, with an average age of 44.26 months ($SD = 3.37$) at the first home visit [time 1 (T1)], 56.70 months ($SD = 3.78$) at time 2 (T2), 69.31 months ($SD = 4.23$) at time 3 (T3), and 80.83 months ($SD = 5.11$) at time 4 (T4). The sample included European American children (49.70%), Latino children (21.60%; primarily Puerto Rican), African American children (12.60%), and multiethnic children (16.10%). There were 137 children who lived with two parents, and 62 children who lived in single-parent homes. The 199 female primary caregivers participated (biological mothers = 192; adoptive mothers = 4; grandmothers = 3). At T1, the average age of mothers was 31.68 years ($SD = 6.94$); most mothers had high school diplomas (84.50%) and 33.10% of mothers had bachelor's degrees. Information was obtained for 158 fathers (biological fathers = 143, stepfathers = 5, adoptive fathers = 4, grandfathers = 3, other = 3). At T1, the average age of fathers was 36.05 years ($SD = 7.75$); most fathers had high school diplomas (90.00%) and 28.00% of fathers had bachelor's degrees. The average family income in this sample was \$54,433 (SD = \$38,623; Mdn = \$47,108). All 199 mothers completed at least one parenting measure at T1, 179 mothers completed at least one measure at T2, 155 mothers completed at least one measure at T3, and 161 mothers completed at least one measure at T4. Out of the 158 fathers in the study, 137 fathers completed at least one measure at T1, 112 fathers completed at least one measure at T2, 92 fathers completed at least one measure at T3, and 90 fathers completed at least one measure at T4. Written informed consent was obtained from all parents who participated and verbal assent was obtained from children. The study was conducted in compliance with the University of Massachusetts Amherst Institutional Review Board.

Procedure

Participants were recruited over a 3-year period by distributing questionnaire packets through state birth records, local pediatrician offices, childcare centers, and community centers throughout Western Massachusetts. Families were told that the goal of the study was to understand factors that help young children with behavior problems outgrow their difficulties. Children with significant behavior problems ($n = 199$) were recruited as part of a larger study [44–46] from 1,752[2] 3-year-old children whose parents completed a

[2] Response rates could not be calculated for sites where packets were presented in a display for interested parents to take. At sites where packets were delivered directly to parents of 3-year-olds (e.g., via

screening packet containing the Behavior Assessment System for Children-Parent Report Scale (BASC-PRS) [47], parental concern about behavior problems, demographic information, and a questionnaire assessing for exclusion criteria (evidence of intellectual disability, deafness, blindness, language delay, cerebral palsy, epilepsy, autism, or psychosis). Criteria for inclusion were: (a) parent responded "yes" or "possibly" to the question, "Are you concerned about your child's activity level, defiance, aggression, or impulse control?" and (b) BASC-PRS hyperactivity and/or aggression subscale *T* scores at or above 65. Fifty-nine percent of eligible families chose to participate in the study. At T1, eligible families were scheduled for two 3-h home visits approximately one week apart, and each parent was paid a total of $200 for the two sessions. Similar information was collected during three more visits that were each completed approximately a year apart, and families were compensated for their time (T2: $125 for two parents or $75 for one parent; T3: $80 for two parents or $50 for one parent; T4: $150 for two parents or $100 for one parent). Bilingual staff conducted home visits for Spanish-speaking families, and all measures were available in Spanish.

Measures

Parent Diagnostic Interview of CD and ODD Symptoms

During annual home visits, the Attention and Disruptive Behavior Disorders module of the Diagnostic Interview Schedule for Children, Fourth Edition (DISC-IV) [48] was administered to parents. Evidence supports its utility in assessing children as young as 3 [49]. At T1–T3 only eight CD symptoms were assessed: lying, bullying/threatening others, damaging others' property, initiating physical fighting, stealing without confrontation, cruelty to animals, hurting others/physically cruel, and starting fires. These symptoms were assessed as they were deemed possible for young children to engage in, and have been previously reported in the literature [3]. All symptoms assessed were endorsed in the present sample, with the exception of starting fires [7]. The following CD symptoms were excluded at T1–T3 as it did not seem plausible that they could be endorsed at this age, and they have exhibited low base rates in previous research with referred samples [7]: use of weapon, stealing while confronting a victim, sexual assault, breaking into private property, staying out at night, running away from home, and truancy. The full DISC-IV was administered at T4. Interviews were administered to mothers or jointly to both parents when available. The number of CD symptoms and number of ODD symptoms endorsed were used in this study. Kuder-Richardson formula 20 (KR-20), the appropriate internal consistency statistic for scales with dichotomous items, was used to assess the internal consistency of CD symptoms (T1 = .51; T2 = .60; T3 = .60; T4 = .63) and ODD symptoms (T1 = .88; T2 = .88; T3 = .89; T4 = .90).

Videotaped Assessment of Maternal Warmth

At each time point, children were videotaped interacting with their mothers during a 5-min play task and a 5-min cleanup task. Ratings were averaged across the two tasks. Global ratings of warmth and negative affect were coded; however, only warmth ratings were included in the current study due to low variability in negative affect. The coding system was adapted from previous work on dysfunctional parenting in discipline [50], and involved rating parents and children on a number of dimensions at the end of each task using global 7-point scales. Raters were undergraduate research assistants who were unaware of parental ratings of children's behavior. Raters received extensive training, which included practice coding tapes for approximately seven weeks. Warmth referred to the extent to which the parent was positively attentive to the child; used praise, encouragement, and terms of endearment; conveyed affection; was supportive and available; was cheerful in mood and tone of voice; and/or conveyed interest, joy, enthusiasm, and positive affect in interactions with the child. Warmth was rated from 1 (*complete absence of warmth*) to 7 (*high level of warmth*). Two independent raters coded each tape, and ratings were averaged. Intraclass correlation coefficients (ICCs) for warmth were acceptable or better at T1–T3 (T1 = .79; T2 = .82; T3 = .70) and modest at T4 (.62).

Audio Assessment of Maternal and Paternal Negative Affect and Positive Affect

To obtain a naturalistic, less reactive measure of parenting, mothers and fathers used a microcassette player to record 2 h of interaction with their children at T1 and T4, selecting times of day that tended to be challenging for them as parents. A preliminary review of the tapes suggested that the first 30 min of tape was sufficient for capturing a wide variety of behavior that was representative of the entire 2 h. Coders were undergraduate research assistants who were unaware of parents' ratings of children's behavior, and received extensive training. Coders practiced coding for approximately 7 weeks before coding

Footnote 2 (continued)

mail and through some pediatric practices), 20% of packets were completed and returned. However, this likely underestimates the response rate because many parents may have received more than one packet.

tapes for the current study. A coding system assessing parental emotion expression (i.e., negative and positive affect) and emotion socialization strategies [51] was used at T1, with only emotion expression coded at T4. Global ratings were made every 5 min on frequency and intensity of expressed negative and positive affect, using a Likert-scale ranging from 1 to 7. Negative affect was coded when mothers and fathers expressed negative emotions including irritation, annoyance, frustration, sadness, and/or anger. Frequency was coded from 1 (*no instances of negative affect*) to 7 (*very often expresses negative affect*) and intensity was coded from 1 (*no negative affect*) to 7 (*strong negative affect*). Positive affect was coded when mothers and fathers expressed positive emotions including happiness, joy, excitement, satisfaction, pleasure, and contentment. Frequency was coded from 1 (*no instances of positive affect*) to 7 (*very often expresses positive affect*) and intensity was coded from 1 (*no positive affect*) to 7 (*strong positive affect*). Frequency ratings and intensity ratings for both constructs were highly correlated ($rs > .90$) and thus were averaged. Each tape was independently coded by two research assistants, and scores were averaged. ICCs for mothers' tapes at T1 and T4 were good or better for both negative (T1 = .89; T4 = .93) and positive (T1 = .86; T4 = .82) affect. ICCs for fathers' tapes at T1 and T4 were acceptable or better for both negative (T1 = .76; T4 = .91) and positive (T1 = .78; T4 = .96) affect. Scores were averaged across the six 5-min segments to obtain one value for both positive and negative affect at each time point.

Self-Reported Parenting

The Parenting Scale [50] is a 30-item self-report scale of parental discipline, which asks parents to rate their own practices using a 7-point Likert scale. The scale yields scores for laxness (e.g., "When I say my child can't do something... I let my child do it anyway (7) vs. I stick to what I said (1)") and overreactivity (e.g., "When my child misbehaves... I get so frustrated or angry that my child can see I'm upset (7) vs. I handle it without getting upset (1)"), two types of parenting behaviors that play a key role in coercive interactions [10]. The Parenting Scale has demonstrated good internal consistency ($\alpha = .83$ for laxness and .82 for overreactivity), and correlates with observations of parenting and child behavior [50]. Mothers and fathers completed the Parenting Scale at every time point. Scores are calculated by averaging across items that load on each scale, where high scores indicate dysfunctional parenting. Internal consistency (i.e., Cronbach's alpha) ranged from .80 to .84 across time for maternal laxness, from .76 to .80 for paternal laxness, from .69 to .75 for maternal overreactivity, and from .74 to .80 for paternal overreactivity.

Data Analytic Plan

To examine the reciprocal relations between parenting variables and CD symptoms, a series of models was created using Mplus 6 [52] for each maternal and paternal parenting behavior separately. Three-way cross-lagged panel models with CD symptoms, ODD symptoms, and parenting behavior were used for the maternal and paternal audio variables (positive and negative affect), because only T1 and T4 data points were available. Fixed effects cross-lagged regression models were used for parenting variables with four time points (maternal and paternal self-reported laxness, maternal and paternal self-reported overreactivity, and maternal videotaped warmth). Each of these models contained two latent variables: a parent latent variable that controlled for between-subject time-invariant factors for T2–T4 parenting behaviors (as a predictor) and a child latent variable that controlled for between-subject time-invariant factors for T2–T4 children's symptoms (as a predictor). These latent variables were allowed to correlate with their respective T1 variables. All analyses controlled for maternal or paternal education (i.e., T2–T4 symptoms and T2–T4 parenting behaviors regressed on parental education as reported at T1). Multi-group analyses were also conducted to inferentially test whether the lagged and cross-lagged pathways differed by child sex for all models. Chi square difference tests for maximum likelihood estimation with robust errors (MLR) determined whether model estimates ought to be constant or allowed to vary by sex.

MLR was used to address missing data in all models. In this method, all observed information is used to estimate parameters and standards errors are computed using a sandwich estimator. Model fit was evaluated using four indicators [53]: χ^2/df (< 2 indicates good model fit), Root Mean Square Error of Approximation (RMSEA; values of .08 and lower represent acceptable model fit), Comparative Fit Index (CFI; values higher than .90 indicate acceptable model fit), and Standardized Root Mean Square Residual (SRMR; values below .08 indicate adequate fit).

Results

Descriptive Statistics

Table 1 presents means, standard deviations, and sample sizes for children's symptoms by sex. There were no statistically significant differences by sex across the four time points. Consistent with the literature, the average number of CD symptoms decreased at the last time point for both boys and girls [54]. Table 2 presents means, standard deviations, and sample sizes for parenting variables at each time point, by children's sex. There were also no significant differences in parenting

Table 1 Mean scores for CD and ODD symptoms by sex

	Boys	Girls	*t*	Total
Time 1	*n* = 107	*n* = 92		*n* = 199
CD	1.77 (1.69)	1.54 (1.31)	.58	1.67 (1.53)
ODD	4.60 (2.05)	4.43 (1.96)	1.06	4.52 (2.00)
Time 2	*n* = 100	*n* = 81		*n* = 181
CD	1.85 (1.64)	1.62 (1.54)	.92	1.75 (1.60)
ODD	4.13 (2.14)	4.32 (2.26)	− .58	4.22 (2.19)
Time 3	*n* = 69	*n* = 71		*n* = 140
CD	1.61 (1.50)	1.65 (1.58)	− .15	1.63 (1.53)
ODD	3.86 (2.25)	3.63 (2.21)	.59	3.74 (2.22)
Time 4	*n* = 86	*n* = 76		*n* = 162
CD	.80 (1.27)	.59 (.94)	1.20	.76 (1.26)
ODD	2.54 (2.21)	2.57 (2.25)	− .09	2.55 (2.22)

Note: Standard deviations are in parentheses. *CD* conduct disorder symptoms; *ODD* oppositional defiant disordersymptoms

*$p < .05$. **$p < .01$. ***$p < .001$

behaviors with sons versus daughters. Table 3 presents correlations between children's symptoms and parenting variables. CD symptoms significantly correlated with ODD symptoms across time points. Fewer significant correlations between CD symptoms and parent variables were found than expected. CD symptoms were only concurrently correlated with maternal overreactivity at T3 and T4. With regard to fathers, CD symptoms at T2 were concurrently correlated with paternal overreactivity and CD symptoms at T4 were concurrently correlated with paternal laxness.

Correlations among maternal parenting measures were stronger within measurement approaches (see Table 3 below diagonal). Audio negative affect and audio positive affect were inversely correlated at both time points. Overreactivity and laxness were significantly concurrently correlated at T2–T4, and approached significance at T1. However, significant but weak correlations were also observed across different measurement methods. For example, T1 video warmth was correlated with T1 audio positive affect. Fewer significant correlations were found than expected among paternal parenting measures (see Table 3 above diagonal). Self-reported overreactivity was concurrently correlated with audio negative affect at T1 and T4. Audio negative affect and audio positive affect were inversely correlated at T1. Overreactivity and laxness were not correlated at any time point.

Reciprocal Relations Between CD Symptoms and Mothers' Parenting

Cross-Lagged (Two Time-Point) Analyses

For maternal audio negative affect and positive affect, no significant cross-lagged effects were found after controlling for ODD symptoms and maternal education. All four fit indices indicated that these models had a good fit to the data, χ^2/df = .97, RMSEA = .00, CFI = 1.00, and SRMR = .02, χ^2/df = .82, RMSEA = .00, CFI = 1.00, and SRMR = .02, respectively. Multigroup analyses examined whether the relations between maternal parenting behaviors and CD symptoms differed for boys versus girls; no significant sex differences emerged, so these results are not reported.

Fixed Effects (Four Time-Point) Analyses

Increases in maternal overreactivity predicted increases in CD symptoms across the preschool years (see Fig. 1), controlling for ODD symptoms and maternal education. No child-to-mother effects were found. All four fit indices indicated that the maternal overreactivity model had a good fit to the data, χ^2/df = 1.83, RMSEA = .07, CFI = .93, SRMR = .06. A decrease in maternal warmth at T3 predicted an increase in CD symptoms at T4, $\beta = -.20$, $SE = .07$, $p = .002$, controlling for ODD symptoms and maternal education. No child-to-mother effects were found. All fit indices indicated that the maternal warmth model had a good fit to the data, χ^2/df = 1.64, RMSEA = .06, CFI = .93, SRMR = .06. There were no cross-lagged effects between CD symptoms and maternal laxness, controlling for ODD symptoms and maternal education. All four fit indices indicated this model had a good fit to the data, χ^2/df = 2.01, RMSEA = .07, CFI = .92, SRMR = .07. Multigroup analyses examined whether the relations between maternal parenting behaviors and CD symptoms differed for boys versus girls; no sex differences emerged, so these results are not reported.

Reciprocal Relations Between CD Symptoms and Fathers' Parenting

Cross-Lagged (Two Time-Point Data) Analyses

For paternal audio negative affect, negative affect at T1 predicted CD symptoms at T4, controlling for ODD symptoms and paternal education, $\beta = .20$, $SE = .10$, $p = .05$. All four fit indices indicated these models had a good fit to the data, χ^2/df = .46, RMSEA = .00, CFI = 1.00, and SRMR = .02. A multigroup model comparison in which lagged and cross-lagged pathways were held equal by sex exhibited a worse fit compared to a model where these estimates were allowed to vary, $\Delta\chi^2$ (7) = 18.28, $p = .01$. In this model, reciprocal effects were found for girls. Negative affect at T1 predicted CD symptoms at T4 controlling for ODD symptoms and paternal education for girls, $\beta = .40$, $SE = .20$, $p = .05$, but not for boys, $\beta = .18$, $SE = .11$, $p = .09$. Moreover, initial CD symptoms in girls predicted negative paternal negative affect at T4, $\beta = .44$, $SE = .18$, $p = .02$, whereas boys' CD symptoms did not predict paternal negative affect, $\beta = -.21$, $SE = .18$,

Table 2 Means and standard deviations for parenting variables across time by sex

	Boys			*Girls*				*Total*		
	n	*M*	*SD*	*n*	*M*	*SD*	*t*	*n*	*M*	*SD*
Mothers: time 1										
Laxness	99	2.95	1.08	84	3.04	.90	− .49	183	2.99	1.00
Overreactivity	99	2.78	.79	85	2.95	.68	− .61	184	2.80	.74
Video warmth	90	4.40	1.14	82	4.25	1.15	.86	172	4.33	1.15
Audio negative affect	85	1.97	.90	74	1.85	.78	.86	159	1.91	.85
Audio positive affect	85	2.61	.87	74	2.76	1.05	− 1.00	159	2.68	.96
Mothers: time 2										
Laxness	96	2.74	.94	81	2.78	.92	− .30	177	2.76	.93
Overreactivity	96	2.72	.81	81	2.80	.80	− .67	177	2.76	.78
Video warmth	88	4.31	.90	77	4.07	1.07	1.57	165	4.19	.99
Mothers: time 3										
Laxness	82	2.70	1.05	74	2.62	.85	.53	156	2.67	.96
Overreactivity	82	2.68	.79	73	2.66	.67	.12	155	2.67	.73
Video warmth	58	4.48	.71	63	4.42	.54	.58	121	4.45	.62
Mothers: time 4										
Laxness	89	2.75	.99	74	2.65	.83	.69	163	2.70	.92
Overreactivity	88	2.80	.83	73	2.70	.74	.73	161	2.75	.79
Video warmth	69	4.26	.50	65	4.19	.61	.83	134	4.23	.55
Audio Negative Affect	71	1.90	.80	59	1.74	.49	1.36	130	1.83	.68
Audio positive affect	71	2.01	.61	59	1.99	.62	.14	130	2.00	.61
Fathers: time 1										
Laxness	79	2.83	.95	58	2.84	.81	− .02	137	2.84	.89
Overreactivity	79	2.60	.79	58	2.58	.84	.13	137	2.59	.81
Audio negative affect	65	1.40	.49	46	1.27	.34	1.54	111	1.35	.43
Audio positive affect	65	3.17	1.01	46	2.91	.81	1.46	111	3.06	.94
Fathers: time 2										
Laxness	73	2.83	.95	53	2.83	.82	− .05	125	2.83	.90
Overreactivity	73	2.77	.80	52	2.72	.77	.33	125	2.75	.79
Fathers: time 3										
Laxness	55	2.72	.77	50	2.63	.89	− .59	105	2.81	.84
Overreactitivy	55	2.77	.95	50	2.86	.71	.59	105	2.68	.82
Fathers: time 4										
Laxness	55	2.81	.97	50	2.92	.78	− .64	105	2.86	.88
Overreactivity	55	2.58	.79	50	2.58	.97	.01	105	2.58	.88
Audio negative affect	38	1.61	.50	32	1.46	.46	1.27	70	1.54	.48
Audio positive affect	38	2.51	.74	32	2.49	.79	.11	70	2.50	.75

Note: *CD* conduct disorder, *ODD* oppositional defiant disorder

$p = .24$. All four fit indices indicated this model had a good fit, $\chi^2/df = .43$, RMSEA = .00, CFI = 1.00, and SRMR = .02.

For paternal audio positive affect, no significant cross-lagged effects were found after controlling for ODD symptoms and maternal education. All four fit indices indicated this model had a good fit to the data, $\chi^2/df = .46$, RMSEA = .00, CFI = 1.00, and SRMR = .02. A multigroup model comparison in which lagged and cross-lagged pathways were held equal by sex exhibited a worse fit from a model where these estimates were allowed to vary, $\Delta\chi^2(7) = 15.62$, $p = .03$. However, no significant differences were found in the cross-lagged effects of interest. All four fit indices indicated the multigroup model had a good fit to the data, $\chi^2/df = 1.10$, RMSEA = .00, CFI = 1.00, and SRMR = .02.

Fixed Effects (Four Time-Point) Analyses

For paternal overreactivity, an increase in CD symptoms at T3 predicted an increase in paternal overreactivity at T4, $\beta = .29$, $SE = .08$, $p = .001$. No father-to-child effects were found. All four fit indices showed mediocre fit to the data,

Table 3 Intercorrelations between CD symptoms and maternal variables (below diagonal) and paternal variables (above diagonal)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. T1 CD	–	.45***	.01	− .05	.08	.14	–	.53***	.32***	.16	.12	–	.46***	.24**	.16	.06	–	.48***	.23***	.09	− .09	.35***	.24*
2. T1 ODD	.45***	–	.10	.08	.13	.04	–	.26**	.46***	.22*	.05	–	.19*	.24**	.17	.25*	–	.22**	.26**	.01	.19	.20*	.17
3. T1 NA	.03	.04	–	− .42***	.05	.21*	–	.05	.02	− .03	.13	–	.27*	.19	.11	.15	–	.23*	.08	.27*	.03	− .01	.14
4. T1 PA	.09	.03	− .37***	–	− .14	− .17	–	− .04	.01	− .15	.01	–	− .20	− .17	.05	.16	–	− .13	.01	− .08	.42***	− .08	.04
5. T1 lax.	.12	.15*	.24	− .12	–	.08	–	− .02	.09	.62***	.11	–	− .02	.02	.46***	.09	–	− .10	.15	.06	.09	.57***	.21*
6. T1 over.	.12	.10	.14	− .11	.13	–	–	.12	.06	− .06	.60***	–	.01	.07	− .11	.45***	–	.07	− .01	.20	− .09	− .07	.60***
7. T1 war.	− .03	.01	− .04	.22**	.18*	.08	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
8. T2 CD	.53***	.26***	.01	.10	− .04	.05	.06	–	.51***	.12	.26**	–	.59***	.40***	.11	.14	–	.50***	.32***	.06	− .15	.16	.28**
9. T2 ODD	.32***	.46***	.02	.06	.10	.23**	.07	51***	–	.20*	.21*	–	.34***	.51***	.12	.24*	–	.27**	.40***	.08	.02	.16	.08
10. T2 lax.	.07	.20**	.07	.01	.67***	.04	− .12	.01	.17*	–	.10	–	.14	.20*	.57***	.03	–	.03	.13	.01	.01	.62***	.07
11. T2 over.	.07	.07	.03	.13	.12	.47***	.05	.14	.16*	.21**	–	–	.20*	.34**	.05	.55***	–	.04	.13	.23	− .10	.11	.55***
12. T2 war.	− .04	− .08	− .06	.21*	.14	− .18*	.45**	− .09	− .13	− .20*	− .06	–	–	–	–	–	–	–	–	–	–	–	–
13. T3 CD	.46***	.19*	.07	.01	− .02	.10	− .05	.59***	.34***	.11	.26**	− .07	–	.57***	.07	.16	–	.58***	.37***	.13	− .19	.22	.35***
14. T3 ODD	.24**	.24**	.20*	− .01	.17	.09	− .09	.40***	.51***	.22**	.10	− .15	.57***	–	.28***	.23*	–	.33***	.48***	.15	.06	.19	.16
15. T3 lax.	− .01	.21*	.24**	.05	.69***	.12	− .08	− .05	.16	.74***	.13	− .12	.06	.24**	–	.15	–	− .03	.22*	− .02	.08	.57***	.03
16. T3 over.	.02	.05	.09	.04	.28**	.47***	.08	.20*	.16	.27**	.66***	− .09	.33***	.25**	.30***	–	–	.03*	.23*	.28*	− .01	.10	.66***
17. T3 war.	− .05	− .02	− .08	.16	− .18	.03	.47***	− .01	− .01	− .21*	.01	.29**	− .06	− .01	− .15	− .02	–	–	–	–	–	–	–
18. T4 CD	.48***	.22**	− .02	.05	− .13	.07	− .04	.50***	.27**	− .04	.12	− .10	.58***	.33***	− .03	.20*	− .21	–	.46***	.06	.06	.21*	.07
19. T4 ODD	.23***	.26**	.01	.09	.09	.11	− .06	.32***	.40***	.16*	.18*	− .10	.37***	.48***	.08	.29***	− .11	.46***	–	.11	.27*	.21*	.17
20. T4 NA	.05	.08	.37***	.16	.17	.03	− .07	.06	.08	.16	.01	− .04	− .03	.01	.10	.15	− .04	.04	.18*	–	− .13	− .04	.35***
21. T4 PA	− .18	− .09	− .26**	.28**	.18*	− .03	.25***	− .08	.06	− .13	− .03	.23*	− .16	− .09	− .12	− .13	.13	− .16	− .14	− .32***	–	− .03	− .02
22. T4 lax.	.01	.17*	.17	.01	.62***	.01	− .16	− .03	.12	.72***	.08	− .13	.03	.17	.74***	.23**	− .09	− .04	.20*	− .25**	− .11	–	− .02

Table 3 (continued)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
23. T4 over.	.01	.10	.20*	.02	.24**	.45***	−.08	.07	.15	.34***	.62***	−.16	.18*	.15	.34***	.66***	−.10	.13	.23**	.20*	−.18*	.37**	–
24. T4 war.	.03	−.13	−.24*	.21*	−.31***	−.04	.33***	.02	−.01	−.35***	.08	.25	.01	−.09	.30**	.02	.34***	.03	−.11	−.17	.03	−.39***	−.08

Note: *T1* time 1, *T2* time 2, *T3* time 3, *T4* time 4, *CD* conduct disorder symptoms, *ODD* oppositional defiant disorder symptoms, *NA* negative affect, *PA* positive affect, *Lax.* laxness, *Over.* overreactivity, *War.* warmth

*$p < .05$; **$p < .01$; ***$p < .001$

$\chi^2/df = 2.29$, RMSEA = .09, CFI = .86, SRMR = .08. For paternal laxness, there were no significant cross-lagged effects between CD symptoms and paternal laxness, controlling for ODD symptoms and paternal education. All four fit indices also showed mediocre fit to the data, $\chi^2/df = 2.20$, RMSEA = .09, CFI = .86, and SRMR = .08. Multigroup analyses examined whether the relations between paternal parenting behaviors and CD symptoms differed for boys versus girls; no sex differences emerged, so these results are not reported.

Discussion

In line with recent efforts to clarify the role of parenting behaviors in the development of CD symptoms and vice versa [55], the current study longitudinally examined reciprocal relations between maternal and paternal parenting behaviors and CD symptoms in preschool boys and girls, controlling for ODD symptoms and parental education. Several parent-to-child effects emerged. Increases in mothers' overreactivity predicted increases in children's CD symptoms across the preschool years, and decreases in mothers' warmth predicted increases in children's CD symptoms from T3 to T4. Less evidence was found for child effects; however, increases in children's CD symptoms predicted increases in fathers' overreactivity from T3 to T4. Reciprocal effects between girls' CD symptoms and paternal negative affect were also found.

Our findings that maternal overreactivity and paternal negative affect predicted later CD symptoms are consistent with some studies of parenting effects in older children. In the Developmental Trends Study, Wakschlag et al. [15] found that harsh discipline predicted CD diagnosis in a sample of referred school-age boys, and Hipwell et al. [18] also found that maternal harsh discipline predicted CD symptoms. Intervention research provides experimental support for the effects of negative parenting on CD in school-age children; participation in a multimodal intervention (Fast Track) was associated with lower scores on harsh discipline, which in turn predicted decreased levels of CD symptoms [56]. The current study extends these findings and shows effects of negative parenting on the development of CD symptoms at the within-individual level. In contrast to Hipwell et al. [18], we did not find evidence for child effects on overreactivity. It may be the case that CD symptoms in older children have a greater effect on parenting behaviors [20], or perhaps relations would have emerged if measured over a different time frame.

With respect to positive parenting behaviors, the current study found an effect of mothers' warmth towards the end of the preschool age-range. This effect is consistent with cross-sectional research on positive parenting practices and

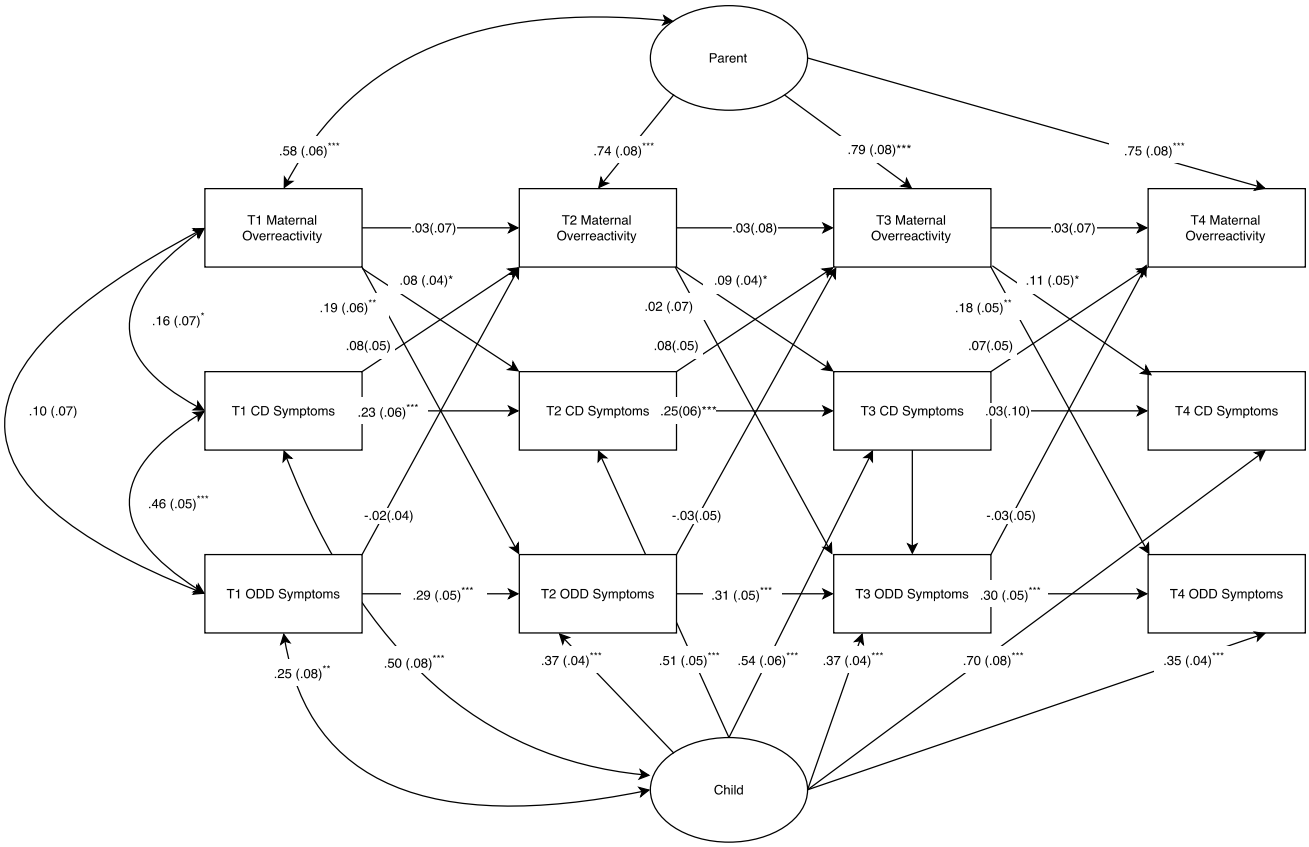

Fig. 1 Fixed effects model for CD symptoms and maternal overreactivity, controlling for ODD symptoms. Standardized coefficients are presented and standard errors are presented in parentheses. Models do not present parental education as a control for simplicity purposes. The parent latent variable controlled for between-subject time-invariant factors for T2–T4 parenting behaviors (as a predictor); the child latent variable controlled for between-subject time-invariant factors for T2–T4 children's symptoms (as a predictor). $*p<.05$, $**p<.01$, $***p<.001$

CD in older children. Pfiffner et al. [57] found that school-age boys and girls with ADHD with comorbid CD, but not ODD, had parents who demonstrated lower maternal warmth and involvement. Maternal warmth has also been found to distinguish between children with CD, emotional disorders, and controls; mothers expressed the least warmth to children with CD [58]. Longitudinal research on older children provides further support for the importance of positive parenting; Hipwell et al. [18] found that maternal warmth inversely predicted CD symptoms in girls. Recent research with preschool children may explain the lack of mother-to-child effects early on. In a different study, maternal warmth at age 2 years predicted callous-unemotional (CU) traits at age 3 years, but did not predict behavior problems [27]. It is possible that whereas the effects of negative parenting on CD symptoms are more immediate, limited warmth may first exert its influence via CU traits and later on CD symptoms. CU traits were not assessed in the current sample, which limits our ability to test this relationship.

The lack of reciprocal relations between CD symptoms and laxness (both maternal and paternal) was contrary to our hypothesis that was based on coercion theory; however, it was consistent with some previous findings. Burke et al. [20] did not find reciprocal relations between CD symptoms and timid discipline, a construct related to laxness. In previous research using this data set, we found that paternal laxness was linked with ODD [22]. Thus, it may be that laxness plays a role in ODD, but not CD. Overall, these findings are consistent with research supporting differential relations between parenting behavior and children's CD versus ODD symptoms.

We found fewer child-to-parent effects than predicted based on coercion theory, and these effects were focused on fathers. Increases in CD symptoms at age 5 years predicted changes in fathers' self-reported overreactivity, and girls' initial CD symptoms predicted negative paternal affect 3 years later. Studies with young children have produced mixed results, with some studies demonstrating child-to-parent effects [23, 26]. However, these studies did not distinguish between-individual effects from within-individual effects, factors that could have contributed to their findings. It is possible that the effects of CD emerge more consistently

at later ages [e.g., 18, 20] or operate across a different time frame. However, the present study suggested that fathers may respond earlier or more strongly to CD symptoms in girls versus boys. Overall, the findings point to the importance of examining how fathers may respond differently to girls' versus boys' behavior problems [34].

In the present study, the relations between mothers' and fathers' parenting behaviors and CD symptoms differed. Most parent-to-child effects were found for mothers, and the child-to-parent effects were only found in fathers. Consistent with the present study, Verhoeven and colleagues found child effects for fathers, but in contrast to the present study, they found similar child effects in mothers [26]. The present study adds to the handful of longitudinal studies of the relation between fathering and young children's externalizing problems, and extends this literature by suggesting that for CD symptoms, there may be differences in the effects of maternal and paternal parenting behaviors. Future research ought to further examine such differences as these may have important implications both for theory and intervention.

Overall, our findings did not entirely support coercion theory in explaining the development of CD symptoms during the preschool years. Reciprocal effects were only observed for girls in one of the two time-point models for fathers. Previous research in this area has suggested that annual assessment may not be able to detect reciprocal effects [14]; however, the present study found evidence for reciprocal effects across a three-year period for girls and paternal negative affect. It should be noted that this finding came from a traditional cross-lagged model, and so it is possible that between-individual factors could account for the effects. Another explanation for the lack of additional reciprocal effects found is that other models may better explain the development of CD symptoms when they first emerge [59]. Future research ought to continue addressing the current methodological gaps in the literature to better understand causal influences on the development of CD symptoms [55].

Study Limitations

Several limitations of the current study should be noted. First, the present study would have benefitted from having access to audiotapes at T2 and T3, which would have allowed the use of fixed effect models in all analyses. Second, the present study suffered from some dropout, and less complete data for some variables than others. Nevertheless, this study used MLR estimation, which makes use of all available data to obtain the most reliable possible estimates [52]. Third, this study relied on parent report to assess children's CD symptoms; additional assessment sources should be included in future work. Fourth, although this study examined several dimensions of parenting behavior, there are a number of other dimensions of parenting, such as physical punishment and parent involvement, that should be examined. Fifth, despite the ethnically diverse sample, it was not possible to examine how cultural factors might be relevant to the relations examined. Future studies ought to examine how cultural factors might influence the relations between parenting behaviors and children's CD symptoms. Lastly, the current study did not examine CU traits [19], which may moderate the influence of parenting behaviors.

Conclusions/Implications

This is the first study to examine reciprocal effects, including within-individual effects as well as between-individual effects, between parenting behavior and CD symptoms in preschool children. The current study found evidence that points to overreactivity and warmth as key parenting behaviors in the development of CD symptoms, and to a lesser extent to the influence of CD symptoms on paternal parenting. Results highlight the possible role parenting may have in the development of early-onset CD symptoms and support the call to include fathers in research examining the development of these symptoms. The differences between mothers and fathers in the relation between parenting and CD symptoms extend the literature in this area [60]. These differences between mothers and fathers need to be considered in future developmental models of CD.

The current study raises several issues that future research can address to better understand the emergence and development of CD symptoms during the preschool years. First, processes that contribute to the expression of CD symptoms appear to begin prior to 3 years of age as these symptoms were already present at this age in the present sample. Similarly, consistent with the literature on externalizing behavior disorders from preschool-age to school-age [54], a decline in the average CD symptoms at T4 was observed in this study. Longitudinal research with even younger children using fixed effects regression models may provide more insight on the processes leading to the expression of this condition. Moreover, inclusion of biological, psychological, and environmental covariates in future models could help disentangle their contributions to the development of CD [33]. In terms of intervention implications, support for parents with young children who exhibit CD symptoms is warranted. Early intervention may be beneficial to parents, as interventions have limited effectiveness once CD symptoms are established in school-age children [61]. More specifically, strengthening the parent–child relationship by reducing parental overreactivity and negative affect and increasing warmth early in development may help to halt the development of CD symptoms. This study provides further evidence to support the inclusion of fathers in interventions for children who exhibit

CD symptoms in early childhood. Clinicians can use information from this study to motivate paternal involvement, given that fathers appear to be active players in the developmental cycle of CD symptoms. Furthermore, the findings of the present study suggest that certain intervention goals might be emphasized for mothers (e.g., increase warmth and reduce overreactivity), and others for fathers (e.g., decrease negative affect). More longitudinal intervention research is needed to explore this possibility.

Summary

Research suggests that CD symptoms emerge during the preschool years; however, little is known about their early development and effects on parenting behavior, and vice versa. This issue is further complicated by the high comorbidity rates between CD and ODD symptoms, as well as research suggesting that both CD symptoms and parenting behaviors are influenced by an array of other factors (e.g., genetic propensities). Using advanced statistical methods that control for between-individual factors as well as ODD symptoms and parental education, the present study was able to show that increases in maternal overreactivity predicted increases in CD symptoms across the preschool years, and a decrease in maternal warmth when children were 5 years old predicted an increase in children's CD symptoms a year later. Also, increases in children's CD symptoms at 5 years of age predicted increases in fathers' overreactivity a year later. A traditional cross-lagged model also suggested reciprocal effects between girls' CD symptoms and paternal negative affect across a three-year period. Findings have implications for theory, and for interventions intended to halt the progression of CD symptoms, and raise questions to guide future research on both theory and intervention. The results highlight the importance of understanding the early development of CD symptoms and maternal and paternal parenting behaviors in families of preschool children.

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