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PARENTING WITH DEPRESSION: A SOCIAL MEDIA-BASED PARENTING PROGRAM FOR NEW MOTHERS WITH POSTPARTUM DEPRESSION

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ABSTRACT

New mothers with depressive symptoms face challenges in obtaining both mental health treatment and education about being a new parent. We tested the effects of a social media-based parenting program for new mothers with postpartum depressive (PPD) symptoms and their infants. We conducted a randomized controlled trial of a parenting program that uses a Facebook platform. Women with mild-moderate depressive symptoms and without suicidality were randomized to the parenting program plus online depression treatment or online depression treatment alone for 3 months. Women completed the Parent-Child Early Relational Assessment (PCERA) pre- and post-intervention, the Edinburgh Postnatal Depression Scale (EPDS) monthly for 9 months, and parent self-report of parenting self-efficacy and stress at baseline and 3 months. We assessed their infants' development using the Bailey Scales of Infant Development-IV at 9 months. Differences between groups were assessed using intention-to-treat analysis. Ninety-four women were enrolled, and 79 (84%) completed the study. Participants were predominantly Black (80%), single (68%), with annual incomes <$30,000 (48%). Women in the parenting program viewed content on average 96% of the time but posted comments on average only 44% of the time. Women in the parenting program reported greater decreases in EPDS scores and greater increases in parenting self-efficacy over time than women in the control group. There were no differences in changes in PCERA or BSID-IV scores between groups at follow-up. This social media-based parenting program for new mothers with PPD symptoms demonstrated greater improvement in depression symptoms and parenting self-efficacy but did not change parent-child interactions or improve child development. Social media is a useful platform to provide parenting education to new mothers with PPD symptoms, but better engagement strategies and coaching are needed to improve parenting skills and child development.

KEYWORDS

Social Media, Parenting, Postpartum Depression

1. INTRODUCTION

Postpartum depression (PPD) is common following the birth of a child (Horowitz and Goodman 2005, Vesga-Lopez, Blanco et al. 2008, Marcus 2009, Pearlstein, Howard et al. 2009). Young mothers are particularly vulnerable to depression; studies report prevalence of 12% to 50% among mothers of young children (Reis 1988, Orr, James et al. 1989, Kemper 1992, Olson and DiBrigida 1994, Henneghan, Silver et al. 1998). The occurrence of depression following the birth of a child has a strong genetic component (Harrington 1993, Harrington, Rutter et al. 1997, Sullivan, Neale et al. 2000), is likely related to the stress of childbirth and parenting, and may be related to hormonal fluctuations during the postpartum period (Olson and DiBrigida 1994, Henneghan, Silver et al. 1998). Environmental stressors such as poverty and social isolation also increase risk for developing depression following childbirth (Henneghan, Silver et al. 1998, Heneghan, Johnson Silver et al. 2000, Miller 2002, Gregory, Butz et al. 2015).

PPD symptoms may adversely impact a mother's ability to nurture and care for her children (Field 1995, Field 2002)·(Jones, Field et al. 1997, Hart, Field et al. 1998). Mothers with depressions have limited knowledge of and feel low self-efficacy for healthy parenting practices (McClennan and Kotelchuck 2000, Chung, McCollum et al. 2004, Paulson, dauber et al. 2006). They are less likely to display positive parenting behaviors and more likely to endorse negative parenting behaviors than non-depressed mothers (Lyons-Ruth, Wolfe et al. 2000, Chung, McCollum et al. 2004, Silverstein, Augustyn et al. 2009). In addition, mothers with depression ineffectively model emotional expression, which may contribute to emotional dysregulation and higher stress in infants and children (Field 1998, Ashman and Dawson 2002). As a result, infants and toddlers may experience more cognitive, language, and socioemotional delays that do infants of mothers who aren't depressed (Field 1992, Hay 1997, Field 1998, Koutra, Chatzi et al. 2013, Kaplan, Danko et al. 2014). As a result, PPD has been considered by Bright Futures, a leading pediatric health supervision guideline, as "one of the greatest risk factors for child behavioral and mental health problems" (Hagan, Shaw et al. 2008).

Unfortunately, new mothers experience substantial barriers to obtaining mental health care, and few receive treatment (Kallem, Matone et al. 2019). We previously adapted an efficacious in-person parenting program for new mothers with PPD symptoms but found that in-person attendance was extremely poor (Boyd, Gerdes et al. 2017). In response, we developed a social media-based parenting program for mothers with PPD symptoms (Boyd, Price et al. 2019, Guevara, Morales et al. 2023). We found that attendance improved greatly and parenting efficacy and depressive symptoms improved. The aim of this study was to test the effects of this parenting program on depression symptoms, parenting responsiveness, parent-reported self-efficacy and stress, and child development. Given its virtual nature, such a program, if shown to be effective, could address barriers to in-person treatment among women suffering with PPD symptoms.

2. METHODS

We recruited 6 urban pediatric practices affiliated with a children's hospital to participate in the study. These practices provide primary care to a racially diverse, urban population. The practices all screened for PPD using the Edinburgh Postnatal Depression Scale (EPDS) at selected infant well child visits through 6 months of age, consistent with the American Academy of Pediatrics' preventive care recommendations (Earls and The Committee on Psychosocial Aspects of Child and Family Health 2010). The EPDS is a validated 10-item scale for PPD, with scores >9 having a sensitivity of 97% and specificity of 43% for major or minor depression and includes an item querying respondents regarding suicidal ideation (Cox, Holden et al. 1987). The study was approved by the local Institutional Review Board and registered with Clinicaltrials.gov prior to enrollment of the first participant (NCT05400161).

Participants were eligible if they were women >18 years of age, screened positive for minor or moderate depressive symptoms at their child's well visit through 6 months of age (EPDS=10-19), could read and write in English, and had access to a smart phone or computer tablet. Participants were excluded if they had infants who were premature (<35 weeks estimated gestational age), with identified genetic syndromes or congenital anomalies, or who were already enrolled in early intervention services. Eligible participants provided written informed consent.

The intervention, Parenting with Depression (PWD), is a social media-based parenting program developed for new mothers with PPD symptoms to enhance parenting skills and improve parental responsiveness. PWD consists of 8 weekly topics: depression psychoeducation/behavioral activation, infant temperament, play, feeding, safety, sleep, parent-child interactions, and shared book reading (Boyd, Price et al. 2019). Content for the 8 topics was derived from the American Academy of Pediatrics' guidance on the care of infants (Hagan, Shaw et al. 2017, Altmann and Hill 2019), and we infused this content with depression psychoeducation and behavioral activation strategies. We used Facebook's Secret User Group platform to administer PWD to ensure confidentiality of participants participating in the group. Participants were instructed to download the Facebook app onto their phone or tablet and were then invited to join the PWD secret user group in groups of 5-8 participants. Content for each topic was released separately in 3 postings on the Facebook site over the course of a week and consisted of 4-minute video vignettes, narrated PowerPoint presentations, and written materials for ease of posting. A facilitator reviewed posts daily, commented on participants' responses to postings, provided coaching tips, and removed any inappropriate postings. A fidelity checklist was developed to assess task completion and quality of responses to participant posts by the facilitator (0- not completed, 1- partially completed, 2- fully completed).

Participants were stratified by practice site and randomized 1:1 in blocks of 15 to the PWD Program plus MoodGym, an online cognitive behavioral therapy program, or MoodGym alone. Moodgym is an evidence-based online cognitive behavioral treatment program that has been shown to be effective at reducing mild-moderate depression symptoms (Twomey and O'Reilly 2016). All participants received a list of community mental health resources.

At baseline, participants completed measures of demographic characteristics (age, sex, race/ethnicity, maternal education level, family structure, family income) and social support. Social support was measured by the Multi-dimensional Scale of Perceived Social Support (MSPSS), a 12-item scale that assesses perceived social support from family, friends, and a significant other (Zimet, Dahlem et al. 1988). Participants completed the EPDS and an item

from the National Comorbidity Survey (NCS) concerning any community mental health service use monthly for 9 months (Wang, Lane et al. 2005). Women who reported scores>20 or suicidality on the EPDS were contacted by phone to assess risk and provided with assistance in obtaining urgent mental health referrals if they were not already in treatment.

Parent measures were completed at baseline and at follow-up 3 months later and consisted of Parenting Sense of Competence Scale (PSOC), Parenting Stress Index-Short Form (PSI-SF), and the Parent-Child Early Relational Assessment (PCERA), the main outcome measure. The PSOC is a validated 17-item self-report measure of parenting self-esteem and competence and consists of two factors: satisfaction and efficacy (Johnston and Mash 1989). The PSI-SF consists of 36 items that measure parenting stress (Abedin 1995)·(Reitman, Currier et al. 2002). The PCERA is a validated, 65-item (29 parental, 28 child, and 8 dyadic items) videotape assessment designed to measure the quality of affect and behavior in parent-child interactions (Clark 1985, Clark 1999). The PCERA has good interrater reliability, internal consistency, discriminant and concurrent validity, and sensitivity to change (Clark, Hyde et al. 1997, Clark 1999, Clark, Tluczek et al. 2004, Clark, Tluczek et al. 2008). The PCERA has 8 subscales: 1) Parental Positive Affective Involvement and Verbalization, 2) Parental Negative Affect and Behavior, 3) Parental Intrusiveness, Insensitivity, and Inconsistency, 4) Infant Positive Affect, Communicative and Social Skills, 5) Infant Quality of Play, Interest Attentional Skills, 6) Infant Dysregulation and Irritability, 7) Dyadic Mutuality and Reciprocity, and 8) Dyadic Disorganization and Tension. Subscales were scored from 1-5 with scores of 4-5 indicating a strength and scores of 1-3 indicating a concern. Participants in the intervention group were asked to rate the acceptability of each topic and the overall program using a 5-point Likert scaled response (1-strongly disagree to 5-strongly agree).

Infants were assessed using the Bayley Scales of Infant and Toddler Development-IV (BSID-IV) at 9 months following enrollment, when infants were 12-15 months of age. The BSID-IV is a validated measure of child cognitive, language, motor, socioemotional, and adaptive development among infants and toddlers aged 1-42 months of age (Bayley and Aylward 2019). The BSID-IV was administered in English following the 9-month visit in a standardized testing facility by a certified psychologist.

We examined summary statistics and assessed differences by randomization group using the t-test for continuous variables and chi-square test for categorical variables. We considered a p-value less than 0.05 for statistical significance. Our primary outcome was between group differences from baseline to the 3-month follow-up of the 8 PCERA parenting subscales. Secondary outcomes consisted of between-group differences from baseline to 3-month follow-up of the PSOC and PSI-SF scores, baseline to 9-month follow-up of the EPDS scores, and differences in BSID-IV subscale scores. As there were small differences in follow-up time among participants, we used group X time interactions to assess differences in outcomes. We developed linear mixed effects models to assess differences in outcomes between groups while accounting for clustering within practices and adjusting for imbalances in baseline characteristics. Primary analyses were conducted using intention-to-treat analysis in which groups were analyzed by their original randomization assignments.

3. RESULTS

Of 466 potential participants who screened positive for depressive symptoms at well child visits, we excluded 372 (99 didn't meet eligibility criteria, 272 were unreachable or declined participation, and 1 withdrew prior to randomization). Therefore, 94 eligible women were enrolled and randomized: 46 to PWD + MoodGym and 48 to MoodGym alone (Figure 1). One participant withdrew and another participant was determined to be ineligible; both in the control group. Forty-six participants in each group completed the 9-month follow-up.

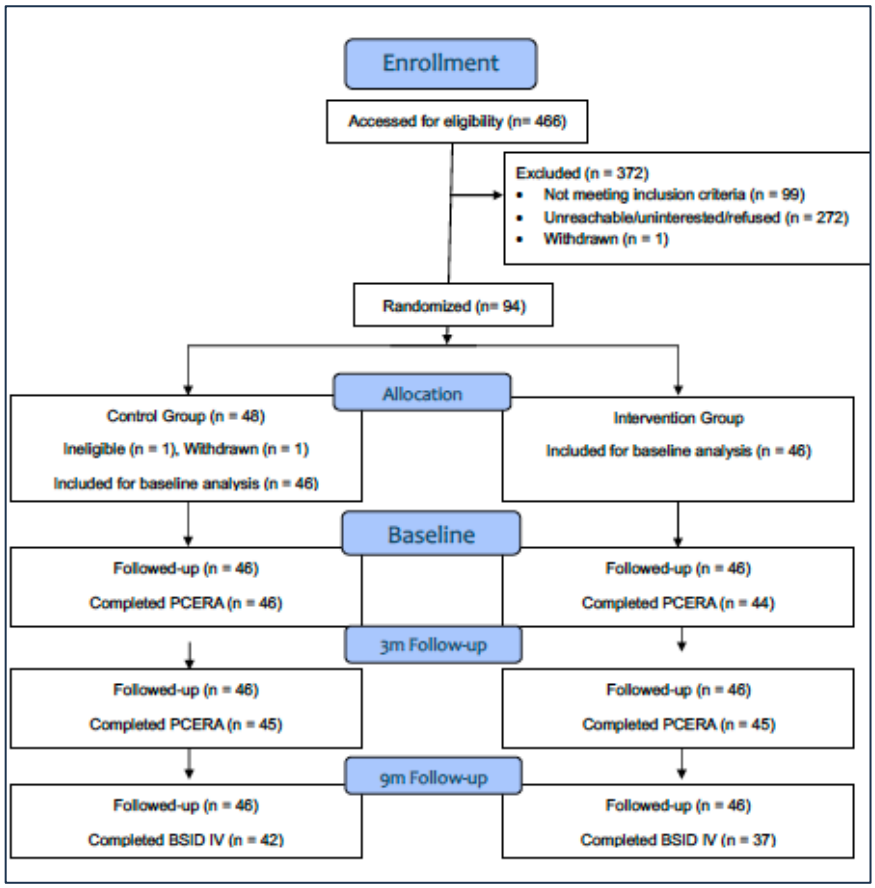

Figure 1. Flow of study participants

Participants were mostly Black and single. They had a mean age of 30.0 years, a reported family income of <$30,000, a high school education or less, and reported modest social support (average MSPSS score=55). There were no differences between the two groups in demographic characteristics or MSPSS scores (Table 1).

Table 1. Characteristics of study participants

Characteristic	Overall N=93	Control N=47	Intervention N=46
Caregiver age, year, median [IQR]	30.0 [25.0, 34.0]	30.0 [24.5, 35.0]	30.0 [25.0, 32.0]
Race and ethnicity (%)			
Asian	2 (2.2)	1 (2.1)	1 (2.2)
Black or African American	71 (76.3)	35 (74.5)	36 (78.3)
White	13 (14.0)	7 (14.9)	6 (13.0)
More than one race	2 (2.2)	2 (4.3)	0 (0.0)
Race other	5 (5.4)	2 (4.3)	3 (6.5)
Hispanic or Latino	9 (9.7)	4 (8.5)	5 (10.9)
Children living at home, median[IQR]	2.0 [1.0, 3.0]	2.0 [1.0, 3.0]	2.0 [1.0, 3.0]
Marital status, (%)			
Single, never married, or separated	63 (67.7)	29 (61.7)	34 (73.9)
Married or living together	30 (32.3)	18 (38.3)	12 (26.1)
Education, (%)			
≤High school or GED	48 (51.6)	24 (51.1)	24 (52.2)
≥College or greater	45 (48.4)	23 (48.9)	22 (47.8)
Gross annual household income, (%)			
<$30,000	45 (49.5)	20 (42.5)	25 (56.7)
$30,000-$59,999	23 (25.3)	12 (25.6)	11 (25.0)
>$60,000	23 (25.2)	15 (31.9)	8 (18.3)

Average EPDS scores at baseline were in the moderate depression range, and there were no differences in average EPDS scores between groups. EPDS scores decreased in both groups but fell significantly faster in the intervention group (-2.8 vs. -1.0, p=0.01) than the control group at 3 months (Table 2). At the 9-month visit, EPDS scores had decreased to a greater extent in the intervention group (-4.4 vs. -3.5) than the control group, but the 9-month EPDS scores were not statistically significantly different between groups (p=0.36). As a result of decreases in EPDS scores over time, both groups had average scores that reflected minimal depression at the conclusion of the study.

Table 2. Changes in EPDS score by study arm

	Control group			Intervention group			Difference between groups	
Visit	EPDS	Change from baseline (95% CI)	p-value	EPDS	Change from baseline (95% CI)	p-value	Between-group difference (95% CI)	Interaction p-value
0	12.9 (4)	Reference		13.8 (3.9)	Reference			
1	12.2 (4.2)			10.9 (3.9)				
2	11.2 (4.8)			10.7 (4.4)				
3	11.3 (4.4)	-1 (-2, 0)	0.046 *	10.8 (4.9)	-2.8 (-3.8, -1.8)	<0.001 *	-1.8 (-3.2, -0.4)	0.012 *
4	10.3 (4.6)			9.8 (4.2)				
5	10 (4.5)			9.7 (4.7)				
6	9.2 (4.4)	-2.6 (-3.7, -1.5)	<0.001 *	10.2 (4.2)	-3.7 (-4.9, -2.6)	<0.001 *	-1.2 (-2.8, 0.4)	0.15
7	9.4 (5.7)			9.8 (4.6)				
8	8.4 (5)			9.1 (4.1)				
9	9.5 (4.8)	-3.5 (-4.8, -2.3)	<0.001 *	8.2 (4)	-4.4 (-5.6, -3.1)	<0.001 *	-0.8 (-2.6, 1)	0.36

For the main outcome, PCERA scores for all 8 subscales were not different between groups at baseline. Average scores ranged from 2.5 to 2.7 for Dyadic Mutuality and Reciprocity, indicating a concern in both groups, to 4.1 to 4.5 for Parent Negative Affect and Infant Dysregulation and Irritability, both indicating strengths (Table 3). There were modest improvements in PCERA scores in both groups, with greater improvements in the control group. However, the control group tended to have lower PCERA scores at baseline, resulting in similar scores between groups at the 3-month follow-up.

Table 3. Changes in PCERA scores by study arm

	Control group			Intervention group			Interaction Term	
Factor	Baseline (n=46)	3-month (n=45)	p-value	Baseline (n=44)	3-month (n=45)	p-value	Estimate (95% CI)	p-value
f1	3.0 (0.6)	3.3 (0.6)	0.002 *	3.3 (0.6)	3.4 (0.6)	0.22	-0.2 (-0.4, 0.1)	0.17
f2	4.2 (0.6)	4.3 (0.6)	0.17	4.3 (0.5)	4.2 (0.5)	0.23	-0.3 (-0.6, 0)	0.07
f3	3.0 (0.6)	3.2 (0.7)	0.002 *	3.3 (0.6)	3.3 (0.5)	0.79	-0.3 (-0.5, 0)	0.038 *
f4	2.8 (0.7)	3.2 (0.7)	0.003 *	2.8 (0.7)	3.3 (0.7)	<0.001 *	0.1 (-0.3, 0.4)	0.75
f5	3.5 (0.6)	3.8 (0.5)	0.001 *	3.7 (0.7)	3.8 (0.5)	0.2	-0.2 (-0.5, 0.1)	0.17
f6	4.1 (0.7)	4.5 (0.6)	0.008 *	4.4 (0.6)	4.5 (0.5)	0.49	-0.3 (-0.6, 0.1)	0.15
f7	2.5 (0.6)	2.9 (0.7)	0.001 *	2.7 (0.7)	2.9 (0.7)	0.029 *	-0.1 (-0.5, 0.2)	0.43
f8	3.1 (0.6)	3.5 (0.7)	0.001 *	3.5 (0.7)	3.5 (0.6)	0.93	-0.4 (-0.7, -0.1)	0.024 *

PSI scores were similar at baseline (81.9 vs 82.7) in both groups and demonstrated modest decreases over time at the 3-month follow-up (80.7 vs 77.4), comparing intervention to control group. PSOC scores were also similar at baseline (68.3 vs 67.5) between groups. However, the intervention group showed a significant increase in PSOC scores (4.8, $p<0.001$) but the control group did not (2.5, p-0.07)

Mean BSID-IV standard scores were in the lower end of the average range for the test (average range for BSID-IV standard scores is 90-109) There were no differences in cognitive, language, motor, socioemotional, or general adaptive standard scores between groups (Table 4). There were no group differences in the number of infants who scored more than one standard deviation below the mean for the test, in the at-risk range ($p\geq0.33$). In this regard, for the cohort as a whole, 25%, 13.9%, 19.2%, 17.3% and 9.3% scored in the at-risk range, across cognitive, language, motor, socioemotional and adaptive domains respectively. However, only 79 infants (84%) completed the BSID-IV.

Table 4. Bayley Scales of Infant and Toddler Development Scores by study arm

	Overall N=79	Control N=42	Intervene N=37	Mean diff (95%CI)	p-value
Cognitive Standard score, mean (SD)	89.9 (14.0)	92.4 (13.4)	87.2 (14.3)	-4.9 (-11.3, 1.6)	0.15
Language Standard score, mean (SD)	94.8 (10.5)	95.9 (9.7)	93.6 (11.4)	-2.1 (-6.9, 2.7)	0.39
Motor Standard score, mean (SD)	93.1 (11.2)	94.3 (8.5)	91.7 (13.5)	-2.3 (-7.6, 3)	0.39
Social-emotional Standard d score, mean (SD)	101.8 (20.1)	103.7 (18.6)	99.7 (21.7)	-3.5 (-13.2, 6.3)	0.49
General adaptive Standard score, mean (SD)	98.4 (8.5)	98.2 (7.4)	98.6 (9.7)	0.6 (-3.5, 4.7)	0.78

Engagement in the PWD program was moderate to high. Almost all intervention participants viewed the content on the Facebook site (on average 96% of participant viewed weekly content). Fewer than half of intervention participants responded to the PWD content posts (on average 44% of participants posted responses to weekly content). Overall, 19 participants (20%) reported any community mental health services use during the study, and there was no difference between groups in the proportion who accessed mental health services in the community (20% intervention vs. 22% control, p=0.61).

Thirty-six (82%) of participants in the PWD program rated the program as highly or very highly acceptable. The average acceptability score was 4.0 with individual topics having average acceptability scores of 3.5 to 4.0.

4. CONCLUSION

In this study, the use of a social media-based parenting program for women with PPD symptoms paired with an online mental health program resulted in a more rapid and sustained decline in depressive symptoms than the online mental health program alone. This result is consistent with a systematic review and meta-analysis of 48 randomized controlled trials of group-based parenting programs that found short-term improvements in maternal depressive symptoms (Barlow, Smailagic et al. 2012). However, the trials reported in the systematic review consisted of in-person group programs only. This result is also consistent with our previously published results from a smaller study of the PWD program in which we found that women who participated in the online PWD program reported similar lower depression scores following the intervention than those who were in a control group (Guevara, Morales et al. 2023).

For the main outcome of parent-child interactions, we found little change in any of the 8 subscales of the PCERA in either group, reflecting little to no improvements in parenting practices. However, women in the intervention group reported improvement in their sense of parenting competence, while women in the control group did not. We speculate that while women derived more self-efficacy from the PWD program, this knowledge didn't translate into observable changes in their interactions with their infants as measured by the PCERA.

One reason that women in the PWD group may not have shown improvement in their parenting interactions with their infants may be their low level of engagement in the program. Although they all nearly universally viewed the weekly content, fewer than half posted comments each week. This latter finding suggests that intervention participants had little active engagement with the content and likely exercised little practice to improve their parenting skills based on the content. Another reason for the lack of improvement in parenting interactions may be that attempts to facilitate teaching of parenting skills through online content was insufficient. Future efforts to provide parenting education via a social media or other digital health platform may need to consider direct coaching strategies including active skill building sessions with participants (e.g. zoom or other videoconferencing sessions with participants to coach skills in lieu of only posted content) and more engaging materials (e.g. brief visually appealing video clips in lieu of longer narrated PowerPoint slides).

Infants whose mothers participated in the PWD program did not demonstrate differences in developmental outcomes when compared to infants whose mothers only received an online CBT program. Given that there were few changes in parent-infant interactions in both groups, as measured by the PCERA, it is not surprising that infants in the PWD group did not demonstrate

greater gains in child development than the control group. In fact, a notable percentage of infants in both groups exhibited mild developmental delays, consistent with prior research on the effects of maternal depression on infant development (Field 1992, Hay 1997, Field 1998, Koutra, Chatzi et al. 2013, Kaplan, Danko et al. 2014).

The study used Facebook, a common social media platform. Although Facebook was not universally preferred as a social media platform among younger participants of this study, it permitted us to create private groups to protect the confidentiality of participants. In addition, it allowed our study team to administer the groups, so that only those individuals who consented to participate in the study were granted access to the group and its content. Future study may consider other social media platforms that have the ability to engage participants but protect their identity.

This study had limitations. First, it was conducted in a single urban location in the U.S. with a predominantly low-income minoritized population. Results may not be generalizable to other settings with different populations. Second, the parenting program consisted only of educational materials posted to a social media group. Synchronous group virtual sessions to coach parenting skills were not included and may have lead to better engagement of participants and skill development.

Despite these limitations, this study has important implications for research. First, given the broad appeal of social media in general, social media-based educational programs have the potential to reach more individuals, particularly women with depressive symptoms and others who face challenges with attendance at in-person meetings. Second, the ubiquitous nature of social media in most countries suggests that social media-based interventions and programs can be easily scaled up. However, attention needs to be paid to privacy concerns of participants and availability of internet connectivity. Third, our study suggests that a social media-based educational program specifically developed for women with PPD symptoms can reduce depressive symptoms and is acceptable to new mothers. Future study will need to address engagement problems and lack of skill acquisition observed in this study to better address parenting deficits and improve parenting skills.

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