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Children's Maternal Representations Moderate the Efficacy of Parent–Child Interaction Therapy—Emotion Development (PCIT-ED) Treatment For Preschool Depression

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Abstract

A randomized controlled trial (RCT) demonstrated that a novel psychotherapy, Parent–Child Interaction Therapy—Emotion Development (PCIT-ED), effectively treats preschool-onset depression. However, little is known about which children benefit most from PCIT-ED. As positive parent-level factors are associated with lesser depressive symptoms, this study explored the potential moderating role of positive parenting relationships on PCIT-ED efficacy. This study examined mothers and their children aged 3–6 ($N = 185$) who participated in the PCIT-ED RCT. Children were randomized to immediate PCIT-ED treatment ($n = 94$) or a waitlist control condition ($n = 91$) that received treatment after 18 weeks. Prior to treatment, children completed a narrative story completion task that was videotaped and coded for children's positive and negative representations of their mothers. Parent–child interaction tasks were also completed pre-treatment and videotaped and coded to measure observed parenting. Odds of MDD diagnosis post-treatment were predicted by the interaction of children's negative maternal representations and treatment group (Estimate = -.68; SE = .27; $\chi^2 = 6.45$; $p = .01$) and the interaction of children's relatively more positive than negative maternal representations and treatment group (Estimate = .30; SE = .13; $\chi^2 = 5.27$; $p = .02$). Observed parenting measures did not significantly predict odds of MDD diagnosis. Thus, PCIT-ED predicted loss of MDD diagnosis for children who displayed maternal representations that were less negative, and relatively more positive than negative. Results suggest that children with relatively more positive maternal representations may be more likely to benefit from PCIT-ED, whereas children with more negative maternal representations may need targeted work to decrease negative maternal perceptions before initiating PCIT-ED in order for treatment to be most effective.

Keywords Preschool depression · Parent–child intervention · Maternal representations · Randomized controlled trial · Treatment moderators

Over the past two decades, an extensive body of empirical research has validated the existence of major depressive disorder (MDD) in the preschool period. Preschool-onset MDD (PO-MDD) has a prevalence rate of 1–2%, displays a chronic course through late adolescence, and has been associated with social difficulties and altered functional brain activity and connectivity into adolescence (for review see: Donohue et al., 2019). Such findings underscore the importance of intervening early to treat this chronic and impairing disorder. A recent randomized controlled trial (RCT) demonstrated efficacy of a novel psychotherapy, Parent–Child Interaction Therapy—Emotion Development (PCIT-ED), in treating PO-MDD (Luby et al., 2018). To date, PCIT-ED is the only empirically supported psychotherapy for PO-MDD available. As the field moves toward identifying which treatments work for whom (Insel, 2009), identifying moderators of PCIT-ED treatment efficacy is critical in order to aid clinicians in making treatment recommendations for depressed preschoolers. Given that PCIT-ED capitalizes on the parent–child relationship to effect change, children's perceptions of their parents and the parent–child relationship prior to treatment, particularly children's representations of their parents, may be a

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potentially powerful moderator of PCIT-ED efficacy. Indeed, studies have found that children's more positive perceptions of their parents predict lesser depressive symptoms, generally, and that positive caregiver-child relationships prior to parent–child therapies for externalizing disorders are associated with better treatment response (Dedousis-Wallace et al., 2020). The purpose of this study was to examine preschooler's parent (in this case maternal) representations prior to treatment initiation—measured through a narrative story completion task—as a potential moderator of PCIT-ED treatment efficacy.

Parent Child Interaction Therapy—Emotion Development

Parent–child interaction therapy—emotion development (PCIT-ED) is a recently developed and validated treatment for PO-MDD that adds a novel, emotion development (ED) module to standard PCIT. Standard PCIT is a widely studied, empirically supported treatment for externalizing behaviors in 3-to 7-year-old children (Thomas et al., 2017) that consists of two treatment components: 'child-directed interaction (CDI)', which teaches parents to interact positively and let their child lead in play, and 'parent-directed interaction (PDI)' which teaches parents warm yet firm limit setting consistent with authoritative parenting approaches. PCIT directly targets parenting during parent–child interactions by using the "bug-in-the-ear" technique in which the caregiver wears a small microphone while the therapist coaches the parent through a one-way mirror, allowing direct modification of parent behavior as it is occurring. PCIT-ED expands standard PCIT by using time-limited courses of CDI and PDI and subsequently adding the novel ED module. Congruent with the view that early depression is a disorder of disrupted emotional development, the ED module uses the above described in vivo coaching technique to teach caregivers to enhance their child's emotional competence and emotion regulation. Caregivers are taught to do this through tolerating, validating, and helping their child regulate his or her distressing emotions, increasing reactivity to positive stimuli, and decreasing reactivity and improving regulation in response to negative stimuli.

A RCT demonstrated that compared to children in a waitlist control condition, children who received PCIT-ED evidenced lower rates of depression, lower depression severity, and lower impairment following treatment; children also demonstrated ODD symptom improvement through standard PCIT components, and effects of PCIT-ED on MDD and ODD symptom improvement were large in magnitude (Luby et al., 2018). Additional documented benefits of PCIT-ED include improved child emotional competence and self-reported and observed improvements in parenting practices, many of which were sustained at a 3-month follow-up (Luby et al., 2020; Whalen et al., 2021). In contrast to these promising findings regarding PCIT-ED treatment outcomes, this work has largely not yet identified moderators of treatment efficacy. One analysis examined the moderating role of callous-unemotional (CU) behaviors (i.e., deficits in empathy, guilt, and prosocial behavior) and found that children with higher levels of CU behaviors were equally likely to benefit from PCIT-ED in terms of MDD or ODD symptom improvement as peers with lower levels of CU behaviors (Donohue et al., in press). Identifying moderators of PCIT-ED treatment efficacy is critical in order to pinpoint specific child characteristics and/or environmental circumstances under which PCIT-ED treatment is most likely to be effective. This information would greatly aid clinicians in making treatment recommendations, particularly when additional empirically supported treatments for PO-MDD are developed and available as treatment options.

A recent systematic review reported that across studies examining psychosocial treatments for adolescent depression, treatment effects have been found to be enhanced for females, and children who are older, of higher SES, and children who have more psychiatric comorbidities and more severe depressive symptoms (Weersing et al., 2017). However, evidence on parent-or family-level moderators of treatment efficacy is mixed. One study found that effects of interpersonal therapy for depressed adolescents (IPT-A) were particularly strong for adolescents who reported high levels of social dysfunction with peers and conflict with their mothers prior to treatment (Gunlicks-Stoessel et al., 2010). Another found improved treatment outcomes for adolescents with lower mother-reported parent–child conflict, along with moderating effects suggesting differing benefits of medication and CBT for adolescents as a function of their family environments (Feeny et al., 2009). Clinically significant levels of parent-reported parent–child conflict have also been found to predict lower likelihood of remission from depression in adolescents (Rengasamy et al., 2013). Yet other studies have found no moderating effects of social functioning or family conflict on treatment outcomes (Curry et al., 2006; Kolko et al., 2000). Importantly, none of the above studies examined parent–child interaction therapies, which are interventions delivered through the parent–child relationship and thus may be particularly influenced by parent-level factors assessed prior to treatment initiation.

Children's Perceptions of Parents and Depression

A growing body of research demonstrates that parenting and the parent–child relationship are salient predictors of the onset and maintenance of MDD in childhood and

adolescence (McLeod et al., 2007; Pinquart, 2017). Indeed, reviews of studies using mostly parent-report measures of parenting conclude that negative parenting, such as parental control and rejection, contributes to the development of MDD in childhood by undermining children's self-esteem, promoting a sense of helplessness, and giving rise to the development of negative self-schemas (Hammen, 1992; Kaslow et al., 1994).

Beyond parents' reports of their own parenting and observations of parent behaviors, children's perceptions of their parents are also associated with child depressive symptoms concurrently and longitudinally (e.g., Belden et al., 2007; Cole et al., 2018). For example, in one study, 7-to 14-year-old children who reported greater negative (i.e. harsh, critical) parenting and less positive (i.e. warm, supportive) parenting at baseline displayed higher levels of depressive symptoms a year later (Cole et al., 2018). A recent meta-analysis of 1,015 studies found that child-reported parenting was associated with stronger links between parenting and internalizing symptoms relative to parent-reported parenting (Pinquart, 2017). Studies that combined parenting information from multiple informants found even stronger negative associations between warmth and authoritative parenting and internalizing symptoms relative to studies that used only parent or child reports (Pinquart, 2017) – however, obtaining multiple informant reports of parenting in the same study is relatively rare (e.g., 4.7% of studies in Pinquart, 2017).

Of particular importance to the present work, empirical evidence supports the predictive utility of children's perceptions of their parents as early as the preschool period. Specifically, preschoolers displaying more severe depression displayed more negative maternal representations in a narrative story completion task (Belden et al., 2007). Importantly, children's negative maternal representations predicted mothers' observed greater use of nonsupportive parenting strategies a year later, suggesting that children's representations of caregiving relationships might be a useful indicator of the parent–child relationship with important implications for child outcomes.

Children's Perceptions of Parents as a Predictor of Treatment Outcome

To date no study has examined the effect of children's pre-treatment maternal representations on the efficacy of treatment of childhood depression. However, there is some evidence that parent-level factors can influence treatment outcomes for disruptive behavior disorders (i.e., Oppositional Defiant Disorder and Conduct Disorder; Booker et al., 2019; Dedousis-Wallace et al., 2020). For example, a recent review of Parent Management Training (PMT)—an intervention that improves consistency in parenting through increasing parental use of differential attention, contingent reinforcement, and time out from reinforcement—found that a positive parent–child relationship was the strongest predictor of better treatment outcomes (i.e., decreases in disruptive behavior) of all predictors examined, including sociodemographic factors (e.g., socioeconomic status) or other parental characteristics (e.g., parental psychopathology or substance use; Dedousis-Wallace et al., 2020). Importantly, two of the three reviewed studies that found that the parent–child relationship predicted treatment outcomes for disruptive behavior disorders examined 3- to 8-year-old children (Dittman et al., 2014; Lavigne et al., 2008), supporting the notion that the parent–child relationship is a key predictor of treatment outcomes in very young children. Though this body of literature has exclusively examined the treatment of disruptive behavior disorders, parent-level factors such as children's maternal representations may similarly predict treatment outcomes for other childhood disorders such as PO-MDD, and may be particularly relevant for interventions that are delivered entirely through the parent–child relationship, such as PCIT-ED.

Positive parent–child relationships prior to an intervention may increase parent–child compatibility, which could facilitate the treatment and lead to improved outcomes (Dedousis-Wallace et al., 2020). Additionally, parents who display greater parental warmth prior to treatment might have greater tools at their disposal to combine with strategies they learn during treatment (Booker et al., 2019). Similarly, positive maternal representations prior to the implementation of parent interventions designed to treat childhood depression may lead to greater cooperation between parent–child dyads and/or facilitate the parent-training skills practiced during the treatment. A greater focus on understanding how parent-level factors influence treatment outcomes may help us identify for whom PCIT-ED treatment may be most effective (Kraemer et al., 2002).

The majority of the aforementioned studies that link positive parent–child relationships to better treatment outcomes utilize parent-reports (e.g., Booker et al., 2019; Dittman et al., 2014) or observational measures of parenting (e.g., Lavigne et al., 2008). However, children's perceptions of their caregiver's parenting or the parent–child relationship can differ from their parent's reports of the same characteristics. A meta-analysis by Korelitz and Garber (2016) found significant parent–child discrepancies in parenting behaviors, such that parents tended to rate their own parenting behaviors more positively than their children did, an effect that may be explained by parents' positive biases of their own parenting or tendencies to give socially acceptable responses. Moreover, even more objective measures of parenting such as observations may not be as predictive if those measures conflict with how children themselves perceive their parent and the parenting relationship. In treatments

such as PCIT-ED, the parent is the primary agent of change and improvements in child symptoms are achieved through changes in parenting practices and through parent-led coaching of novel adaptive emotional strategies. Thus, children who have more positive perceptions of their caregivers prior to treatment may be better able to engage with these new parent-led practices and may thus obtain more benefit from the treatment. As such, examining children's own maternal representations (rather than parent-report) as a moderator of PCIT-ED treatment may be particularly important.

Narrative Methodology in Young Children

Story completion narratives, such as the MacArthur Story Stem Battery (MSSB; Bretherton & Oppenheim, 2003) have a history of use in clinical and developmental research (see Yuval-Adler & Oppenheim, 2014 for a review). In contrast to parent-report and observational measures, narratives provide a unique opportunity to capture children's own perspectives, expectations, and internal working models of experiences. In these tasks, an examiner typically sets up a series of emotionally evocative stories using dolls, children complete the end of each story using the dolls, and children's videotaped narratives are later coded for constructs of interest. One construct that has been examined in the literature is children's representations of caregivers during the narratives, which are measured by coding positive and negative ways in which children depict caregivers behaving toward the child in the story during the narratives. Thus, children's parental representations are thought to reflect children's internal perceptions of parents and/or the parent–child relationship. Indeed, there is extensive support for the validity of narratives to assess children's representations of parents (e.g., Emde et al., 2003; Laible, 2006, 2011; Oppenheim et al., 1997). Although very little work has examined the concordance between children's maternal representations and observations of parenting, the previously reviewed study by Belden et al. (2007) found that children's negative maternal representations were mildly to moderately and significantly associated with more negative observed parenting behaviors and affect 1 year later, demonstrating that children's representations are both associated with observable behavioral parental characteristics, and also a distinct construct. Moreover, studies examining parental representations and psychopathology have found links between children's negative parental representations and increased conduct problems (Stadelmann et al., 2010) and maternal report of children's increased psychological distress (Oppenheim et al., 2007). Given the critical role of the parent–child relationship in PCIT-ED and the aforementioned discrepancies between parent and child reports of parental behaviors, the present study used the MSSB to assess children's own maternal representations as a potential moderator of PCIT-ED treatment efficacy.

The Current Study

In sum, whereas previous studies have found that a more positive pre-treatment parent–child relationship predicted better child outcomes following disruptive behavior disorder treatments, studies have not examined whether similar parent-level factors moderate the efficacy of treatment for childhood depression, key to appropriate treatment targeting. Thus, the current study aimed to examine parenting and the parent–child relationship—measured through both child-report (i.e., children's maternal representations) and behavioral observations—as a moderator of treatment outcomes of an RCT of PCIT-ED for preschool depression. Maternal representations were assessed via children's responses to four story stem narratives administered prior to treatment, and mother's positive and negative parenting was measured observationally through two parent–child interaction tasks. We hypothesized that children with more positive maternal representations would show increased response to PCIT-ED treatment (i.e., more likely to lose their depression diagnosis) relative to children with less positive maternal representations. We also hypothesized that positive parenting measured via the parent–child interaction tasks would also moderate treatment response, though possibly to a lesser extent than children's own representations due to the potential importance of children's own perceptions.

Methods

Participants

Participants were 3-to 6-year-old children and their mothers who were participants in a single-blind randomized control trial (RCT) of PCIT that added a novel Emotion Development module (PCIT-ED) between 2014 and 2017. Children were recruited from pediatrician's offices, daycares, preschools, and mental health facilities in the greater St. Louis metropolitan area using the Preschool Feelings Checklist (PFC; Luby et al., 2004) to identify children at high-risk for depression (≥ 3 items endorsed). Children who subsequently met criteria for MDD were invited to enroll and randomized to either immediate treatment (PCIT-ED group; $n = 94$) or to a wait list control condition (WL group; $n = 91$). Exclusionary criteria were: 1) autism spectrum disorder; 2) serious neurological syndrome or chronic medical disorder; 3) significant developmental delay; and/or 4) current antidepressant or psychotherapy treatment. The trial was registered with clinicaltrials.gov (NCT02076425). Further details

about the PCIT-ED study recruitment, design, and methods as well as findings related to efficacy in ameliorating depression are presented in the original treatment outcomes report (Luby et al., 2018). This study examined children's maternal representations within mother–child dyads (other caregiver-child dyads [$n = 2$] were excluded) in a subset of $N = 185$ dyads who completed assessments at both pre-treatment and post-treatment (see CONSORT diagram for further details, Fig. S1, Supplement).

Course of Treatment

As described above, PCIT-ED is a manualized, 20 session psychotherapy treatment conducted over the course of 18 weeks. The treatment consists of 6 sessions of child-directed interaction (CDI) and 6 sessions of parent-directed interaction (PDI), followed by 8 sessions of the novel, emotion development (ED) module. This study examines assessments by raters blind to treatment condition and study hypotheses that were conducted both pre-treatment and immediately post-treatment (for WL participants, 18 weeks post-randomization).

Ethical Considerations

Study procedures were pre-approved by the Washington University School of Medicine IRB. Informed consent and assent was obtained from parents and children, respectively.

Measures

Depression Children's depression was assessed using the Kiddie Schedule for Affective Disorders and Schizophrenia—Early Childhood (K-SADS-EC; Gaffrey & Luby, 2012) a diagnostic interview administered to parents by a trained rater which consists of a series of developmentally appropriate questions to assess DSM-5 criteria for psychiatric disorders in preschool-aged children. The KSADS demonstrates good construct validity and test re-test reliability. The current study's primary outcome was children's loss of depression diagnosis post-treatment (i.e., no longer meeting criteria for MDD or MDD-NOS). Children's MDD severity scores (possible range: 0–9) and ODD severity scores (possible range: 0–8) at baseline were also examined as covariates in follow-up analyses. Questions probed the presence of MDD symptoms over the prior month, though to meet criteria for MDD, symptoms had to have occurred over a 2-week period. The KSADS-EC was videotaped, reviewed for rater drift, and calibrated for accuracy, and satisfactory inter-rater reliability for MDD was established ($\mathbf{K} = 0.74$).

Narrative Task and Coding

Children's maternal representations Story stem narratives (e.g., Bretherton & Oppenheim, 2003), a reliable and valid measure of 3-to 7-year-old children's internal working models, were administered pre-treatment to assess children's maternal representations. Narratives have been shown to be useful and sensitive in detecting differences between diagnostic groups and measures of socioemotional functioning in very young children. For each narrative, an examiner sets up an emotionally evocative story using doll props (e.g., "you are at the grocery store with your mom and you have lost your favorite teddy bear, show and tell me what happens next"), and children complete the stories by acting out an ending with the relevant child and parent dolls and associated props. Four story stems were presented to the children that focused on themes of separation, loss and/or transgression due to their unique relevance for children with MDD (see Hennefield et al., in press, for additional details regarding the specific narratives administered). Following standard procedure (Bretherton & Oppenheim, 2003), stories were administered in a fixed order.

Coding Videotaped narratives were coded by master's level clinicians with expertise in PO-MDD using an adapted version of the MacArthur Narrative Coding Manual (Robinson et al., 2002). Clinicians were blind to the child's clinical characteristics, treatment group assignment, and study hypotheses. The present study examined three variables related to children's positive and negative representations of their mothers in the narratives. These included ways in which children depicted mothers behaving *toward the child* in the story through actions, words, and/or tone of voice. Only children's representations of mothers, rather than other caregivers, were examined as mothers were overwhelmingly (94.6%) the parent involved in PCIT-ED treatment. Positive representations of mothers ("*Mother Positive"*) were coded when children depicted mothers as protective, caretaking, affectionate, warm, caring, supportive, and/or affirming. Examples include child depictions of mother protecting the child from possible danger (e.g., "Be careful with the scissors") and giving affection (e.g., kissing the child). Negative representations of mothers ("*Mother Negative"*) were coded when children's narratives included harsh or punitive depictions (e.g., aggression or exaggerated discipline), rejection, or ineffective parenting wherein the parent is unable or unwilling to help the child when asked. Examples include child depictions of maternal aggression (e.g., "I'm going to kick you") and rejection (e.g., mother pushes child away). Each variable was coded as absent (0) or present (1) in a specific story, and scores were then averaged across all four stories. One final variable examined was a measure of the extent to which mothers were depicted as relatively more positive than negative in the narratives ("*Mother Difference"*), calculated by subtracting Mother Negative from Mother Positive.

Training followed the procedures outlined in Robinson et al. (2002) whereby a small team of coders reviewed the manual, discussed how specific codes should be interpreted, observed video examples of codes across multiple children with different narrative styles, and practiced coding from pre-selected training videos. Discrepancies were compared and discussed. This process was repeated until all coders achieved reliability. Five coders were trained to initial reliability on 12 videos in which codes were compared to those of a master coder. Percent agreement between the master coder and each individual coder on the training videos ranged from 75.0–100% ($M = 89.6\%$) for Mother Positive and 75.0–75.0% ($M = 75.0\%$) for Mother Negative. Simple agreement was calculated due to the low frequency of these codes within the training videos. Coders subsequently rated videos independently and met with the master coder frequently for case consultation and to prevent rater drift.

Observational Tasks and Coding

Parent–child interaction tasks Observations of mothers' positive and negative parenting were coded from two structured parent–child interaction (PCI) tasks completed by each mother–child dyad during the pre-treatment assessment and designed by Kochanska and Aksan (1995, 2004). Both tasks were designed to be mildly stressful, induce child negative emotions, and require caregiver assistance for completion. In the Marble Run task, caregivers and children were required to replicate a photo to build a standing marble run. In the Etch-A-Sketch task, caregivers and children were required to work together to make their way through a maze on an Etch-A-Sketch, each controlling one dial. Tasks were videotaped and parent behavior and affect were coded using the procedures described below.

Behavioral coding All observations were videotaped and coded using the Dyadic Parent–Child Interactions in Early Childhood, PCIT-ED edition manual (Whalen & Gilbert, 2017) which was adapted for use in our laboratory from the Dyadic Interaction Coding Manual (Lunkenheimer et al., 2011). The coding system is designed to capture a descriptive landscape of functional control/compliance behavior and affective displays in caregivers and their preschool-aged children. A unique feature of this coding scheme is that behavior and affect are coded independently from each other. For example, a caregiver may use verbal discipline while maintaining a positive affect display or engage in emotion talk while displaying negative affect. The focus of the current study was on maternal behaviors and affective displays.

Codes for each task (Marble Run and Etch-a-Sketch) were summed and four parenting variables were each converted to proportions in which the duration of each code was divided by the total length of the combined tasks (to account for any variation in length of the PCI between dyads). First, *Duration of Negative Parenting Behavior* was the mean duration of parent expressions of the following individual behavioral codes: Negative Physical Discipline, Negative Verbal Discipline, Intrusiveness, and Disengagement. Second, the *Duration of Negative Parenting Affect* was the mean duration of parent expressions of the following individual affective codes: Anger/Frustration and Sad/Anxious/Fearful/Worried. Third, *Duration of Positive Parenting Behavior* was the mean duration of parent expressions of the following individual codes: Physical Affection, Emotional Talk, Positive Reinforcement, Proactive Structure, Engagement, use of Rationale, and use of Directives. Finally, the *Duration of Positive Affect Composite* was the mean duration of parent expressions of the following individual codes: Low Intensity Positive Affect (e.g., closed mouth smiles; slightly positive warm tones) and High Intensity Positive Affect (e.g., open mouth smiles; regular positive fluctuations in voice tone such as excited yelling or high-pitched sounds; laughing; singing).

Coders blind to children's treatment group and the study hypotheses independently rated each video using the Noldus Observer XT software (Zimmerman et al., 2009). Coders were required to achieve greater than 80% reliability with two master coders during an initial training period. After this was achieved, coders rated videos independently. The two master coders rated 20% of random videos to ensure that inter-observer agreement was maintained over time and prevent rater drift.

Mother's Depression Symptoms

Mother's depression symptoms were assessed pre-treatment and examined as a covariate. Mothers completed the Beck Depression Inventory, (BDI-II; 1996), a self-report measure validated in a numerous populations, including caregivers. The BDI consists of 21 questions scored on a scale ranging from 0–3 and summed to create a total score, which was used.

Data Analytic Plan

Analyses of study hypotheses examined whether 1) children's maternal representations and/or 2) observed measures of mother's parenting measured prior to treatment initiation moderated the efficacy of PCIT-ED in treating depression. First, logistic regression analyses probed the interaction between children's maternal representations measured at the pre-treatment assessment and treatment group (PCIT-ED vs WL) in predicting loss of MDD diagnosis at the post-treatment assessment. The three above described internal representation variables—Mother Positive, Mother Negative,

and Mother Difference—were examined in three separate analyses. Each analysis controlled for children's age, sex, and pre-treatment MDD severity. Assumptions of logistic regression were met. FDR correction for multiple comparisons was used. Any significant interactions were then probed in order to determine at which levels of the maternal representation variables the significant association between group and loss of MDD diagnosis was significant. Interactions were investigated by running several models, centering maternal representation variables at different values (e.g., 0, 1, 2, 3, and 4). Second, logistic regression analyses probed the interaction between observed parenting measured pre-treatment and treatment group in predicting post-treatment loss of MDD diagnosis. The four above described observed parenting variables—Negative Parenting Behavior, Negative Parenting Affect, Positive Parenting Behavior, and Positive Parenting Affect—were examined in four separate analyses. Each analysis again controlled for children's age, sex, and pre-treatment MDD severity. Assumptions of logistic regression were met.

Finally, supplemental analyses were conducted to confirm that any significant results remained significant when 1) an intent-to-treat approach was used, and 2) when controlling for the effect of children's comorbid ODD symptom severity and mothers' depression symptom severity each measured pre-treatment. For the intent-to-treat analyses, the MI and MIANALYZE procedures in SAS v9.4 were used to create 25 multiply imputed datasets that were then pooled for analyses assessing post-treatment loss of MDD diagnosis. Variables included in the multiple imputation process were sex and the pre-treatment variables age, externalizing disorder, internalizing disorder, MDD severity, and the maternal representation and observed parenting variables. Several subjects were missing maternal representation and/or observed parenting variables, so these scores were imputed in addition to post-treatment diagnosis. Imputations were conducted by randomization group. Logistic regression models of post-treatment loss of MDD diagnosis were then conducted on the multiply imputed datasets, covarying for sex, age, and pre-treatment MDD severity.

Results

Descriptive Statistics

Descriptive statistics are presented in Table 1, and correlations among study variables are presented in Table 2.

Table 1 Descriptive Statistics ($N = 185$)

		All Subjects ($N = 185$)		PCIT-ED ($N = 94$)		Wait List ($N = 91$)		PCIT-ED vs. WL	
Variable		%	*N*	%	*N*	%	*N*	χ^2	*p*
Female Sex		33.0	61	33.0	31	33.0	30	0.00	0.9987
Hispanic Ethnicity		11.4	21	13.8	13	8.8	8	1.17	0.2801
Race								F.E	0.0927
White		79.5	147	85.1	80	73.6	67		
Black		9.2	17	5.3	5	13.2	12		
Asian		0.5	1	1.1	1	0.0	0		
More than 1 race		10.8	20	8.5	8	13.2	12		
	Range	Mean	*SD*	Mean	*SD*	Mean	*SD*	*t*	*p*
Pre-treatment Age	3.0 – 7.0	5.23	1.06	5.17	0.96	5.28	1.15	-0.68	0.4978
Maternal Representations									
Mother Positive	0 – 4	1.73	1.23	1.66	1.15	1.80	1.32	-0.75	0.4558
Mother Negative	0 – 3	0.39	0.63	0.42	0.63	0.36	0.63	0.69	0.4926
Mother Difference	-2 – 4	1.33	1.49	1.24	1.39	1.42	1.60	-0.79	0.4281
Depression Severity									
MDD Severity – Pre-treatment	3 – 9	5.58	1.47	5.49	1.47	5.68	1.47	-0.89	0.3756
MDD Severity – Post-treatment	0 – 9	2.96	2.21	1.80	1.69	4.15	2.04	-8.57	< 0.0001
Observed parenting									
Duration Negative Behavior	0.00 – 0.23	0.03	0.04	0.03	0.03	0.03	0.04	-0.62	0.5380
Duration Positive Behavior	0.32 – 0.66	0.47	0.04	0.47	0.04	0.47	0.04	0.51	0.6072
Duration Negative Affect	0.00 – 0.36	0.05	0.07	0.05	0.07	0.05	0.06	0.20	0.8439
Duration Positive Affect	0.00 – 0.50	0.21	0.16	0.21	0.15	0.21	0.17	-0.17	0.8675

PCIT-ED Parent–Child Interaction Therapy—Emotion Development, *WL* Waitlist Control Group, *MDD* Major Depressive Disorder, *F.E.* Fisher's Exact Test

Table 2 Correlations Among Variables ($N = 185$)

Variable	1	2	3	4	5	6	7	8	9	10
1. Age										
2. Sex	0.07									
Maternal representations										
3. Mother Positive	0.15*	-0.34**								
4. Mother Negative	0.07	0.08	-0.22**							
5. Mother Difference	0.08	-0.31**	0.91**	-0.60**						
Depression severity										
6. MDD Severity – Pre-treatment	0.20**	0.02	-0.02	0.02	-0.03					
7. MDD Severity – Post-treatment	0.09	0.01	-0.01	0.09	-0.05	0.19*				
Observed parenting										
8. Duration Negative Behavior	-0.13	0.13	-0.17*	0.04	-0.16*	-0.04	0.02			
9. Duration Positive Behavior	0.12	-0.09	0.16*	-0.07	0.16*	0.08	-0.07	-0.91**		
10. Duration Negative Affect	-0.15*	0.13	-0.22**	0.15*	-0.25**	0.01	-0.06	0.24**	-0.25**	
11. Duration Positive Affect	-0.27**	-0.10	0.01	-0.13	0.07	0.04	0.05	-0.19**	0.12	-0.30**

[a]Sex is coded as 1 = male, 0 = female

MDD Major Depressive Disorder

* = $p < .05$

** = $p < .01$

Older children had greater pre-treatment depressive severity. Children's narratives generally contained more positive than negative maternal representations. Older children and girls displayed more positive representations of mothers. Neither children's maternal representations nor mothers' observed parenting were related to children's pre-treatment depressive severity. Within subjects, children's maternal representations were correlated in expected directions, with positive and negative representations displaying inverse relationships.

Relationships Between Narratives and PCI

Children who had more positive maternal representations had parents who displayed a significantly greater duration of positive parenting behavior and lesser duration of negative parenting behavior and negative affect during PCI (Table 2). Similarly, children who had relatively more positive compared to negative maternal representations had parents who displayed a greater duration of positive parenting behavior and a lesser duration of negative parenting behavior and affect during PCI. In contrast, children's more negative maternal representations were only significantly associated with greater duration of negative parenting affect.

Do Children's Maternal Representations Moderate PCIT-ED Treatment Efficacy?

The interaction of children's positive maternal representations and treatment group in predicting odds of loss of MDD diagnosis was not significant. In contrast, the interaction of children's negative maternal representations and treatment group was a significant predictor of odds of post-treatment loss of MDD diagnosis (Table 3). Follow-up analyses probing this significant interaction indicated that the effect of group on loss of MDD diagnosis was significant for Mother Negative values of 0 and 1, but not for values of 2 or 3 (see Table S2, supplement). In other words, PCIT-ED treatment predicted loss of MDD diagnosis, but only for children who had few negative maternal representations at the pre-treatment assessment. For example, when baseline Mother Negative scores were 0 (i.e., children did not demonstrate negative maternal representations), PCIT-ED children were 4.44 times more likely than WL children to lose their MDD diagnosis. In contrast, when baseline Mother Negative scores were 2 or 3 (i.e., children demonstrated greater negative maternal representations), there was no significant difference in likelihood of loss of MDD diagnosis by treatment group (Fig. 1).

Finally, the interaction of children's more positive than negative maternal representations and treatment group in predicting odds of loss of MDD diagnosis was also significant (Table 3). Follow-up analyses probing this significant interaction indicated that the effect of group on loss of MDD diagnosis was significant for Mother Difference values of 0, 1, 2, 3, and 4 (more positive than negative maternal representations; Table S3), but not for values of -1, -2, or -3 (more negative than positive representations). In other words, PCIT-ED treatment predicted loss of MDD diagnosis, but only for children who had certain relatively more positive than negative pre-treatment maternal representations. For

Table 3 Logistic Regression Models of Interactions Between Children's Pre-treatment Maternal Representations and Treatment Group Predicting Post-treatment Loss of MDD Diagnosis ($N = 182$[a])

	Estimate	SE	χ^2	*p*	*FDR p*
Mother Negative					
Intercept	1.07	1.04	1.06	0.3030	
PCIT-ED vs. WL	1.49	0.23	42.57	< 0.0001	
Female	-0.05	0.19	0.07	0.7874	
Pre-treatment age	0.00	0.18	0.00	0.9790	
Pre-treatment MDD severity score	-0.15	0.13	1.36	0.2443	
Pre-treatment Mother negative	-0.28	0.27	1.11	0.2911	
Pre-treatment Mother negative X PCIT-ED group	-0.68	0.27	6.45	0.0111	.03
Mother Positive					
Intercept	0.80	1.05	0.59	0.4436	
PCIT-ED vs. WL	0.82	0.30	7.57	0.0059	
Female	-0.02	0.20	0.01	0.9187	
Pre-treatment age	-0.02	0.18	0.01	0.9252	
Pre-treatment MDD severity score	-0.12	0.12	0.95	0.3306	
Pre-treatment Mother positive	0.05	0.16	0.08	0.7784	
Pre-treatment Mother positive X PCIT-ED group	0.21	0.16	1.88	0.1707	.17
Mother Difference					
Intercept	0.58	1.04	0.30	0.5814	
PCIT-ED vs. WL	0.83	0.22	14.31	0.0002	
Female	-0.05	0.20	0.07	0.7887	
Pre-treatment age	0.03	0.18	0.02	0.8837	
Pre-treatment MDD severity score	-0.13	0.13	1.06	0.3036	
Pre-treatment Mother difference	0.13	0.13	0.95	0.3293	
Pre-treatment Mother difference X PCIT-ED group	0.30	0.13	5.27	0.0217	.03

[a]Three subjects were excluded from these analyses who were missing all three maternal representation variables

MDD Major Depressive Disorder, *PCIT-ED* Parent–Child Interaction Therapy—Emotion Development, *WL* Waitlist Control Group

example, when baseline Mother Difference scores were 4 (i.e., children's maternal representations were much more positive than negative), children receiving PCIT-ED treatment were 7.62 times more likely than WL participants to lose MDD diagnosis. In contrast, when baseline Mother Difference scores were -1, -2, or -3 (i.e., children's maternal representations were more negative than positive), there was no significant difference in likelihood of loss of MDD

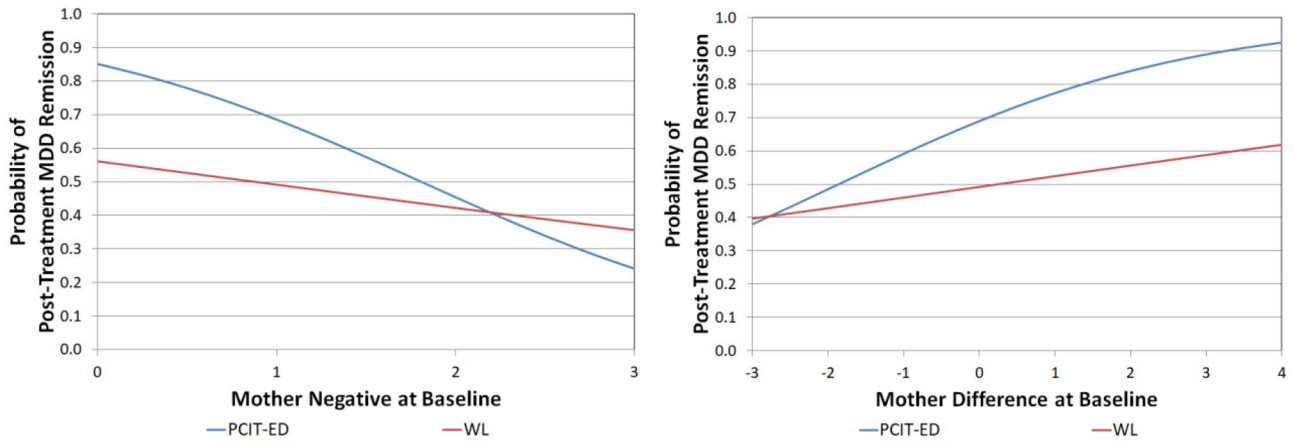

Fig. 1 Interactions Between Pre-treatment Maternal Representations and Treatment Group Predicting Post-treatment Loss of MDD Diagnosis

diagnosis by treatment group (Fig. 1). Both of the significant interactions detailed above were confirmed using an intent-to-treat approach (Table S4, Supplement). Both significant interactions also remained significant when controlling for the effect of both children's comorbid ODD symptom severity and mother's depression severity at baseline (see Tables S5-6, Supplement).

Do Observations of Mothers' Parenting Moderate PCIT-ED Treatment Efficacy?

In contrast, none of the positive or negative observations of mothers' behavior or affect interacted significantly with treatment group to predict odds of post-treatment loss of MDD diagnosis (Table 4). In other words, behaviorally coded observations of mothers' parenting did not moderate PCIT-ED treatment efficacy.

Discussion

The present study investigated the role of positive parenting relationships in moderating the efficacy of PCIT-ED, a parent–child centered psychotherapy for preschool depression. In line with study hypotheses, PCIT-ED treatment predicted children's loss of MDD diagnosis, but only for children who displayed fewer negative maternal representations at a pre-treatment assessment. Similarly, PCIT-ED treatment also predicted loss of MDD diagnosis for children who had relatively more positive (compared to negative) pre-treatment maternal representations. In contrast, neither positive nor negative observed parenting behavior or affect predicted loss of MDD diagnosis. Findings remained significant when accounting for the potential influence of both children's ODD symptoms and mothers' depression symptoms. Overall, findings suggest that children's perceptions

Table 4 Logistic Regression Models of Interactions Between Pre-treatment Parent–Child Interaction (PCI) Observations and Randomization Group Predicting Post-treatment Loss of MDD Diagnosis ($N = 183$[a])

	Estimate	SE	χ^2	p
Intercept	1.12	1.05	1.14	0.2857
PCIT-ED vs. WL (Group)	1.34	0.24	32.30	< 0.0001
Female	-0.08	0.19	0.19	0.6642
Pre-treatment age	-0.07	0.17	0.18	0.6696
Pre-treatment MDD severity score	-0.12	0.12	0.92	0.3374
Pre-treatment PCI Negative Behavior	-1.42	4.46	0.10	0.7505
Pre-treatment PCI Negative Behavior X Group	-4.67	4.42	1.12	0.2902
Intercept	0.06	2.21	0.00	0.9792
PCIT-ED vs. WL (Group)	-2.16	2.06	1.10	0.2953
Female	-0.08	0.19	0.17	0.6788
Pre-treatment age	-0.07	0.17	0.17	0.6819
Pre-treatment MDD severity score	-0.12	0.12	0.95	0.3294
Pre-treatment PCI Positive Behavior	2.19	4.49	0.24	0.6266
Pre-treatment PCI Positive Behavior X Group	7.17	4.44	2.61	0.1061
Intercept	0.57	1.06	0.30	0.5866
PCIT-ED vs. WL (Group)	1.42	0.23	39.41	< 0.0001
Female	-0.07	0.19	0.12	0.7256
Pre-treatment age	0.01	0.18	0.00	0.9489
Pre-treatment MDD severity score	-0.14	0.13	1.31	0.2525
Pre-treatment PCI Negative Affect	4.12	2.69	2.35	0.1255
Pre-treatment PCI Negative Affect X Group	-4.66	2.66	3.08	0.0790
Intercept	1.72	1.12	2.37	0.1238
PCIT-ED vs. WL (Group)	1.13	0.30	14.29	0.0002
Female	-0.08	0.19	0.16	0.6852
Pre-treatment age	-0.14	0.18	0.63	0.4258
Pre-treatment MDD severity score	-0.11	0.12	0.84	0.3580
Pre-treatment PCI Positive Affect	-1.46	1.20	1.47	0.2247
Pre-treatment PCI Positive Affect X PCIT-ED	0.29	1.15	0.06	0.8025

[a]Two subjects were excluded from these analyses who were missing all four PCI scores

MDD Major Depressive Disorder, Post-treatment 18 weeks after randomization, *PCIT-ED* Parent–Child Interaction Therapy—Emotion Development, *WL* Waitlist Control Group

and internal working models of their mothers play a key role in whether PCIT-ED is efficacious in treating MDD in young children. Moreover, findings suggest that assessing the strength of the parent–child relationship based on the child's perception may be an important clinical indicator of whether PCIT-ED is likely to be effective. It also suggests that efforts to reduce children's negative maternal representations and/or enhance their positive representations prior to treatment onset may be warranted.

In our study, PCIT-ED treatment predicted post-treatment loss of MDD diagnosis among children who displayed maternal representations that were less negative and relatively more positive than negative. Our finding is consistent with prior evidence that more positive parent–child relationships prior to parent–child interventions predicted decreases in disruptive behavior disorders post-treatment (Booker et al., 2019; Dittman et al., 2014; Lavigne et al., 2008; Miller-Slough et al., 2016), and extends these findings by demonstrating that children's pre-treatment maternal representations impact the efficacy of a parent–child treatment for preschool depression. To our knowledge, this study is the first to identify a moderator of treatment for depression prior to adolescence, information that is critical in order to individualize treatment for depressed children (Prins et al., 2015).

Researchers have hypothesized that positive parenting and parent–child relationships might predict better response to treatment for disruptive behavior disorders due to better compatibility between parent expectations and child behavior (Dedousis-Wallace et al., 2020) or a better match between parental characteristics and the particular psychosocial treatment (Booker et al., 2019). Children's relatively more positive maternal representations might moderate efficacy of depression interventions for similar reasons; children's positive maternal representations may be conveying important information about their mother's personal characteristics that make them well-suited for PCIT-ED treatment. Interestingly, whereas children's maternal representations moderated treatment outcomes, observed parenting, both in the form of parenting behaviors and affective displays, did not. Given that children's maternal representations in narrative tasks are thought to reflect children's internal models of their relationship with their own mother (Bretherton & Oppenheim, 2003), these representations may impact how open children are to the novel parent strategies instilled during treatment. Because treatments like PCIT-ED depend so heavily on the parent–child relationship to improve child symptoms, children's maternal representations may be particularly crucial for maximizing children's receptiveness to maternal input during this treatment, perhaps similar to the importance of rapport in other forms of therapy. Specifically, adequately positive perceptions of parents might be particularly important for the efficacy of PCIT-ED because it teaches the parent to scaffold their child's experience and regulation of emotions, and positive maternal perceptions might be necessary in order for the child to be receptive to and trusting of their mother as this emotional facilitator. Our finding that children's representations and not mother's observed behaviors predicted loss of MDD diagnosis suggests that a greater focus on children's representations of their mother and the mother–child relationship, rather than focusing on parenting styles, is warranted when determining the right course of treatment for a given parent–child dyad. For instance, children may need to already have relatively positive maternal representations prior to treatment in order to optimally benefit from PCIT-ED which is a treatment that relies on the caregiver to serve as the "arm of the therapist." Future studies should test whether positive maternal representations are particularly influential to treatments for childhood depression compared to other disorders and should examine additional possible moderators of treatments for childhood depression including PCIT-ED in order to guide individualized treatment recommendations for families.

Further, our finding that PCIT-ED treatment predicted loss of depression diagnosis for children who displayed fewer negative and relatively more positive than negative maternal representations before the start of treatment is consistent with work showing that a client's relationship with their therapist (i.e., therapeutic alliance) moderates treatment outcomes (Horvath & Symonds, 1991; Martin et al., 2000). Prior researchers have posited that within behavioral treatments, the therapeutic alliance is critical because it increases treatment collaboration and motivation (Kendall, 1991). Although this work has largely focused on adults, meta-analytic work in children and adolescents has also found that a more positive therapeutic alliance was associated with better treatment outcomes (Shirk & Karver, 2003). PCIT-ED treatment is delivered primarily through the parent–child relationship rather than direct interactions with the therapist, and thus the parent's role in improving child symptoms through PCIT-ED is similar to the role of a therapist in other types of treatments. To further build on this work, future studies should examine how children's maternal representations interact with other parent and child characteristics, such as maternal psychopathology and parent–child relationship quality, to predict treatment outcomes.

Our findings have important implications for guiding clinicians' treatment recommendations for preschoolers with depression. For example, our findings suggest that, compared to children with more negative maternal representations at baseline, children with relatively greater positive maternal representations prior to treatment initiation may be more likely to benefit from PCIT-ED to alleviate depression. Future studies should examine conditions under which children with more negative maternal representations at baseline may derive the most benefit from PCIT-ED. For example, in

order for PCIT-ED to be most effective, these children may need more targeted, intensive work directly with a therapist to decrease their negative maternal representations *prior* to initiating PCIT-ED, or these children may require a different "dose" of PCIT-ED (e.g., longer treatment duration or additional CDI sessions to strengthen the parent–child relationship). While our study cannot say for certain which may be the best approach, it does suggest that a careful consideration of children's maternal representations and the factors influencing these representations are needed in order to make the most appropriate treatment recommendation. Further, although PCIT-ED is currently the only empirically supported treatment for depression in the preschool period, as alternative treatment options are tested and become available, our study findings might aid clinicians in determining which treatments may be most beneficial to specific patients.

There are at least three limitations of this study. First, as the vast majority of caregivers in our sample who completed PCIT-ED were mothers, this study examined mother–child dyads only. As the proposed mechanism for treatment moderation concerns the relationship between the parent-as-"arm of therapist" and the child, that is not necessarily problematic for the study conclusions. However, whether findings extend to children's representations of fathers or other caregivers is unknown. Second, the duration of negative parenting affect observed in the parent–child interaction tasks was low. Although these tasks are designed to elicit frustration, parents and children are aware they are being videotaped and may therefore be on their 'best behavior.' Thus, we regard these interactions as only a small window of what is actually occurring in the home environment. Third, the majority of participants were White and from middle class backgrounds. As there is a stronger discordance between parent and child reports of parenting in adolescence from ethnic minority (vs. White) and lower socioeconomic backgrounds (e.g.,, children's maternal representations might be a particularly important moderator of treatment outcome for children from minority backgrounds. Future studies should include more children from diverse racial and socioeconomic backgrounds and should examine the role of cultural differences in parenting on treatment efficacy.

In sum, our study found that PCIT-ED treatment, a parent–child interaction therapy for the treatment of preschool depression, predicted loss of depression diagnosis for children who displayed fewer negative, and relatively more positive compared to negative representations of their mothers prior to the intervention. This finding suggests that children's maternal representations are an important moderator of PCIT-ED treatment efficacy that should be considered by clinicians when referring depressed preschoolers to psychotherapeutic treatments. This study also identifies children's maternal representations as a potentially important target of intervention prior to more focused treatment for preschool-onset MDD.

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Compliance with ethical standards

Research Involving Human Participants and Informed Consent Study procedures were pre-approved by the Washington University School of Medicine IRB. Informed consent and assent was obtained from parents and children, respectively.

Conflict of Interest The authors report no conflicts of interest.

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