



# Initial promise of child-parent psychotherapy in reducing stress and postpartum depression among mothers experiencing homelessness: a feasibility and pilot study

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Received: 27 February 2024 / Accepted: 1 July 2024

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## Abstract

**Purpose** Mothers experiencing homelessness undergo significant stressors in addition to parenting stress, yet the rate and treatment of postpartum depression (PPD) within this population has yet to be explored. We assessed the risk for PPD and examined the changes in PDD and parenting stress following engagement in treatment.

**Methods** Participants included 182 mothers with infants 7 months of age or younger in a shelter setting. After initial assessment of PPD and parenting stress, families participated in Child-Parent Psychotherapy (CPP). Post assessment was then conducted after 16 weeks.

**Results** CPP was successfully implemented with high levels of procedural and content fidelity ( $M=0.99$ ,  $SD=0.04$ ;  $M=0.95$ ,  $SD=0.09$ , respectively), treatment satisfaction (94%;  $M=4.83$ ,  $SD=0.52$ ), and relatively moderate levels of intervention completion (53.8%). Following participation in CPP, mothers reported decreases in parenting stress ( $d=0.51$ ) and continuous PPD symptom severity ( $d=0.43$ ). The proportion of mothers with clinically elevated self-report PPD symptoms also decreased from 15.3 to 6.7% ( $p=.013$ ). Lastly, improvements in total parenting stress predicted improvements in PPD symptom severity ( $B=0.12$ ,  $p<.001$ ).

**Conclusions** The findings highlight the relevance of screening for PPD among mothers experiencing homelessness. Most importantly, relationship-based interventions like CPP demonstrate promise in indirectly treating PPD for at-risk populations and within a shelter setting.

**Keywords** Psychotherapy · Postpartum depression · Ill-house persons · Stress · Family

Homelessness is a growing concern in the United States with an estimated one in 30 children experiencing homelessness each year (United Nations Human Settlements Programme, 2005). There are multiple pathways to homelessness including gender-based violence, economic stressors (e.g., lack of affordable housing and childcare with extended hours, low

wages), and health-related issues (i.e., mental and physical health of the child and/or mother) which can be exacerbated with the experience of homelessness (Batterham 2019; Bassuk et al. 1997; Rabiah-Mohammed et al. 2020; Zhao, 2023). One area of concern that has been particularly understudied in women experiencing homelessness is postpartum depression (PPD). Current theoretical models suggest that significant stress can be a risk factor for PPD pathology (Beck 2001; Polmanteer et al. 2019). Women who become pregnant while experiencing homelessness are often young, malnourished, lack a social support system, and are highly stressed (Bassuk and Weinreb 1993). The combination of the stresses of homelessness, parenting, and development of PPD can be detrimental for not only the mother but also the child (Aoyagi and Tsuchiya 2019; Slomian et al. 2019). While there have been numerous studies targeting PPD by

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providing an intervention directly to the mother, few have examined whether a more attachment-based approach (e.g., Child-Parent Psychotherapy) can be effective, and none, to our knowledge, have taken place at a homeless shelter (Cooper et al. 2003; Nillni et al. 2018; Valverde et al. 2023). The current study sought to document the current risk for PPD and the effects of in-shelter time-limited Child-Parent Psychotherapy on parenting stress and PPD among mother-child dyads experiencing homelessness.

PPD rates are estimated to range from 13 to 19% (O'Hara and McCabe 2013; O'Hara and Swain 1996). However, much of the studies estimating the rate of PPD utilized a primarily white, middle class, married, and relatively high education (i.e., high school graduate or greater) sample. Those who are experiencing homelessness may be especially vulnerable in developing PPD due to the inherent traumas that come with homelessness (Milaney et al. 2020; Tsai et al. 2020). Furthermore, Black and Hispanic/Latinx individuals are disproportionately represented in the homeless population within the United States due to the historic and current impacts of racism, ethnic- and gender-based discrimination (e.g., disparities in access to health care, education, housing, financial and economic resources, social justice) (Castilla-Puentes et al. 2022; Leemis et al. 2022; Kirkinis et al. 2021; United States Department of Housing and Urban Development, 2020). Thus, the intersection of homelessness and discrimination may explain the elevated levels of depression, stress, and greater risk for developing PPD observed among this population (Belle & Doucet, 2003; Chazan-Cohen et al. 2007; Park et al. 2011).

Despite such vulnerability, little is known regarding the rate of PPD and the efficacy of interventions to reduce PPD among women experiencing homelessness. One way to treat PPD in those experiencing homelessness may be indirectly through targeting their symptoms of stress. Those with PPD are likely to report higher levels of stress and lower levels of bonding with their child; maternal bonding has been shown to mediate the relationship between PPD diagnostic status and parenting stress (Reck et al. 2016). Similarly, parenting stress has been shown to predict future depressive symptoms among mothers with PPD in a unidirectional model (Thomason et al. 2014). However, additional research is needed given that current studies primarily explore the associations between stress and depressive symptoms in White, highly educated, and low depression severity samples.

Psychological interventions shown to be effective in treating PPD include cognitive-behavioral therapy, interpersonal therapy, and psychodynamic therapy (Cooper et al. 2003; Nillni et al. 2018; Valverde et al. 2023). Given the high risk for mental health issues among those experiencing homelessness, there is a need for effective, family-based, culturally relevant, and trauma-informed assessment and

treatment models (DeCandia et al. 2017; Llewellyn-Beardsley et al. 2019;) Child-Parent Psychotherapy (CPP), a relationship-based treatment, may be a promising intervention for targeting trauma, stress, and depression in mother-child dyads (Hare et al. 2023a, b). Relationship-based interventions have shown to improve positive interactions with their infants, reduce parental stress, and reduce depressive symptoms (Clark et al. 2008). CPP was originally developed to improve the psychological and relationship functioning of young children and parents exposed to trauma (Lieberman et al. 2005). Specifically, CPP has been shown to decrease symptoms of depression among mothers, especially for those who were exposed to more traumatic experiences (Ippen et al. 2011; Lavi et al. 2015). Although CPP has been shown to reduce depression, CPP has yet to be evaluated for treating PPD specifically. Given the elevated rate of gender-based violence among women experiencing homelessness, CPP may be particularly relevant for mothers experiencing homelessness and may indirectly reduce PPD symptom severity by targeting symptoms of trauma and parenting stress via improving the mother-child bond (Alto et al. 2021; Chu et al. 2021).

Overall, evidence-based interventions are needed to address the mental and physical health concerns that can further contribute to homelessness. As part of a larger community-based, service-driven research project, the first goal of the current study was to document the proportion of elevated PPD among mothers experiencing homelessness. The second goal was to examine the feasibility, acceptability, and promise of delivering time-limited CPP within the shelter setting. The third was to evaluate the effects of CPP on parental stress and PPD. First, we hypothesized that the proportion of elevated PPD would be comparable if not higher than the United States' PPD rates. Second, we expected time-limited CPP to be well-attended and result in high intervention satisfaction scores. Third, we anticipated that CPP would significantly reduce parenting stress and, in turn, reduce PPD symptoms.

## Methods

### Participants and recruitment

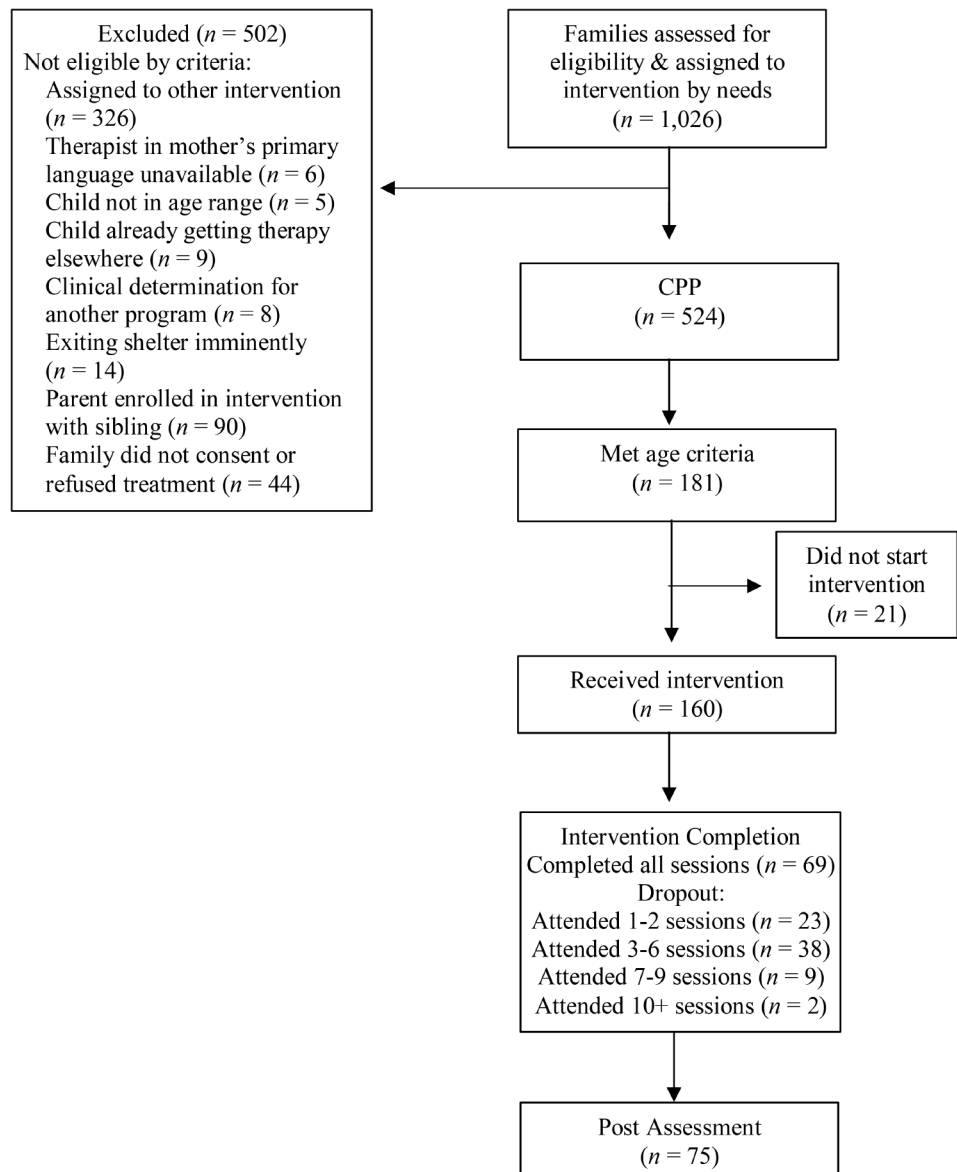
The current study was part of a larger service-driven, community-based research project within one of the largest women's shelters in the United States. All parents received clinical assessments upon arrival, and they were offered therapeutic services or linked to outside services. For example, time-limited CPP was offered for children from birth to 17 months of age, time-limited Parent-Child Interaction Therapy (PCIT) was provided for children ages 18 months

to 6 years of age, and time-limited trauma-focused cognitive behavioral therapy (TF-CBT) was provided for children between the ages of 5 and 17 years of age. Mothers experiencing more severe mental disorders were provided with in-shelter counseling and psychiatric services or families were linked to outside services in the case that the child was experiencing significant developmental delays. For more details regarding additional therapeutic services, clinical needs, and outcome data for the overall shelter sample, see Arcia (2021).

Qualifying criteria for the purpose of the present study included having a child 7 months of age or younger at the start of the intervention and participating in CPP (for evaluating the effects of CPP and PCIT on older children between the ages of 2 and 5 years of age, please refer to Graziano et al. 2023; and for the effects of TF-CBT, please refer to

Spiegel et al. 2022). Of those mother/infant dyads within the specific age range ( $n=244$ ), 63 were excluded due to lack of consent for the research project, imminent departure from the shelter, a sibling receiving simultaneous treatment, language differences between the participant and clinician, and clinical determination. See Fig. 1 for Consort Flow Diagram. The final sample includes 181 mothers with infants enrolled in CPP. Infant demographics were similar to those of the caregiver (see Table 1) and included 83 girls (45.9%) and an average age of 2.4 months ( $SD=2.0$ ). Mothers were primarily non-Hispanic (70.7%), Black (71.3%), only English speaking (71.2%; 21.0% multilingual; 6.6% only Spanish speaking), single/never married (93.4%), had some high school education (50.3%), had not previously been involved in child protective services (54.1%), and had an average of 1.65 children ( $SD=0.86$ ). Significant trauma history was

**Fig. 1** Consort flow diagram



**Table 1** Participant demographics and variables of interest

Demographic Variables	%	<i>n</i>
<b>Ethnicity</b>		
Hispanic/Latinx	29.3	53
<b>Race</b>		
White	27.6	51
Black	71.3	129
Multiracial	1.1	2
<b>Preferred Language</b>		
English	71.2	129
Spanish	6.6	12
Creole	0.6	1
Multilingual	21.0	38
Other	1.1	2
<b>Education Level</b>		
Some High School	50.3	91
High School Graduate	36.5	66
Some College Education	11.0	20
Associate's Degree	1.7	3
College Graduate	0.6	1
Technical School	0.6	1
<b>Marital Status</b>		
Single, never married	93.4	169
Married	2.8	5
Widowed	1.1	2
Separated or Divorced	3.3	6
<b>Department of children &amp; families involvement</b>		
Past	45.9	83
Present	25.4	20
<b>Gender-Based Violence/Victimization History</b>		
Domestic and/or Family Violence	87.3	158
Physical Assault	68.0	123
Sexual Assault	28.7	52
Survivors of Homicide Victims	11.1	20
Sexually Abused/Assaulted as a Child	7.7	14
Physically Abused as a Child	47.0	85
Physically Abused as a Child	43.7	79
Child Pornography as a Child	0.6	1
Stalking/Harassment	24.9	45
Human Trafficking: Sex	5.5	10
Kidnapping	7.7	14
Teen Dating Victimization	8.8	16
Hate Crime: Sexual Orientation	3.9	7
<b>Variables of Interest</b>		
	<b><i>M</i></b>	<b><i>SD</i></b>
<b>Pre-Intervention</b>		
PSI Total Stress	72.48	15.23
PSI Parent Distress Subscale	30.05	8.37
PSI Parent-Child Dysfunction Subscale	19.19	4.85
PSI Difficult Child Subscale	23.30	5.86
EPDS Mean Score	5.22	5.60
<b>Post-Intervention</b>		
PSI Total Score	64.22	15.60
PSI Parent Distress Subscale	25.25	7.79
PSI Parent-Child Dysfunction Subscale	17.29	4.85
PSI Difficult Child Subscale	22.05	5.45
EPDS Mean Score	3.77	3.90

Note PSI=Parenting stress as measured by the Parenting Stress Index – Short Form; EPDS=postpartum depression as measured continuously by the Edinburgh Postnatal Depression Scale

noted as 87.3% of the mothers reported experiencing gender-based violence along with other traumas (see Table 1).

## Procedure

This study was approved by the University's Institutional Review Board and was conducted between August 2017 and March 2022. Mother-child dyads completed an intake assessment to determine whether CPP was an appropriate intervention for their family. At intake, participants completed a series of questionnaires to evaluate demographic information, PPD, and parental stress. Following this intake, mother-child dyads were assigned to a therapist to complete CPP. Following completion of the intervention or after 16 weeks, mothers were asked to complete the questionnaires on PPD and parental stress again. Following completion of the assessments, children received a toy, and mothers were offered one incentive of their choice (e.g., in-shelter salon voucher, nail polish); all compensation was worth no more than \$20. All interventions were provided at no cost to the families at the shelter by shelter staff.

## Intervention description and adaptation

Child-parent psychotherapy (CPP) is a relationship-based intervention for children ages 0–5 years that targets a history of trauma (Lieberman et al. 2005). CPP consists of toddler-parent psychotherapy (TPP), preschooler-parent psychotherapy (PPT), and infant-parent psychotherapy (IPP), and they focus on the parent-child relationship to target developmental outcomes for the child based in attachment, cognitive-behavioral, social-learning, and psychodynamic theories. CPP intervention modalities include the following: (a) facilitating developmental progress; (b) providing psychoeducation through unstructured developmental guidance; (c) encouraging protective behavior; (d) interpreting the child's and parent's feelings and actions; (e) providing emotional support and empathetic communication; and (f) assistance with daily living concerns including crisis intervention, case management, and service referrals (Lakatos et al. 2019a; Lieberman and Van Horn 2005; Lieberman and Horn 2011).

The sessions were conducted in an unstructured format to be tailored to the needs of each family. CPP was originally adapted to be a year-long intervention with three phases: assessment and engagement, core intervention, and recapitulation and termination (Lakatos et al. 2019b). While CPP was originally designed to be completed in 50 sessions, the average number of sessions is 21 (Hagan et al. 2017). The following adaptations were made to CPP for the current study: (1) limit the number of sessions to 12 and (2) make sure the therapists progressed families across all phases of

CPP prior to termination. Clinicians at the women's shelter were master's level licensed clinical staff or therapists in training who were certified or in the process of receiving certification in CPP. A licensed mental health counselor who had completed CPP training completed biweekly supervision and biweekly consultation calls with a national leading CPP trainer. CPP sessions occurred in weekly hour-long sessions. To ensure that therapists were completing all phases and components of CPP, therapists completed consent checklists for each session. Supervisors checked 20% of those sessions at random by comparing electronic health records (EHR) intervention session notes to the checklists. Discrepancies were resolved between the clinician and supervisor.

## Measures

### Intervention completion and attendance

Attendance for each session was measured from therapists' contact notes within the EHR system. Intervention completion rates were calculated based on the percentage of families that completed 12 sessions within a 16-week period. The present study also calculated the percentage of families that eventually completed the CPP intervention beyond the 16-week assessment period defined as completing at least 10 out of the 12 sessions.

### Intervention satisfaction

Mothers provided ratings of intervention satisfaction by completing selected items from the Therapy Attitude Inventory (TAI) (Brestan et al. 1999). Parents indicated their degree of satisfaction with CPP across a 5-point Likert scale regarding (a) improvements in the parent-child relationship, (b) general feeling about the CPP program, and (c) how likely the parent was to recommend CPP to others. Answers above "3" indicate an improvement in the parent-child relationship, satisfaction with the intervention, and likelihood to recommend the program.

### Parenting stress

Mothers completed the Parenting Stress Index – Short Form (PSI-SF) (Abidin and Brunner 1995) prior to the start of and following the end of the intervention or at the 16-week post-assessment, which ever came first. The PSI-SF consists of 36 items that assess self-report parenting stress. The items utilize a 5-point Likert scale to evaluate agreement with each statement (1 = "strongly disagree", 5 = "strongly agree"). The PSI-SF includes three subscales (Parental Distress, Parent-Child Dysfunction, and Difficult Child) as well

as a Total Stress scale. The Total Stress scale has good internal reliability ( $\alpha=0.88$ ) within this sample, and the PSI-SF has good concurrent and predictive validity with the full-length questionnaire ( $r=.94$ ) (Gray et al. 2012; Langkamp et al. 1998). Primary analyses utilized the Total Stress scale, and supplemental analyses included the three PSI subscales.

### Postpartum depression

Mothers completed the Edinburgh Postnatal Depression Scale (EPDS) (Cox et al. 1987) prior to the start and following the end of the intervention or at the 16-week post-assessment, which ever came first. The EPDS consists of 10 items that assess self-report PPD. Each item is scored on a 4-point scale to evaluate frequency of each symptom and added together for a total score, with continuous scores ranging from 0 to 30. Total EPDS scale has good internal validity ( $\alpha=0.83$ ) within this sample. Clinical cut-off scores for high risk of PPD is set at a sum score of 11. A cut-off score of 11 has been shown to maximize sensitivity (81%) and specificity (88%) (Levis et al. 2020). Mothers were categorized according to EPDS clinical severity (0 = "below cut-off", 1 = "at or above cut-off").

### Data analysis

The statistical analyses were conducted using Statistical Package for the Social Sciences, SPSS version 28 (SPSS 28). The amount of missing data for pre-intervention variables ranged 1.7–49.5% and ranged 24.7–58.8% for post-intervention variables. Missing data prior to the intervention was due to the EPDS being implemented later in data collection. Missing data at post-intervention was due to families who dropped out of the intervention and did not complete post-intervention assessments; this was primarily due to departure from the shelter. Because of the large amount of missing data at both pre- and post-intervention, multiple imputation was not performed (Clark and Altman 2003; Jakobsen et al. 2017). Rather, subsequent analyses relied on complete case analyses. There were no significant demographic differences among families with complete versus missing data.

Preliminary analyses examined whether the outcome measures related to all demographic variables. Next, the proportion of at-risk for PPD was reported according to the clinical cut-off of the EPDS. Intervention fidelity, completion, attendance, intervention duration, and intervention satisfaction were then described. Regarding treatment outcomes, McNemar's test was performed to evaluate within-group changes in the proportion of those who were at or above the EPDS clinical cut-off after the intervention. Repeated measures ANOVAs were performed to evaluate

how parental stress and EPDS scores changed from pre- to post-intervention. To evaluate how change in stress predicts change in EPDS scores, two regression-based models with 2,000 bootstrapped replicates were used (a continuous and a categorical one). Supplemental analyses were conducted for the PSI subscales and EPDS. Cohen's  $d$  estimates for within-subjects were calculated by comparing pre- and post-intervention scores.

## Results

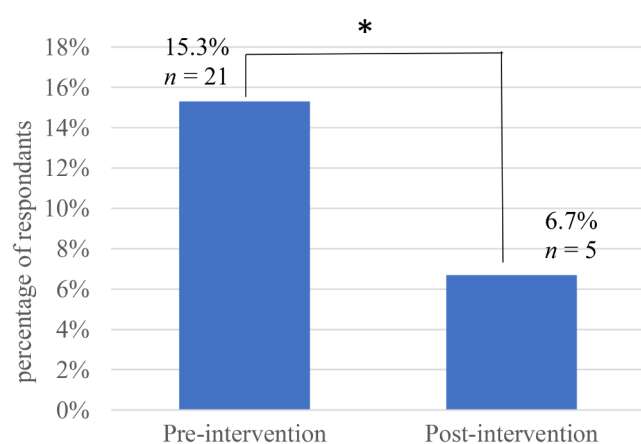
### Postpartum depression proportion

Multivariate analyses indicated that EPDS and PSI scores did not vary significantly by any demographic variables, thus no covariates were included in subsequent analyses. Prior to the intervention, 15.3% ( $n=21$ ) of caretakers who completed the EPDS reported having a score at and above 11 indicating high risk for PPD.

### Intervention feasibility and acceptability

*Intervention Fidelity.* Overall procedural and content fidelity of the CPP in a time-limited format was high ( $M=99%$ , range 83-100%;  $M=95%$ , range 74-100%, respectively).

*Intervention Completion and Attendance.* Prior to the start of the intervention, 12% ( $n=21$ ) of families never initiated any intervention (see Fig. 1). Of the families that initiated CPP, 43.1% ( $n=69$ ) completed 12 sessions of CPP and the three required phases. Of note, 53.8% ( $n=86$ ) eventually completed the intervention beyond the 16-week time frame; the average number of sessions was 11.44 ( $SD=1.06$ ). Intervention completion did not vary by initial PSI and EPDS scores nor any demographic variables.



**Fig. 2** Proportions of clinically elevated EPDS pre- and post-intervention. Note EPDS = Edinburgh Postnatal Depression Scale,  $*p < .05$

*Intervention Satisfaction.* Overall, mothers reported improvements in their relationship with their child ( $M=4.33$ ,  $SD=0.93$ ), as well as high rates of satisfaction with the CPP program ( $M=4.83$ ,  $SD=0.51$ ) and willingness to recommend CPP to others ( $M=4.75$ ,  $SD=0.70$ ). Specifically, 68% reported improvement in the parent-child relationship, 94% of mothers reported satisfaction with the CPP program, and 93% reported they would recommend CPP to others.

### Stress and postpartum depression

Mothers reported a significant decrease from pre to post in PSI-SF scores,  $F(1,91)=21.57$ ,  $p < .001$ ,  $d=0.51$ , and EPDS scores,  $F(1,74)=9.76$ ,  $p = .003$ ,  $d=0.43$ . Within the PSI subscales, mothers reported a significant decrease from pre to post in PSI Parent Distress ( $F(1,91)=29.02$ ,  $p < .001$ ,  $d=0.59$ ) and Parent-Child Dysfunction ( $F(1,91)=8.00$ ,  $p = .006$ ,  $d=0.39$ ); changes in the Difficult Child subscale were not statistically significant ( $F(1,91)=3.73$ ,  $p = .057$ ,  $d=0.22$ ) See Table 1 for pre- and post-intervention measure scores. McNemar test analyses indicated a significant reduction in the proportion of participants with clinically elevated EPDS scores,  $p = .013$ , such that the proportion of clinically elevated EPDS scores decreased from 15.3 to 6.7%, see Fig. 2. Next, a hierarchical linear regression analysis indicated that post-intervention PSI-SF significantly and positively predicted post-intervention EPDS,  $F(3,71)=8.46$ ,  $p < .001$ ,  $d=0.44$ . In other words, and as seen in Table 2, by controlling for pre levels of PSI-SF and EPDS, greater reductions in parenting stress were shown to be associated with greater reductions in EPDS from pre- to post-intervention. Finally, a hierarchical linear regression analysis indicated that post-intervention PSI-SF significantly and positively predicted post-intervention categorical EPDS,  $R^2=0.18$ . In other words, greater reductions in parenting stress predicted a change in categorical EPDS from clinically elevated symptoms to subclinical threshold. Please refer to Table 2 for more details. Similar significant effects were also found for the PSI subscales such that reductions in Parental Distress, Parent-Child Dysfunction, and Difficult Child were associated with reductions in continuous EPDS from pre- to post-intervention; no significant associations were observed for the change in categorical EPDS (See Supplementary Table 1).

## Discussion

The present study represents the first trial, to our knowledge, examining the feasibility, acceptability, and initial promise of an abbreviated time-limited version of a well-established

**Table 2** Linear and logistic regression analyses with parenting stress predicting continuous and categorical EPDS

Linear Regression	B (95%CI)	Total R <sup>2</sup>	R <sup>2</sup> Change	F Change	χ <sup>2</sup>
Step 1		0.12	0.12	5.01**	
Pre EPDS	0.24(0.08, 0.40)**	-	-	-	-
Pre Total Stress	-0.02(-0.08, 0.04)	-	-	-	-
Step 2		0.26	0.14	13.62***	
Pre EPDS	0.21(0.06, 0.35)**	-	-	-	-
Pre Total Stress	-0.07(-0.13, -0.01)*	-	-	-	-
Post Total Stress	0.12(0.05, 0.18)***	-	-	-	-
<b>Logistic Regression</b>	<b>OR (95%CI)</b>	<b>R<sup>2</sup></b>			<b>χ<sup>2</sup></b>
Step 1		0.06	-	-	1.77
Pre EPDS	1.47(-18.51, 20.08)	-	-	-	-
Pre Total Stress	-0.03(-0.11, 0.01)	-	-	-	-
Step 2		0.18	-	-	3.51
Pre EPDS	1.65(-18.55, 25.38)	-	-	-	-
Pre Total Stress	-0.08(-0.18, -0.04)*	-	-	-	-
Post Total Stress	0.08(0.00, 0.26)*	-	-	-	-

Note \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Nagelkerke R<sup>2</sup> reported for logistic regression models; OR = odds ratio

early intervention program, CPP, in a homeless shelter to target PPD. This study highlighted the significance of studying PPD given that 15.3% of the women experiencing homelessness at this shelter reported at-risk levels of PPD. As it relates to the intervention, time-limited CPP was successfully implemented within the homeless shelter as evidenced by high fidelity rates and satisfaction ratings by the participants. Time-limited CPP was demonstrated to be a potentially effective intervention in reducing parenting stress and PPD symptom severity. Finally, the reductions in parenting stress predicted the reduction in at-risk levels of PPD.

Many of the individual and dyadic interventions implemented in homeless settings target adults' substance use disorders, families' trauma, and children's externalizing behaviors (Graziano et al. 2023; Magwood et al. 2020). However, this study's exploration of PPD in a shelter setting highlights an underdeveloped and possibly unaddressed area of concern for mothers experiencing homelessness. This study discovered a significant proportion of women experiencing homelessness to be at-risk for PPD (15.3%) that is comparable to the rate of PPD observed in the general population (13–19%) (O'Hara & McCabe, 2013; O'Hara & Swain, 1996). However, the proportion of those with

elevated PPD scores is lower than what might be expected given that homelessness has been associated with greater odds of having depression (Chazan-Cohen et al. 2007; Park et al. 2011). It is possible that mothers within this study underreported symptoms as a protective measure or that being provided with trauma-informed shelter with enriched supportive services can reduce such symptoms, but additional research is needed to understand parenting stress among those experiencing homelessness (Arcia 2021). Despite the significant proportion of elevated EPDS scores among mothers experiencing homelessness, no PPD interventions had been evaluated within a shelter setting prior to this study. Previous evidence-based interventions targeting PPD include peer support groups, individual cognitive-behavior therapy, interpersonal therapy, and antidepressant medication (Cooper et al. 2003; Nillni et al. 2018; Stewart and Vigod 2016; Valverde et al. 2023). Interpersonal therapy includes improving relationships with others to assist with the transition to parenthood, yet it does not focus on the parent's relationship with the infant. The maternal bond has been shown to be associated with both postpartum depression and parental stress (Flykt et al. 2010; Reck et al. 2016; Thomason et al. 2014). Despite this, few studies have evaluated mother-child relationship-based interventions to reduce parenting stress and PPD. In this study, the implementation of CPP, an attachment-based intervention, reduced parenting stress, especially parental distress and parent-child dysfunction, and PPD severity suggesting that PPD interventions may find success in targeting the parent-child relationship.

Given the intense need for mental health services among those experiencing homelessness, adaptable and wide-reaching interventions are needed. Abbreviated CPP had previously been implemented in shelter and NICU settings to reduce child externalizing behaviors, increase positive parent verbalizations, reduce parenting stress, and target trauma (Graziano et al. 2023; Lakatos et al. 2019a). This study further demonstrates the versatility of CPP in addressing a variety of mental health concerns including PPD. The acceptability of CPP and reductions of parenting stress could also be attributed to the supportive nature of the shelter setting; mothers and children are provided shelter, food, parenting support, and mental health interventions free of cost. However, previous evaluation of relationship-based interventions for mother-infant dyads using a waitlist control group observed significant reductions in depressive symptoms and parenting stress, suggesting that the present study's findings further support the utilization of relationship-based interventions (Clark et al. 2008).

## Limitations

Regarding limitations, this study lacked a control group for ethical reasons given the service-based nature of the study. Thus, it is possible that reductions in stress and PPD may be due to the trauma-informed, supportive, and stable environment of the shelter. Such a trauma-informed environment is crucial for mothers experiencing homelessness given that a significant portion (87.3% in our sample) reported experiencing gender-based violence. Future studies should implement a research design that includes a control or non-specific support group in order to isolate the effects of the intervention on parenting stress and postpartum depression symptoms. This study was also unable to determine the long-term effects of CPP on parenting stress and PPD. Given the lack of resources generally provided to homeless shelters, follow-up with families was not feasible. The lack of longitudinal nature of this study also makes it difficult to establish the mediating effects of parenting stress on CPP and PPD. Therefore, we cannot conclude that the reduction in parenting stress directly causes the reduction in PPD. Future studies should make efforts to conduct multiple post-intervention assessments to better evaluate the intervention effects. Furthermore, there was no observational measure of the mother-infant bond which may be yet another mechanism for how CPP may reduce PPD. One way in which future studies can improve upon this is conducting a mother-infant interaction task in which parent verbalizations and behaviors are coded to evaluate how CPP changed parental interactions beyond self-report. Although comparable to other studies evaluating interventions among those experiencing homelessness, this study experienced high rates of attrition (only 53.8% completed treatment) primarily due to families exiting the shelter unrelated to child protective service involvement (96.9%; Armstrong et al. 2021; Graziano et al. 2023; Herbers et al. 2020). Attrition may be better improved by following up with participants after shelter departure to encourage treatment completion. Additional research is also needed to determine how time-limited CPP may compare to full-length CPP in reducing PPD severity. Finally, it is important to note that a significant portion of mothers experiencing homelessness have experienced significant trauma (most often gender-based violence) along with other mental disorders (e.g., anxiety, substance use) which may have been impacted by participation in an infant-child program such as CPP.

## Conclusions

Mothers experiencing homelessness with infants experience similar rates of at-risk PPD relative to national rates. This study is the first, to our knowledge, to showcase how a time-limited parent-infant intervention (i.e., CPP) can be

feasibly implemented by shelter staff. Findings further highlight the promise of CPP in helping to reduce PPD among mothers experiencing homelessness by reducing parenting stress. It is important to acknowledge that there are various evidence-based interventions that directly target mothers' mental health functioning (Cooper et al. 2003; Nillni et al. 2018; Valverde et al. 2023), although such interventions are rarely transported to a shelter setting (Haskett et al. 2016). This study shows not only the feasibility of transporting evidence-based interventions to shelter settings, but also that mental health professionals can use an attachment-based parent-child intervention like CPP to indirectly address mothers' PDD.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s00737-024-01492-8>.

**Acknowledgements** The authors would like to thank the children and families of Lotus House for their participation and the dedicated team of Lotus House for making this community based, service driven research possible, with special mention to Gabrielle Contreras, LCSW, Stephanie Padro, LMFT, Michelle Alexandre, LMHC, Geneva Comeau, LMHC, Arleny Mirambeau, MSW, Ireysis Ramos Garcia, MSW, Franchesca Ali, MSW, LeShea Jenkins, MEd, Leanett Reinoso, BA, Melissa Claros-Eraza, BS, Isabella Dell Oca, BA, Shameequa Buxton, JD, and Gabriela Saenz, MA. This project was made possible by the generous funding of: The Children's Trust of Miami Dade County, Florida; Miami Dade County Homeless Trust; Miami Dade County and Lotus Endowment Fund, Inc.; Micky and Madeleine Arison Family Foundation; Carnival Foundation; Martin Z. Margulies; Angela Whitman and Family Foundation; and our community.

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**Funding** The clinical services provided to the participants was supported by the funding of The Children's Trust of Miami Dade County, Florida; Miami Dade County Homeless Trust; Miami Dade County and Lotus Endowment Fund, Inc.; Micky and Madeleine Arison Family Foundation; Carnival Foundation; Martin Z. Margulies; Angela Whitman and Family Foundation; and our community. All funding



was used for operations of the shelter and interventions provided at no cost.

**Data availability** Data may be available upon request from the corresponding author.

## Declarations

**Ethical approval** The study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Human Investigation Committee (IRB) of Florida International University (IRB-17-0265).

**Informed consent** Informed consent was obtained from the parent participants.

**Competing interests** The authors have no relevant financial or non-financial interests to disclose.

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