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ORIGINAL CONTRIBUTION

Sustained remission of child depression despite drift in parent emotion management skills 18 weeks following Parent Child Interaction Therapy: emotion development

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Abstract

Whether effects of psychotherapies for depression are sustained after treatment is an important clinical issue. In older depressed children and adolescents such treatments have been shown to be sustained for several months. Rates of remission ranged from 62–69% at 3 months–1 year in one large scale study. To date there has been no data to inform whether the effects of earlier interventions for depression in the preschool period are sustained. To address this, we used data from a randomized controlled trial of a novel early intervention for depression called "Parent Child Interaction Therapy Emotion Development" (PCIT-ED) that has shown efficacy for depression, parenting stress and parenting practices. Participants and their caregivers were re-assessed 18 weeks after treatment completion. All study procedures were approved by the Washington University School of Medicine Internal Review Board prior to data collection. Study findings demonstrated a high rate of sustained gains in remission from depression, decreased parenting stress and parental depression 18 weeks after completion of a trial of PCIT-ED in a population of young children. Parental response to the child expression of emotion, a key treatment target drifted back towards baseline after 3 months. Relapse rates were 17% and predictors of relapse were the presence of an externalizing disorder, a higher number of co-morbid disorders and poorer guilt reparation and emotion regulation measured at treatment completion. This extends the body of literature demonstrating parent–child interaction therapy (PCIT) to have sustained effects on targeted disruptive symptom profiles to early childhood depression. This relatively low relapse rate after 18 weeks is comparable or better than many empirically proven treatments for depression in older children.

Keywords Child psychopathology · Childhood depression · PCIT · Parenting

Introduction

Randomized controlled trials (RCTs) and subsequent meta-analyses have established the efficacy of psychotherapies for depression in older children and adolescents. Most recently, a moderate effect size of 0.30 across all RCTs of psychotherapies for depression in children ages 4-to 18 was found in a meta-analysis [1]. An earlier meta-analysis of treatments for depression in children documented a similar effect size of 0.34, with no significant difference in effects of cognitive behavioral therapies (CBTs) compared to other psychotherapeutic treatments [2]. Interestingly, Forti-Buratti et al. [3] found no significant effect of existing treatments for depression compared to no treatment in children age 12 and younger, although the analysis was limited by the fact that very few treatment studies of preadolescent children had been conducted at the time of review.

Studies have also documented that the effects of evidence-based therapies for depression in older children and adolescents are in general sustained for at least several months after treatment completion. Weisz et al. [2] found that treatment effects were maintained at 2-to 3-months following treatment, but not 1 year post-treatment or later. A more recent meta-analysis found evidence of durability of CBTs

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for depression as indexed by retained or increased effect size magnitudes across follow-up assessments conducted 1, 3, 6, and 12 months post-treatment [4]. However, 90% of the groups used non-blind evaluator-assessed outcomes at the 12 month assessment, which likely inflated effect sizes at this time point. Follow-up analyses of the Treatment for Adolescents with Depression Study (TADS) revealed that 64% of participants randomly assigned to receive CBT achieved remission post-treatment, and rates of remission at 3, 6, 9, and 12 months post-treatment ranged from 62–69% [5]. One of the only known treatment studies that included children younger than 12 that also included follow-up assessments found that 76% of children aged 9–15 that received family therapy achieved remission post-treatment, which was sustained at a rate of 81.1% after 6 months [6]. Together, this body of work suggests that effects of evidence-based treatments for depression in older children and adolescents persist many months after treatment is completed, with findings mixed as to whether gains persist at 1-year post-treatment or later.

Yet, high recurrence rates have been documented even for efficacious treatments. For instance, 30% of TADS participants in the CBT group relapsed at some point during the 1-year follow-up period [5]. Other studies of evidence-based treatments have found similar recurrence rates ranging from 22–39% within 1-to 2-years post-treatment [7–9]. Evidence in adults suggests that there are few consistent predictors of recurrence following treatment. The number of prior depressive episodes and presence of residual symptoms post-treatment have emerged as the most consistent predictors of relapse in adults [10]. In older children and adolescents, studies have documented some potential predictors of relapse including female gender, the presence of an anxiety disorder, greater suicidal ideation, and greater self-reported parent–child conflict at the end of treatment [7, 11]. Other factors such as lower socioeconomic status and lower self-efficacy have been found to predict late recurrence, at 4 years post-treatment [12].

Based on the sobering effect sizes of psychotherapeutic treatments for childhood depression and their high recurrence rates, we designed and tested an earlier intervention for depression in the preschool period: Parent–Child Interaction Therapy Emotion Development (PCIT-ED). PCIT-ED represents an adaptation of the empirically proven and widely used standard PCIT [13]. In previous work (Luby et al. [22]) we demonstrated that children who completed an 18-week trial of PCIT-ED as compared to a wait list control exhibited lower rates of depression diagnoses and severity and lower impairment compared to those in the wait list condition (Cohen's $d > 1.0$). Measures of child emotional functioning, including less emotional liability, better emotion regulation and better guilt reparation were also significantly improved. Further, parental characteristics also improved in the PCIT-ED treatment group. Parents' own depression and parenting stress decreased while adaptive parenting practices, including those in response to the child's expression of emotion, such as emotion reflection and processing, increased. However, we do not yet know whether these benefits of PCIT-ED in terms of child or parent depression and/or behavior are sustained after treatment has been completed.

In support of the possibility that PCIT-ED treatment gains might be sustained, meta-analytic findings indicate that standard PCIT demonstrates large effect sizes for the treatment of disruptive disorders as well as decreased parenting stress [14, 15]. Further, treatment-related gains in child externalizing and disruptive presentations have been shown to persist across 3, 6, and 12 months and up to six years following completion of PCIT treatment, demonstrating the impressive long-term effects of this early intervention [16–19]. Moreover, one study demonstrated that 3–6 years following treatment, improvements in child disruptive behaviors were not only maintained, but showed continued progress over time [17]. Further, parent-related stress, child-related stress, and maternal locus of control have consistently demonstrated sustained gains at follow-up [17, 19, 20], with some support indicating that adaptive observed parenting practices also persist [16]. Adaptations of PCIT for early childhood anxiety similarly show evidence of sustained gains at 3 months follow-up in small scale trials [21]. Taken together, there is strong evidence that the effects of PCIT and some adaptations are long-lasting and sustained. However, it is unknown whether PCIT adapted for depression (PCIT-ED) demonstrates similar treatment-related gains in child depressive symptoms, parenting stress, and/or parenting styles in the months after treatment completion.

The goal of the current work was to investigate whether response to PCIT-ED administered to children between the ages of 3–7 and their primary caregivers was sustained 18 weeks after treatment completion. To our knowledge, PCIT-ED is the first and only developmentally appropriate psychotherapy designed for the treatment of depression during the preschool period that has been empirically tested in a large scale RCT. As noted above, when compared to a wait list control condition, the treatment showed efficacy and large effect sizes [22]. The novel Emotion Development (ED) module was designed to modify parenting response to the child's emotional expression and was effective in making parents more emotionally validating, tolerant and encouraging of their child's expression of emotion. Based on this, we tested whether child outcomes of remission from depression and improved adaptive function were sustained over time, as well as whether improvements in child emotion regulation were sustained, given that this was directly targeted by the ED module. In addition, we examined whether improvements in parental depression were sustained. Further, we also examine whether improvements in parenting practices,

particularly parental management of the child's intense emotions directly targeted by the ED module, were also sustained at the 18-week follow-up.

Methods

PCIT-ED study methods are detailed in Luby et al. [22]. Children were recruited from preschools, primary care sites and mental health clinics in the St. Louis metropolitan area using the Preschool Feelings Checklist (PFC) to screen for early childhood depression. Those with elevated PFC scores without co-morbid Autism Spectrum Disorder or neurological disorders were invited to the lab for a comprehensive in-person assessment that included the Kiddie-Schedule for Affective Disorders and Schizophrenia-Early Childhood Version (K-SADS-EC) [23]. $N = 229$ children meeting all inclusion/exclusion criteria who were not on antidepressant medications or currently in active psychotherapy were randomized to either the active PCIT-ED treatment immediately or to a wait list (WL) control condition for 18 weeks, after which they received the active treatment. Comprehensive assessments by raters blind to treatment group were completed after PCIT-ED (or 18 weeks post-randomization in WL subjects) which we refer to as "post 1" and again 18 weeks after treatment completion or "post 2" (see Fig. 1). However, only those randomized to PCIT-ED first underwent another assessment 18 weeks after therapy completion at post 2 and thus are the only children included in the present analyses.

Overview of PCIT-ED

PCIT-ED consists of child-directed interaction (CDI) and parent-directed interaction (PDI) limited to 6 sessions each. The novel ED module follows CDI and PDI and is conducted over 8 sessions. The ED module utilizes the standard PCIT teach and coach and bug in the ear methods to address parental response to the child's expression of intense and/or dysregulated emotion. Live in vivo stressors designed to induce frustration, guilt, and sadness are utilized, and the parent is coached by the therapist while responding to the child during a "hot" emotional episode. The ED module teaches the caregiver to validate the child's emotion, aid children's emotion understanding (e.g., help them to label emotions), and teach the child adaptive emotion regulation strategies (e.g., use prosocial behaviors to alleviate guilt). Homework designed to practice emotion skills is also administered (similar to homework occurring during CDI and PDI).

Measures

Comprehensive assessments were conducted at baseline, post 1, and post 2. The assessments included parent reports of child psychopathology including several measures of depression, parental depression, and parenting styles as well as therapist ratings of parental behaviors related to goals of PCIT-ED and coded during observation of parent–child play interactions at these intervals.

Child psychopathology

Kiddie-Schedule for Affective Disorders and Schizophrenia-Early Childhood (K-SADS-EC) [23] This is a developmentally adapted version of the widely used and well-validated K-SADS. The K-SADS-EC assesses age appropriate manifestations of Axis I disorders that arise during the preschool period. It has good psychometric properties [23]. All K-SADS-EC interviews were conducted by master's-level clinicians and were videotaped, reviewed for reliability, and calibrated for accuracy of diagnosis in consensus case conferences. Satisfactory interrater reliability was established before the study started, and kappa values during the study were computed on a monthly basis; the overall kappa value during the study period was 0.74 for major depression and 0.88 for all diagnoses. Depression severity was examined using major depressive disorder (MDD) core severity score,

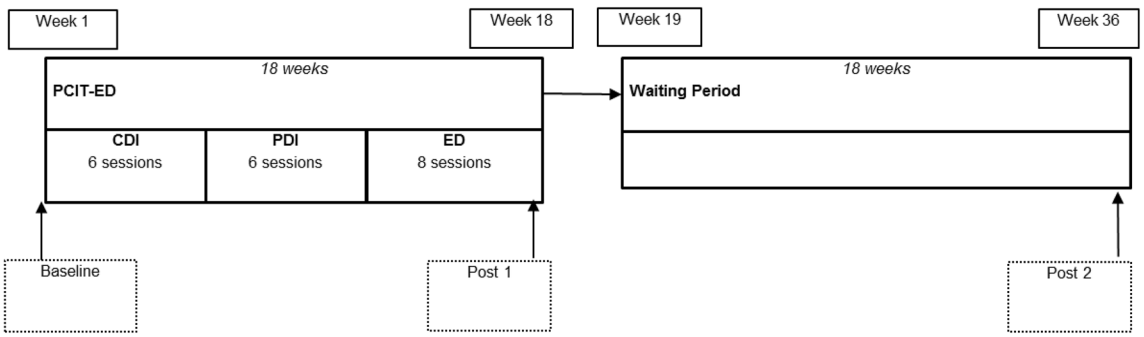

Fig. 1 Assessment timetable for subjects randomized to treatment first

which was the sum of core symptoms of depression for which a child met criteria.

Child behavior checklist (CBCL) [24] The caregivers of all children completed the CBCL at baseline, post 1, and post 2. This widely used and well-validated measure assesses internalizing (including subscales of depressive and anxiety symptoms) and externalizing behavioral problems using age-based norms. A dysregulation subscale has also been derived from this measure and was used in the analyses below [24].

Eyberg child behavior inventory (ECBI) The ECBI is a 36-item parent report of the child's behavioral functioning completed at each therapy session [25]. ECBI data collected at baseline (session 1) and post 1 (session 19) were included in the analyses. The measure has high reliability and validity across age and socioeconomic status and has been shown to be a sensitive measure of PCIT treatment response [26].

The Preschool feelings checklist (PFC) The PFC is a validated screener used to identify children at high risk for MDD. The PFC-Scale, a 23-item Likert scale, adapted from the PFC screener, was administered at baseline, post 1, and post 2 to measure depression severity via caregiver report [27].

Child adaptive function

Children's Global Assessment Scale (CGAS) This measures children's global level of impairment and it was completed by the clinician-rater at baseline, post 1, and post 2 [28].

Clinical Global Impressions improvement scale (CGI-I) This is a 7-point Likert scale used in treatment research in which the blind clinician rates their impression of improvement based on the clinical interview [29]. This was completed at post 1 and post 2.

Preschool and Early Childhood Functional Assessment Scale/Child and Adolescent Functional Assessment Scale (PECFAS/CAFAS) This is a semi-structured measure of functioning rated by a clinician with previously established reliability that assess the child's psychosocial functioning and impairment based on parent report of the child's functioning from the K-SADS-EC [30, 31].

Child emotional functioning

Emotion Regulation Checklist (ERC) This is a caregiver-report measure of children's self-regulation that targets affective lability, intensity, valence, and flexibility and includes both positively and negatively weighted items on a Likert scale [32]. The ERC was administered at baseline, post 1, and post 2.

My child This a widely used caregiver-report measure with established validity and reliability [33]. The guilt feelings scale assesses the child's tendency to experience maladaptive (e.g., excessive) guilt, and the guilt reparation scale assesses the extent to which children use reparative prosocial behaviors (e.g., apologizing) to address these feelings. The My Child was administered at baseline, post 1, and post 2.

Parenting and parental depression/stress

Dyadic Parent Child Interaction Coding System (DPICS) This is a measure of parent–child relationship functioning along the lines of domains targeted in PCIT (e.g. CDI, PDI etc.) It was rated by trained study therapists (who were not blind) who achieved reliability during formal PCIT training completed prior to the study onset. It is based on observation of free play [34] and was coded at baseline, post 1, and post 2.

Coping With Children's Negative Emotions Scale (CCNES) The CCNES is a valid and reliable caregiver-report measure consisting of six subscales that reflect different ways parents cope and use strategies in response to children's expressions of negative emotion such as anger, sadness, and fear [35]. This measure assesses the use of minimization of emotions and the use of distraction during intense negative emotions, two commonly used parenting strategies deemed maladaptive, and which PCIT-ED was designed to change. The CCNES was completed at baseline, post 1, and post 2.

Parenting Style Questionnaire (PSQ) This is a widely used and well-validated scale that assesses parenting style across the following domains: dismissing, disapproving, laissez-faire, and emotion coaching [36]. The PSQ was administered at baseline, post 1, and post 2.

Parenting Style and Dimension Questionnaire (PSDQ) This is a widely used scale that assesses global parenting style based on the original Baumrind definitions of authoritative, authoritarian, and permissive parenting [36]. The PSDQ was administered at baseline, post 1, and post 2.

Beck Depression Inventory–II (BDI-II) This is a widely used, reliable and valid self-report measure that assesses severity of depression in caregivers over the previous 2 weeks [37]. This was completed at baseline, post 1, and post 2.

Parenting Stress Index (PSI) The PSI is a reliable and valid caregiver-report measure designed to assess the magnitude

of stress within the parent–child dyad. This measure focuses on three major domains of stress: child characteristics, parent characteristics, and situational life stress and was completed at baseline, post 1, and post 2 [38].

Analysis

Children randomized to PCIT-ED first who completed both post 1 and post 2 assessments were compared on the measures described above at the two time points to determine if results of the PCIT-ED therapy were sustained 18 weeks after therapy ended. Comparisons of continuous measures were made using paired *t* tests, and comparisons of dichotomous measures were made using McNemar's tests.

Potential predictors of MDD diagnosis at post 2 in children randomized to PCIT-ED who no longer met criteria for MDD at post 1 were assessed using logistic regression.

Multiple comparisons were accounted for using FDR correction for each set of analyses: demographics, child psychopathology, emotion regulation/understanding and guilt, maternal depression/stress, CCNES, parenting, DPICS, and ECBI. Within each set of analyses, false discovery rate (FDR) correction was applied separately to potential predictors assessed at baseline, at post 1, and change from baseline to post 1.

Results

Table 1 shows demographic characteristics of the $n=79$ subjects randomized to PCIT-ED first who completed both post 1 and post 2 assessments. The post 2 assessment occurred mean (SD) 19.93 (2.77) weeks after post 1. See Supplemental Table 1 showing no demographic differences between completers and non-completers with the exception of income-to-needs.

Post 1 and Post 2 comparisons

Child depression and co-morbid psychopathology

Table 2 shows means and standard deviations of all variables for baseline (pre-treatment), post 1 (post-treatment) and post 2 (18-week follow-up), as well as the statistics for the comparison of post 1 and post 2 (baseline to post 1 previously published, see [39]). Of the $N=79$ children, $n=53$ (67.1%) did not have MDD at either the post 1 or post 2 assessment (sustained recovery), $n=12$ (15.2%) had MDD at both the post 1 and post 2 assessments (sustained non-response), $n=3$ (3.8%) had MDD at post 1 but not post 2 (delayed recovery), and $n=11$ (13.9%) had MDD at post 2 but not post 1 (recurrence). Remission rates defined by no MDD at post 2 and $\geq 50\%$ reduction in MDD core severity score/PFC-Scale score were 69.6% (MDD core: clinician rated) and 46.2% (PFC-Scale: parent rated). The post 2 relapse rate for children who had recovered from MDD at post 1 was 17%.

As shown in Table 2, the rate of MDD was greater at post 2 than post 1, although this did not hold up to FDR correction. The rates of co-morbid disorders as assessed by the KSADS-EC including mania/hypomania, internalizing disorders, externalizing disorders, attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD) did not differ at the two time points. Severity as defined by MDD severity core score, PFC-Scale score, CGAS score, and PECFAS/CAFAS score did not significantly differ at post 1 and post 2. Clinician-rated improvement as assessed by the CGI, however, was

Table 1 Demographic characteristics of subjects randomized to PCIT-ED who completed post 1 and post 2 assessments ($N=79$)

	Mean	SD
Post 1 age	5.57	0.96
Post 2 age	5.95	0.97
Post 1 income-to-needs ratio	3.39	1.11
Post 2 income-to-needs ratio	3.32	1.09
Weeks between post 1 and post 2	19.93	2.77
	%	*N*
Male gender	65.8	52
Hispanic ethnicity	12.7	10
Race		
Caucasian	83.5	66
African–American	6.3	5
Asian	1.3	1
More than one race	8.9	7

Table 2 Comparisons of Scores on child-focused measures at post 1 vs. post 2 assessments in subjects randomized to PCIT-ED who completed post 1 and post 2 assessments ($N=79$)

	Baseline		Post 1		Post 2		Post 1 vs. post 2		
	%	*N*	%	*N*	%	*N*	χ^2	*p*	FDR *p*
Disorders									
MDD	100.0	79	19.0	15	29.1	23	4.57	0.0325	0.2956
Mania/hypomania	1.3	1	0.0	0	0.0	0	–	–	–
Internalizing disorder	43.0	34	7.7	6	10.3	8	0.67	0.4142	0.5621
Externalizing disorder	55.7	44	19.2	15	18.0	14	0.11	0.7389	0.8409
ADHD	22.8	18	9.0	7	11.5	9	0.67	0.4142	0.5621
ODD	48.1	38	11.5	9	11.5	9	0.00	1.0000	1.0000
CD	2.5	2	0.0	0	0.0	0	–	–	–
Co-morbid disorders	Mean	SD	Mean	SD	Mean	SD	*t*	*p*	FDR *p*
Number of co-morbid disorders	1.36	1.15	0.28	0.51	0.40	0.76	1.53	0.1290	0.3064
Severity									
MDD severity core score	5.52	1.53	1.59	1.68	1.82	1.70	1.40	0.1664	0.3162
PFC-Scale total score	37.90	9.51	18.56	9.68	20.21	10.57	1.95	0.0552	0.2956
CGAS score	44.81	6.85	78.58	16.53	76.47	18.75	− 1.31	0.1942	0.3354
PECFAS/CAFAS total score	11.53	3.68	4.42	2.92	5.13	4.43	1.80	0.0755	0.2956
CGI-Improvement	–	–	2.03	0.86	3.04	1.23	6.03	< 0.0001	< 0.0001
CBCL									
Depression T-score	68.18	8.35	56.04	6.13	55.83	6.89	0.35	0.7268	0.8409
Anxiety T-score	64.36	11.54	55.86	7.43	56.04	7.70	− 0.26	0.7966	0.8409
Internalizing T-score	66.09	7.79	53.19	9.48	52.22	10.85	1.22	0.2246	0.3556
Externalizing T-score	64.14	10.51	51.43	10.71	52.73	11.61	− 1.63	0.1073	0.2956
Dysregulation profile score	190.3	20.3	165.3	15.3	167.4	17.6	− 1.62	0.1089	0.2956
ERC									
Liability/negativity	36.97	6.40	28.37	6.23	28.96	7.04	1.09	0.2770	0.3925
Emotion regulation	23.45	3.50	26.97	3.22	26.67	3.68	− 0.99	0.3271	0.3925
Emotion understanding									
Verbal	1.68	0.29	1.80	0.24	1.85	0.14	1.92	0.0584	0.1752
Non-verbal	1.76	0.23	1.82	0.24	1.89	0.14	2.59	0.0116	0.0696
My child									
Guilt reparation	24.53	4.96	27.93	5.07	27.68	5.13	− 0.68	0.5005	0.5005
Guilt feelings	17.86	2.66	17.32	2.52	17.13	2.60	− 1.00	0.3224	0.3925

significantly greater at post 2, indicating less improvement at post 2. CBCL depression, anxiety, internalizing, and externalizing T-scores and the CBCL dysregulation profile score did not differ significantly at the two time points.

Emotion regulation, emotion understanding, and guilt

Also detailed in Table 2, the children's lability/negativity and emotion regulation as assessed by the ERC did not differ significantly at post 1 and post 2. Scores on the verbal and non-verbal subscales of emotion understanding were even better at post 2, but these results did not hold up to FDR correction. Guilt reparation and guilt feelings composite scores on the My Child did not differ significantly at post 1 and post 2.

Maternal depression and stress

Maternal depression severity as measured by the BDI-II did not differ significantly at post 1 and post 2 (Table 3). Similarly, maternal stress as measured by the PSI subscales did not differ significantly at the two time points (Table 3).

Coping with children's negative emotions scale (CCNES)

As shown in Table 3, all subscales of the CCNES except problem-focused reactions were significantly different at post 1 and post 2. Distress reactions, punitive reactions, and minimization reactions (all negative forms of parenting) were greater at post 2 compared to post 1 (but still lower than baseline), and consistent with this, expressive

Table 3 Comparisons of scores on parent-focused measures at post 1 vs. post 2 assessments in subjects randomized to PCIT-ED who completed post 1 and post 2 assessments ($N=79$)

	Baseline		Post 1		Post 2		Post 1 vs. post 2		
	Mean	SD	Mean	SD	Mean	SD	*t*	*p*	FDR *p*
Maternal depression									
BDI-II total score	10.19	7.76	6.14	7.47	6.04	8.37	− 0.21	0.8332	0.8795
PSI									
Distractibility/hyperactivity	26.29	6.68	20.86	6.31	21.28	6.53	1.18	0.2400	0.5897
Adaptability	31.95	5.42	24.83	5.61	24.96	6.27	0.33	0.7437	0.8795
Reinforces parent	12.45	4.10	9.08	2.79	9.39	3.02	1.20	0.2337	0.5897
Demandingness	28.67	5.60	21.30	6.64	21.79	7.62	1.09	0.2809	0.5897
Mood	18.79	3.26	14.25	4.04	13.92	4.12	− 1.04	0.3027	0.5897
Acceptability	14.87	3.36	11.14	2.87	11.39	3.15	1.03	0.3066	0.5897
Child Domain	133.03	18.07	101.46	22.46	102.74	25.26	0.95	0.3463	0.5897
Competence	30.71	6.58	26.07	6.95	25.53	6.74	− 1.31	0.1956	0.5897
Isolation	13.96	4.55	12.61	4.29	12.29	4.01	− 0.86	0.3949	0.5897
Attachment	12.74	3.41	10.95	3.42	11.24	3.31	1.02	0.3123	0.5897
Health	11.24	3.72	10.62	3.72	10.16	3.41	− 1.45	0.1512	0.5897
Role restriction	18.78	5.29	17.61	4.96	17.41	4.94	− 0.56	0.5766	0.7825
Depression	21.86	6.23	18.91	5.89	18.74	5.92	− 0.43	0.6693	0.8478
Spouse	18.28	6.05	17.26	6.68	16.72	7.00	− 1.29	0.1997	0.5897
Life stress	7.89	9.39	4.82	7.87	4.74	6.26	− 0.11	0.9100	0.9100
Parent domain	127.55	25.85	114.01	27.45	112.08	26.07	− 1.26	0.2129	0.5897
Total stress	260.57	36.72	215.47	44.99	214.82	46.80	− 0.26	0.7918	0.8795
Defensive responding	38.00	9.37	33.67	9.52	33.17	9.11	− 0.84	0.4035	0.5897
CCNES									
Distress reactions	2.83	0.69	2.30	0.66	2.46	0.69	2.31	0.0235	0.0282
Punitive reactions	2.25	0.69	1.56	0.60	1.70	0.50	2.70	0.0086	0.0129
Expressive encouragement	5.13	0.96	6.09	0.83	5.85	0.89	− 3.48	0.0008	0.0048
Emotion-focused reactions	5.65	0.83	5.35	1.08	5.56	1.01	2.95	0.0042	0.0084
Problem-focused reactions	5.93	0.65	6.23	0.66	6.17	0.78	− 1.01	0.3178	0.3178
Minimization reactions	2.24	0.84	1.61	0.62	1.76	0.61	3.24	0.0018	0.0054
PSQ									
Dismissing	10.16	3.46	6.61	3.13	7.24	3.42	2.04	0.0447	0.1006
Disapproving	6.32	3.91	3.32	3.46	2.99	3.20	− 1.78	0.0792	0.1426
Laissez-Faire	6.38	1.30	5.49	0.96	5.66	1.11	1.29	0.2022	0.2800
Emotion coaching	18.45	2.14	19.58	2.15	19.80	2.26	1.13	0.2640	0.3317
PSDQ									
Authoritative parenting	106.46	9.54	110.42	9.81	109.51	9.86	− 1.40	0.1657	0.2711
Warmth and involvement	47.11	3.74	48.89	3.87	48.25	4.05	− 1.89	0.0630	0.1260
Reasoning/induction	28.03	3.65	28.72	3.65	28.63	3.66	− 0.29	0.7702	0.8155
Democratic participation	16.07	3.06	16.84	2.66	16.87	3.03	0.09	0.9255	0.9255
Good natured/easygoing	15.26	1.84	15.96	1.84	15.76	1.95	− 1.29	0.2020	0.2800
Authoritarian parenting	38.99	5.97	32.68	5.28	34.22	5.55	3.86	0.0002	0.0036
Verbal hostility	9.50	2.10	7.75	1.71	8.17	1.80	2.85	0.0057	0.0342
Corporal punishment	9.22	1.73	7.74	1.31	8.07	1.27	2.36	0.0209	0.0720
Non-reasoning	9.72	2.31	8.59	1.93	8.91	2.09	2.09	0.0402	0.1006
Directiveness	10.54	2.35	8.61	1.88	9.08	2.15	2.44	0.0171	0.0720
Permissive parenting	31.84	5.32	27.89	5.04	28.34	5.12	1.10	0.2764	0.3317
Lack of follow-through	12.51	2.64	10.76	2.62	11.54	2.83	3.35	0.0012	0.0108
Ignoring misbehavior	7.34	1.84	7.79	2.01	7.32	1.63	− 2.30	0.0240	0.0720

Table 3 (continued)

	Baseline		Post 1		Post 2		Post 1 vs. post 2		
	Mean	SD	Mean	SD	Mean	SD	*t*	*p*	FDR *p*
Self-confidence	11.99	2.70	9.34	2.53	9.49	2.41	0.74	0.4589	0.5163
DPICS									
DPICS CLP N positive behaviors	28.92	11.56	46.56	15.40	46.29	15.98	− 0.17	0.8631	0.9416
DPICS CLP N negative behaviors	21.88	10.70	6.59	6.80	7.62	7.05	1.38	0.1710	0.4104
DPICS PLP N positive behaviors	35.53	11.70	42.80	13.44	41.05	15.07	− 0.94	0.3492	0.5986
DPICS PLP N negative behaviors	33.07	15.08	14.24	9.07	15.38	9.79	1.04	0.3005	0.5986
PDI PLP N commands	7.14	4.92	4.70	3.63	5.15	4.53	0.82	0.4156	0.6234
PDI PLP child's response	2.97	2.49	2.30	1.75	3.14	3.17	1.83	0.0743	0.4104
PDI PLP child compliance	0.72	0.35	0.77	0.35	0.75	0.37	− 0.31	0.7580	0.9096
DPICS CU N positive behaviors	29.45	11.81	22.11	15.60	22.00	17.18	− 0.06	0.9548	0.9548
DPICS CU N negative behaviors	24.19	11.52	11.91	10.33	10.26	7.53	− 1.59	0.1163	0.4104
PDI CU N commands	7.34	4.29	5.32	5.30	3.69	3.29	− 3.04	0.0032	0.0384
PDI CU child's response	2.90	2.28	2.71	2.19	2.49	2.49	− 0.68	0.4963	0.6617
PDI CU child compliance	0.67	0.36	0.70	0.33	0.88	0.91	1.41	0.1629	0.4104

CLP child-led play, *PLP* parent-led play, *CU* clean up

encouragement (positive parenting skill) was lower at post 2 compared to post 1 (but still higher than baseline). One exception to this pattern was that one form of positive parenting, emotion-focused reactions, was greater at post 2.

Parenting style

The dismissing subscale of the PSQ had higher scores at post 2, but this difference was not significant after FDR correction (Table 3). No other PSQ subscales differed at the two time points. Scores on authoritarian parenting and its verbal hostility subscale on the PSDQ were significantly greater at post 2 than at post 1, and while PSDQ permissive parenting did not differ significantly at post 1 and post 2, its lack of follow-through subscale did (Table 3). PSDQ authoritative parenting and its subscales did not differ significantly at post 1 and post 2.

Dyadic parent–child interaction coding system (DPCIS)

The only DPICS measure that differed significantly at post 1 and post 2 was the number of direct and indirect commands used during the PDI Clean-up task, which was significantly greater at post 1, indicating some decrease in use of PDI skills.

Predictors of post 2 MDD relapse in subjects remitted at post 1

There were $n = 64$ subjects without a diagnosis of MDD at the post 1 assessment. Of these, $n = 11$ had a recurrence of MDD at the post 2 assessment. Potential predictors of MDD at post 2 that were investigated were baseline and post 1 values and change scores from baseline to post 1 on all of the measures described above. Of these, only those presented in Table 4 significantly predicted a diagnosis of MDD at post 2 after FDR correction. Predictors included post 1 externalizing disorder, greater number of post 1 co-morbid disorders, greater internalizing, externalizing, depression, and anxiety severity at post 1, and greater overall impairment at post 1. Notable findings also included lower levels of guilt reparation and higher emotion dysregulation at post 1. Of note, neither change in CCNES scores during treatment or CCNES scores after treatment completion significantly predicted MDD relapse at post 2.

Discussion

Study findings demonstrate a high rate of sustained gains in remission from depression 18 weeks after completion of an 18-week trial of PCIT-ED in a population of young children. Further significant decreases in parental depression and parenting stress were also sustained. This extends the body of literature demonstrating PCIT to have sustained effects on targeted disruptive symptom profiles to early childhood depression [14, 17]. This relatively low relapse rate after 18 weeks is comparable or better than many empirically proven treatments for depression in older children. Notably, predictors of relapse were the presence of an externalizing disorder at post 1, a higher number of co-morbid disorders and poorer guilt reparation and emotion regulation at post 1. Other predictors that were identified that might be seen as early indicators of relapse (or incomplete remission)

Table 4 Predictors of relapse (post 2 MDD) in subjects remitted at post 1 ($N=64$)

Disorders	No post 2 MDD (N = 53)		Post 2 MDD (N = 11)		No post 2 MDD vs. post 2 MDD		
	%	*N*	%	*N*	χ^2	*p*	FDR *p*
Post 1 externalizing disorder	7.6	4	36.4	4	5.71	0.0169	0.0317
	No post 2 MDD (N = 53)		Post 2 MDD (N = 11)		No post 2 MDD vs. Post 2 MDD		
	Mean	SD	Mean	SD	χ^2	*p*	FDR *p*
Co-morbid disorders							
Number of post 1 co-morbid disorders	0.11	0.32	0.55	0.69	6.89	0.0087	0.0218
Severity							
Post 1 MDD severity core score	0.77	0.93	1.82	0.75	8.35	0.0039	0.0218
Post 1 PFC-Scale total score	15.72	8.95	22.45	5.82	4.63	0.0314	0.0428
Post 1 CGAS score	86.81	8.59	76.82	12.80	6.94	0.0084	0.0218
Post 1 PECFAS/CAFAS total score	3.20	1.98	5.39	2.00	7.53	0.0061	0.0218
CBCL							
Post 1 depression T-score	53.98	4.87	58.18	6.59	4.88	0.0272	0.0408
Post 1 anxiety T-score	54.25	5.77	60.64	8.51	7.05	0.0079	0.0218
Post 1 internalizing T-score	50.26	8.98	60.18	7.53	7.76	0.0053	0.0218
Post 1 externalizing T-score	48.74	10.32	57.36	9.33	5.41	0.0200	0.0333
Post 1 dysregulation profile score	161.17	13.15	174.00	16.98	6.04	0.0140	0.0300
ERC							
Post 1 emotion regulation	28.11	2.81	24.64	3.41	8.47	0.0036	0.0216
My child							
Post 1 guilt reparation	29.15	4.49	24.74	5.46	6.34	0.0118	0.0354
ECBI							
Change in intensity T-score (BSL to post 1)	− 18.87	6.19	− 11.55	7.12	7.90	0.0050	0.0100

were higher depression severity at post 1 and slower rates of change of global improvement in functioning during the course of treatment. The finding that poor guilt reparation was a predictor might suggest that this should be a more intensive focus of treatment. The finding that a co-morbid externalizing disorder is associated with relapse is well known in older samples [40] and underscores the importance of addressing this domain in depression treatments.

Of particular interest was that although there were relatively sustained gains in child symptoms of depression, the positive changes in parenting strategy relevant to response to the child's expression of intense emotion seen during treatment showed a significant drift back towards baseline levels after the 18-week period. Notably, changes in parental response to the child's expression of intense emotion was a direct and unique target of the ED module. Thus, this finding could suggest that booster sessions on the use of ED skills may be helpful, particularly if this drift in parenting skills is associated with later relapse of child depression symptoms at a later follow-up point. However, of note, maintenance booster sessions in standard PCIT have demonstrated no added benefit to an assessment only follow-up, as gains were maintained regardless of whether booster sessions were added [41]. Our prior work showed that parenting strategies demonstrated greater change across treatment in children randomized to PCIT-ED compared to wait list, but the current analyses found that change in these parenting strategies did not predict relapse. Nonetheless, conducting follow-up check-ins and providing booster sessions as needed to target this domain may prove beneficial to help sustain gains in parental responses to the child's emotional expression.

Limitations of the study are that the follow-up period was short and limited to 18 weeks. A longer period, such as at least 1 year later, would be of interest and clinical importance given that standard PCIT has shown sustained effects over many months and even up to multiple years [17, 19] and that studies are mixed as to whether effects of treatments for depression in older children persist 1 year post-treatment or later [4]. A later follow-up is particularly important given the changes in parental response to the child's expression of intense emotion in this shorter follow-up, behaviors that were a key target of the ED module and thought to be important to ameliorating the child's depression. While these reductions in positive parenting behaviors did not predict relapse at 18 weeks, it is possible that they could predict relapse after longer periods of time. Given that this aspect

of positive parental behavior change was not fully sustained, a later outcome assessment would be particularly important. While we cannot rule out that the sustained improvement are related to the natural course of the disorder, longitudinal studies of preschool onset depression show that is has a relapsing and chronic course similar to the disorder in older children and adolescents and in general does not spontaneously resolve with development [42–44].

Conclusions

Study findings demonstrate sustained gains 18 weeks after completion of an 18-week parent–child psychotherapy for early childhood depression, PCIT-ED. Improvements in parental depression and stress were also maintained, while gains in parental emotion management skills showed drift back towards baseline after 18 weeks. Findings suggest that further booster sessions or other forms of enhancing proficiency may be needed to help parents maintain these emotion management skills deemed key to helping the child maintain optimal emotional well-being. Future investigation of follow-up 1 year or more after treatment are now needed.

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Compliance with ethical standards

Conflict of interest None.

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