Original Paper

Development and Feasibility of a Group-Based Online Intervention to Prevent Postpartum Depression

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Abstract

**Background:** Postpartum minor and major depression (PPMD) has a 20% 3-month prevalence rate. The consequences of PPMD are significant for mother, infant, and family. There is a need for interventions that prevent PPMD that are effective and accessible, however, many barriers exist for women who attempt to access perinatal depression prevention programs. Internet interventions for the treatment and prevention of depression are widely accepted as efficacious and may overcome some of the access to treatment barriers perinatal women face. However, internet interventions offered without any human support tend to have low adherence but positive outcomes for those who do complete treatment. Internet support groups often have high levels of adherence but minimal data supporting efficacy as a treatment for depression. Taken together, these findings suggest that combining the treatment components of individual interventions with the support provided by an internet support group may create an intervention with the scalability and cost effectiveness of an individual intervention and the better outcomes typically found in supported interventions.

**Objectives:** This report describes the development of a peer supported internet intervention to prevent postpartum depression and explore the feasibility and acceptability of this approach.

**Methods:** Clinic based needs assessment and focus groups were used to develop the internet intervention. Once the intervention was developed, women who were 20-28 weeks pregnant with symptoms of depression (PHQ-9 scores of 5-14) but no major depression diagnosis were enrolled in an RCT to compare 8 weeks of a CBT based peer supported internet intervention to an individual internet intervention designed to prevent postpartum depression. Assessments took place at baseline, 4 weeks, 8 weeks (end of treatment), 4 weeks and 6 weeks postpartum.

**Results:** Twenty-four women completed the RCT. PHQ-9 scores at 6 weeks postpartum remained below the clinical threshold for referral for treatment in both groups, with depression measures showing a decrease in symptoms from baseline to postpartum. At 6 weeks postpartum, only one woman out of twenty-four (4%) met criteria for PPMD. There was no difference between groups in adherence to the intervention, with an average of 14.55 logins over the course of treatment.

**Conclusions:** Results suggest women were responsive to both peer support and individual internet interventions to prevent postpartum depression and that peer support may be a useful feature to keep participants adherent.

Registration: Clinicaltrials.gov NCT02121015

**Keywords:** postpartum depression; online; Internet; feasibility; peer support
Introduction
Postpartum minor and major depression (PPMD) has a 20% 3-month prevalence rate [1]. The consequences of PPMD are significant for mother, infant, and family [2]. Loss of pleasure, low mood, fatigue, difficulty thinking, concentrating, and making decisions, and sleep and appetite disturbance all lead to impairment in daily functioning and especially in caring for an infant. Depressed mothers often show gaze avoidance, more negative and fewer positive facial expressions, and slower or mistimed responses to infant bids for attention [3]. Infants of depressed mothers show less eye gaze during feeding, less play, less positive affect, higher levels of withdrawal behavior, and are more drowsy and fussy and show higher levels of insecure attachment than infants of non-depressed mothers[2][4]. This negative impact extends to the preschool years and beyond [4][5]. In sum, PPMD leads to impairment in maternal behavior, cognition, and affect and has a clear and negative long-lasting effect on the child. The need for interventions that prevent PPMD that are effective and accessible is widely recognized. Many barriers exist for women who attempt to access perinatal depression prevention or treatment programs. These include stigma, cost, scheduling difficulties, and lack of providers and programs [6]–[8]. Structural barriers such as time constraints, lack of child care, and transportation are also substantial barriers to obtaining psychological treatment among 75% of depressed urban primary care patients [9]. Online prevention/intervention programs have the potential to overcome many of these barriers.

Internet interventions for the treatment of depression are widely accepted as efficacious [10]–[14]. Prevention interventions are fewer, but also have demonstrated support [15] [16]. These interventions commonly consist of didactic material and interactive tools to practice skills. Stand-alone individual interventions (those without any human support) typically show smaller effect sizes than coach-supported interventions, likely due to decreased adherence. While coach-
supported interventions may have improved outcomes, drawbacks include increased cost and decreased scalability. Internet support groups (ISGs), where peers provide support rather than trained coaches, are frequently utilized by pregnant women and new mothers, with 75% of mothers endorsing use of Internet delivered support [17]. However, despite good adherence and high levels of interest, ISGs have limited data supporting their efficacy for treating depression. Taken together, these findings suggest that combining the treatment components of individual interventions with the support provided by ISGs may create an intervention with the scalability and cost effectiveness of an individual intervention and the better outcomes typically found in supported interventions. There have been a number of small trials that suggest that peer support has the potential to improve adherence and depressive outcomes [18][19][20]. The aims of this article are to describe the development of a peer supported internet intervention to prevent postpartum depression and explore the feasibility and acceptability of this approach.

**Method**

**Stage I: Needs Assessment and Focus Groups**

**Needs Assessment:** In 2012, during routine clinic visits, 99 pregnant women at the Northwestern University and University of Iowa OB-GYN clinics were surveyed about their access to the internet and their interest in internet delivered depression prevention programs. Women ranged from 21-46 years old, 97 out of 99 (98%) were married or living with their partner, and 70 out of 99 (71%) were white. High speed internet was available in the homes of 91 out of 99 (92%) women, with 84 of 91 women (92%) using the internet at least “sometimes” to look for health information. Interest in an internet based program to prevent depression was high, with 71 of 99 (72%) reporting some desire to participate. Learning ways to raise a happy baby, how to avoid
post-pregnancy problems, and communicating with other pregnant women were the most frequently elicited reasons for interest in the program.

**Focus Groups:**

With IRB approval, focus groups were conducted to engage women from the target population in the intervention building process (topics, theme, usability of potential application). Focus groups were held July through September 2014 with a total of six participants. Two groups were held in-person on campus at one of the participating institutions; the third group was held online for ease of data collection and participation. All were facilitated by a psychologist consultant for this grant, and analyzed using a phenomenological approach to qualitative analysis [21].

**Participants**

Participants were recruited by word-of-mouth from investigators at the two participating institutions and through recruitment flyers distributed around the campus of one institution. Participants ranged in age from 25-45, reported median income of $100,000.00 and education level as graduate or post-graduate. Furthermore, 100% of the sample identified as Caucasian, and 100% were partnered/married. One participant was still pregnant (0 children), 2 participants reported having 2 children each, and 3 participants reported 1 child in their household.

**Procedures**

Questions were formulated along three lines of inquiry: 1) Pregnancy topics of interest (topics about which women might be seeking more information); 2) Themes for the intervention (motifs and look/feel of the internet site); 3) Use of the intervention (how, when and why they might interact with the intervention).
Investigators defined pregnancy topics of interest in initial meetings regarding creation of the intervention, and vetted these to focus groups. Investigators also asked for any topics participants did not see included in this pre-made list. Participants were initially asked for themes they had either seen or thought of themselves in response to pregnancy, mothering, babies, etc. Three themes for the intervention had already been created by the research team in conjunction with the application development team, and were vetted among focus group participants. Finally, participant interest in using the proposed intervention was gauged through the use of diagrams of pre-determined themes, potential topics as discussed in the focus group, and the broader concept of social media for information and community.

Results

Topics. Topics to be included in the final version of the intervention fell within three common categories – Physical Changes (mother and fetus), Logistical Challenges, and Emotional Stresses.

In terms of Physical Changes, three of the six women (50%) reported that including information on body changes - such as weight, body after baby, changes during and after pregnancy, and breastfeeding - would be helpful. The implication was that simple psychoeducation itself would ease anxiety levels. Logistical challenges – including the broad “different strategies work for different kids” and the specific “When to amend your will” were the second most common response in terms of topic category. Finally, all six women (100%) described some sort of Emotional Challenge they had anticipated at some time during their pregnancy, including the fears of “Am I meant to be a mother” and “the experience of having a baby is not ‘easy’ or ‘happy’ or ‘blissful’”. Each woman described including these topics in an
app designed to prevent postpartum depression, or at least recognize it early on if it were to occur, as a helpful, if not essential, goal.

Themes. In reviewing predetermined themes offered for the overall appearance of the app, the overwhelming favorite (N=6, 100%) was a Flower Garden. This theme seemed to reflect the undercurrent of “new” and “emerging” in spontaneous participant answers. One participant stated, “…the flower theme…I think it has a positive tone of growing and new life.”

Participants also felt strongly and negatively toward the predetermined themes of Egg in a Nest and Fish Bowl. One participant commented, “Not sure about the eggs…reminds me of something to eat.” And even more strongly, “I don’t know what I would want – but I know I wouldn’t want anything with teddy bears, ducks, or other baby animals.”

Use. Participants were asked a number of questions about their anticipated or hypothetical use of an intervention during pregnancy. Participants suggested notifying program participants of new content via any number of messaging systems, including text, email, push notification, or pop-up within the app. Participants suggested the information in the intervention should be credible, monitored by an authority or third party figure, and should include information about how to use the app, as well as how to be social on the app. In this way, study participants could create a supportive, informative community. Finally, participants suggested incentivizing social interaction on the intervention with changes in the Flower Garden environment, like growth or more flowers in the garden as interpersonal activity or use of the app increases.
Stage II: Pilot Trial

Participants and Procedures

24 pregnant women in their second trimester participated in exchange for compensation. The sample was predominantly Caucasian (17 of 24; 72%) with 2 of 24 (8%) African American, 2 of 24 (8%) Asian or Asian American, 2 of 24 (8%) Multiracial, and 1 of 24 (4%) Latina. The average age was 30.5 years (SD=4.05). The majority of the sample was married or cohabitating (20 of 24; 83%), and were employed either part-time or full-time (16 of 24; 67%).

Eligible participants were 18 years of age or older, between 20-28 weeks gestation at time of baseline assessment, had a score between 5-14 on the PHQ-9, were able to read and speak English, and had access to the internet on any device. Exclusion criteria included diagnosis of a major depressive episode, psychotic disorder, bipolar disorder, substance use disorder or other diagnoses using the Mini International Neuropsychiatric Interview (MINI), current use of psychotropic medications, intention to resume antidepressant medication after delivery (if women discontinued use during pregnancy), currently in group psychotherapy, and endorsed suicidality (with separate procedures in place for responding to these women). The rationale for the PHQ-9 eligibility criteria is that subthreshold depression symptoms are a common criterion for entry to prevention programs [22], [23]. The purpose of prevention interventions is to halt the progress towards PPMD thus identifying those already on the trajectory is important.

All women who met eligibility criteria from May 2015 to August 2015 were invited to participate in the study. Participants were identified by the University of Iowa’s Institute for Clinical and Translational Science (ICTS). The ICTS accessed the medical records from the University of Iowa Hospitals and Clinics and generated a list of women who were currently pregnant and 18 years of age and older. UI research team members followed up with the women
generated from that list to inquire about interest in participation. Additionally, University of Iowa and University of Illinois-Chicago employed use of mass-email and advertisement via Research Match.

Interested participants were directed to the study web page where they completed the initial online screener. Consent was obtained prior to completion of the screening questionnaire. Eligible women were invited to complete the baseline clinical phone interview and self-report assessments, which was the final step in determining eligibility for the study. Once women completed the assessments and were deemed eligible, they were randomized into a cohort. This is discussed in greater detail below.

All procedures were approved by the Institutional Review Boards at the University of Iowa, Northwestern University, and University of Illinois-Chicago.

**Study Design**

Participants were randomized in groups of seven to nine to either the Share (group) condition, or the Control (individual) condition. 18 women comprised the Share condition, and 7 women comprised the Control condition. Subsequent to randomization, participants had an initial 20-minute phone call with the study staff to establish rapport, ensure site functionality, and elicit change-talk via motivational interviewing. Study staff had no additional contact with participants except for regularly scheduled assessments. Study data were collected and managed using REDCap electronic data capture tools hosted at the University of Iowa [24].

**The Website**

The Sunnyside website was an 8-week online prevention intervention developed by research partners at Northwestern University [25]. The Sunnyside website is based on cognitive behavioral principles [26] that consisted of 16 core didactic lessons (plus three booster sessions)
and five associated tools. See Table 1. for an overview of intervention content. Each lesson, which required 10-15 minutes to complete, was uniquely designed to provide information about pregnancy and postpartum issues, as well as the tenants of cognitive behavioral therapy (CBT). At the conclusion of each lesson, women were prompted with a “Call to Action” slide that encouraged them to directly apply the CBT strategies that were learned in the lessons. The lessons were comprised of text and video material. In addition to the eight weeks that comprised the core portion of the intervention, participants also completed booster sessions, which were lessons made available at two weeks, four weeks, and six weeks postpartum.

New lessons and accompanying tools were released twice a week, and participants received an email notification upon the release of this material. The initial lesson introduced the cognitive behavioral principles utilized throughout the intervention, and explained how one’s thoughts and behaviors affect their moods and physical being. Associated tools served to complement the lessons by having the women directly apply the CBT strategies that were discussed in the lessons. The program contained 5 tools: “Think,” “Feel,” “Do,” “Relax,” and “Achieve.” Taken together, the lessons and tools provided useful information and additional resources on how to manage mood, and also how to cope with depression and anxiety.

Content and layout was identical for the Control and Share, with the exception that the Share site featured a newsfeed and accountability features. While the Control participants focused on the lessons and interactive tools on the website, the Share participants also collaborated through the “Activity Feed.” The “Activity Feed” was a constantly updating feed that displayed each of the women’s activity on the site. Here, participants were able to post, “like”, and comment or provide feedback to other women’s posts. Discussion questions were posted with the release of each lesson in order to encourage interaction.
Share participants also maintained an “Individual Garden Plot” as well as a “Community Garden” that were linked to user profiles. Women provided information about themselves in the Profiles in order to increase group bond. In both of the garden plots, incentives, like garden gnomes or flower collections, were earned by completing various tasks on the site, such as reading a new lesson or posting on the feed, but they were only added to the Community Garden once each of the group members had completed the identified task. The Flower Garden provided a visual representation of each participant’s site use in order to increase accountability to each other on task completion. Women were also able to reach out to each other with a generic “nudge” message that sent an email indicating that a specific group member requested return to the site. A deliberate decision was made to not allow private messaging between participants in order to encourage interaction on the site.

Women were also provided a “Contact Moderator” tool to report any issues that arose with either the site or with group members. Staff members watched over the site to verify that medically inaccurate information was not being posted and to ensure this was a safe space for participants to disclose their feelings.

Table 1. Intervention Description

<table>
<thead>
<tr>
<th>Lesson Content</th>
<th>Associated Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week 1, Part 1</strong></td>
<td><strong>Week 1, Part 2</strong></td>
</tr>
<tr>
<td><strong>Your Mood and Your Pregnancy</strong>: An introduction to the principles and risk factors of depression during pregnancy.</td>
<td><strong>The Feel Tool</strong>: Participants are encouraged to rate their mood each time they visit the site to get a better sense of their day-to-day feelings. Participants are reminded to keep using the <strong>Feel Tool</strong>.</td>
</tr>
<tr>
<td><strong>Worries about Me and my Baby</strong>: Articulated worries that mothers-to-be have during their pregnancy and provides helpful insights into those worries.</td>
<td></td>
</tr>
<tr>
<td><strong>Mood Management</strong>: An introduction to the CBT principles of the program and how one’s thoughts and behaviors affect their moods and physical being.</td>
<td><strong>The Think Tool</strong>: Used to track one’s thoughts and discern between helpful and harmful thinking. Participants are reminded to keep</td>
</tr>
<tr>
<td><strong>Challenging Your Thinking</strong>:</td>
<td></td>
</tr>
<tr>
<td>Part 2</td>
<td>Week 3, Part 1</td>
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<tr>
<td>--------</td>
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<tr>
<td>are provided with strategies to help combat their negative thought patterns and learn new adaptive thoughts.</td>
<td><strong>Positive Activity During Pregnancy:</strong> Described how their behaviors can affect their mood and the importance of planning positive activities.</td>
</tr>
<tr>
<td>Week 7, Part 1</td>
<td><strong>Relaxation:</strong> The Mind-Body Connection is further discussed and participants are introduced to specific relation and mindfulness techniques.</td>
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<tr>
<td>Week 7, Part 2</td>
<td><strong>Employment Issues:</strong> Participants are trained how to cope with pregnancy and postpartum symptoms at work, and maternal leave is discussed.</td>
</tr>
<tr>
<td>Week 8, Part 1</td>
<td><strong>During/After the Birth: How to Manage/Resources:</strong> A review of the stages of labor, pain management during childbirth, and post-delivery tips for when the women are home with their newborns.</td>
</tr>
<tr>
<td>Week 8, Part 2</td>
<td><strong>Moving Forward and Conclusions:</strong> Participants are given a final summary of the cognitive-behavioral lessons they have learned and are reminded of the signs and symptoms of “the blues” and postpartum depression.</td>
</tr>
<tr>
<td>Booster Lesson 1</td>
<td><strong>Welcome Back:</strong> Previously-discussed topics are revisited, including postpartum depression/“the blues,” asking for help, and setting boundaries.</td>
</tr>
<tr>
<td>Booster Lesson 2</td>
<td><strong>Relationships and Unhelpful Thoughts:</strong> Participants are reminded of the importance of their bond with their partner, and the cognitive-behavioral principles of the program were revisited.</td>
</tr>
<tr>
<td>Booster Lesson 3</td>
<td><strong>Tracking and Challenging Thoughts and Planning Pleasant Activities:</strong> The connection between thoughts and positive activities are reexamined, and relaxation and mindfulness strategies are reviewed.</td>
</tr>
</tbody>
</table>
Measures

Participants completed a total of 5 study assessments, which included self-reported online questionnaires and interview-based assessments that were conducted over the phone by trained graduate students in clinical psychology. Outcomes were assessed at baseline, week 4 of the treatment program, week 8 (end of treatment), 4 weeks postpartum, and 6 weeks postpartum. Interview assessments were conducted at baseline, week 8 and 6 weeks postpartum. Self-report measures were collected at all five time points.

Depressive Symptoms

The Hamilton Depression Rating Scale (HDRS) is a 17-item scale that assesses the severity of depression symptoms. Participants are scored on a range of severity (0-4) or incidence (0-2), based on the variable. Variables include depressed mood, agitation, and somatic symptoms, among others [27]. Data on the structured HDRS support inter-rater reliability, internal consistency, and high test-retest reliability [28].

The Inventory of Depression and Anxiety Symptoms (IDAS) is a self-report tool that aims to assess specific dimensions of depression and anxiety symptomatology. It contains 10 symptom-specific scales, including suicidality, appetite, and panic, among others, as well as 2 broader scales for general depression and dysphoria. This inventory possesses both internal consistency and content validity [29]. The 20-item general depression scale was used for this study.

The Patient Health Questionnaire (PHQ-8) is an 8-item modification of the primary care evaluation of mental disorders (PRIME-MD) used to provide diagnostic criteria for depression symptoms and commonly used in depression screening. The Patient Health Questionnaire-9 (PHQ-9) is a replica of the 8-item form with the addition of a suicidality item. Participants are
scored based on the frequency of certain moods and behaviors over the last 2 weeks, from 0 (not at all) to 3 (nearly every day) [30]. The internal reliability and test-retest reliability of this measure was excellent with a Cronbach’s α of 0.89 and 0.84 respectively, and correlates strongly with other mental health assessments [31]. The PHQ-8 was administered during the initial online screening, while the PHQ-9 was used for all other assessments.

*Psychiatric diagnosis*

The Structured Clinical Interview for DSM Axis-I Disorders (SCID-I) is a semi-structured interview that guides the diagnosis of the major DSM Axis-I disorders. Its modules show excellent to good reliability and superior validity compared to clinical interviews (First, 1995). Suicidality was assessed using the suicide question from the Mini International Neuropsychiatric Interview (MINI), a brief structured interview for the diagnosis of DSM and ICD disorders [32].

*Use*

Use was examined through total number of logins, completion of tools and lessons. Peer support features (likes, comments, nudges and posts) were examined for those in the Share condition.

*Usability and Satisfaction*

Usability and satisfaction were measured using the USE questionnaire [33] which was designed to measure satisfaction, usefulness, ease of use, and ease of learning.

*Statistical Analyses*

Because this was a pilot study, descriptive statistics were used to examine the data.

*Results*

Depression
PHQ-9 scores at 6 weeks postpartum remained below the clinical threshold for referral for treatment in both groups, with measures showing a decrease in symptoms from baseline to postpartum with the exception of the PHQ-9. PHQ-9 scores in the Control group increased slightly from baseline to 6 weeks postpartum but still remain below a clinically significant threshold. One woman in the Control group met criteria for a major depressive episode at 6 weeks postpartum. See Table 2. for more information.

Table 2. Depression Outcomes

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>4 weeks</th>
<th>8 weeks</th>
<th>4 weeks postpartum</th>
<th>6 weeks postpartum</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N=6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ9</td>
<td>5.60 (3.5)</td>
<td>4.4 (3.7)</td>
<td>7.3 (4.8)</td>
<td>3.0 (0)</td>
<td>7.2 (5.4)</td>
<td>+1.6 (1.9)</td>
</tr>
<tr>
<td>HAMD-20</td>
<td>8.3 (2.9)</td>
<td>6.2 (3.9)</td>
<td>41.6 (13.7)</td>
<td>45.0 (7.1)</td>
<td>41.3 (9.0)</td>
<td>-6.0 (1.2)</td>
</tr>
<tr>
<td>IDAS</td>
<td>47.3 (7.8)</td>
<td>42.4 (9.8)</td>
<td>41.6 (13.7)</td>
<td>45.0 (7.1)</td>
<td>41.3 (9.0)</td>
<td>-6.0 (1.2)</td>
</tr>
<tr>
<td>SCID</td>
<td>0</td>
<td>0</td>
<td>17%</td>
<td>0</td>
<td>0</td>
<td>1 (17%)</td>
</tr>
<tr>
<td><strong>Share</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N=14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHQ9</td>
<td>5.1 (3.6)</td>
<td>5.8 (4.3)</td>
<td>3.7 (2.3)</td>
<td>2.3 (1.3)</td>
<td>3.7 (3.8)</td>
<td>-1.4 (.2)</td>
</tr>
<tr>
<td>HAMD-20</td>
<td>8.6 (5.4)</td>
<td>3.6 (2.0)</td>
<td>3.6 (2.0)</td>
<td>3.3 (2.3)</td>
<td>3.3 (2.3)</td>
<td>-5.3 (3.1)</td>
</tr>
<tr>
<td>IDAS</td>
<td>45.4 (6.3)</td>
<td>43.9 (6.6)</td>
<td>37.7 (4.7)</td>
<td>36.9 (7.0)</td>
<td>36.6 (4.8)</td>
<td>-8.8 (1.5)</td>
</tr>
<tr>
<td>SCID</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

Attrition and Site Use

One participant in the Share group withdrew from participation prior to beginning the intervention. Mean number of logins across the 8-week intervention plus booster sessions was 12.6 (range 5-21) for Control (N = 7) and 16.5 (range 2-35) for Share (N = 17). There was no difference in logins between groups (p=.33). The average number of lessons accessed (Control, M: 12.1, SD: 5.6; Share, M: 13.7, SD: 4.3; p = .47) and tools utilized (Control, M: 28.6, SD: 32.8; Share, M: 27.0, SD: 22.9; p=.89) was similar between groups. Data are provided in Table 3.
Table 3. Adherence Data

<table>
<thead>
<tr>
<th></th>
<th>Control N=7</th>
<th>Range</th>
<th>Share N=17</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logins</td>
<td>12.6 (6.9)</td>
<td>5-21</td>
<td>16.5 (9.3)</td>
<td>2-35</td>
</tr>
<tr>
<td>Lessons accessed</td>
<td>12.1 (5.6)</td>
<td>2-17</td>
<td>13.7 (4.3)</td>
<td>2-18</td>
</tr>
<tr>
<td>Tools used</td>
<td>28.6 (32.8)</td>
<td>1-89</td>
<td>27.0 (22.9)</td>
<td>0-67</td>
</tr>
</tbody>
</table>

Use of peer support features was fairly low (M: 5.9, SD: 5.6), however 10 out of 17 participants (59%) used at least one feature. Commenting on discussion questions or posts was most popular (59%); initiating status updates also was common (53%). The “like” and “nudge” features were utilized by fewer participants (35% and 12%).

Usability and Acceptability

At week 8, scores on USE subscales ranged from 1 (strongly disagree) to 7 (strongly agree), and fell in the average range for both groups. Control participants’ mean scores were 3.69 (SD: 1.76) for usefulness, 4.94 (SD: 0.88) for ease of use, 5.77 (SD: 0.91) for ease of learning, and 3.93 (SD: 1.70) for satisfaction. Share participants' mean scores were 4.42 (SD: 0.87) for usefulness, 4.97 (SD: 0.74) for ease of use, 5.73 (SD: 0.87) for ease of learning, and 4.58 (SD: 1.11) for satisfaction.

Discussion

This paper outlines the development and feasibility testing of a novel online intervention to prevent postpartum depression. It indicates that pregnant women are willing to use an individual intervention or a group-based program and that doing so may impact the development of depressive symptoms. At the completion of the trial, only one woman (5%) in this at-risk sample
met criteria for PPMD compared to a 17% prevalence rate seen in at-risk women in the absence of an intervention [34]. Depressive symptoms decreased across most measures from baseline to postpartum in both the Share group and the control individual condition.

Intervention use was high as compared to other online PPMD prevention interventions, with no significant difference between groups. For example, for pregnant women in the Mamma Mia trial, an automated web-based PPMD prevention intervention, the average number of sessions was 7.4 (of 16) [15]. The e-MB trial, another online individual intervention for PPMD prevention, found reasonable adherence (40.47 minutes of intervention use) but did not have a significant impact in the development of PPMD [16]. Content in Sunnyside was carefully designed to provide desired pregnancy information as well as mood management material and it is possible that this helped draw women back to the site.

Usability scores indicate that the overall user experience was satisfactory. However, limited uptake of the peer network features suggest that changes could be made to increase group discussion and cohesion. Increased utilization of peer support features might lead to greater differences between groups but given that both groups showed adequate adherence and positive outcomes, optimization of those features may not provide any further benefit.

There are several strengths in this trial. To our knowledge, this is the first online intervention for PPMD prevention that included peer social support. Social support is consistently found to be beneficial for pregnant women but can be difficult to access for many women. Women consistently utilized the intervention, even without human support, suggesting that this modality of intervention is appealing to pregnant women.

The limitations of this trial include a small sample size and short length of follow up. Ideally, follow up would be closer to six months or one year in order to determine if PPMD
developed later in the postpartum period. Additionally, most of our participants were recruited via electronic methods, such as email or Research Match, the online volunteer registry. This suggests participants were comfortable using technology. The results may not generalize to those without familiarity with the internet.

**Conclusion**

In conclusion, this study outlines the development process and feasibility testing of an online intervention to prevent postpartum depression. Results suggest that women were responsive to the intervention although it would benefit from continued refinement. Next steps include a larger trial with a longer follow up period.

**Acknowledgements**

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