

Disentangling the impact of phone coaching from online intervention for perinatal Veterans: Lessons learned from a randomized components trial with MomMoodBooster

Emily B. K. Thomas, Stephanie Nettleton, Michael W. O'Hara, Bruce Alexander

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Abstract

Background: Perinatal depression is a major public health concern, and internet-based interventions may increase access to empirically based interventions. Investigating the contributing components of internet-based interventions is critical to implementation research and sustainability efforts within healthcare systems.

Objective: This randomized components trial investigated the impact of an internet-based cognitive behavioral therapy intervention for perinatal depression, comparing the online intervention alone to the online intervention plus phone coaching, assessed with quantitative and qualitative outcomes.

Methods: Pregnant and postpartum Veterans (N = 51) were randomized to 1) MomMoodBooster (MMB) or 2) MomMoodBooster + phone coaching (MMBPC) and completed three study assessments (baseline, 3-month follow-up, 6-month follow-up). The intervention consisted of six weekly modules and two optional booster modules. Linear mixed-effects modeling was used to determine the impact of intervention condition over time on depressive symptoms, behavioral activation, and negative automatic thoughts. The impact of intervention condition throughout the intervention was assessed using the Patient Health Questionnaire-9 at weeks 1, 3, and 5 of the intervention. Qualitative analyses identified themes related to helpful aspects of the program and areas for improvement.

Results: Veterans who completed the welcome call, required for login to the intervention, were included in the analyses (n = 46). Between-assessment analyses were limited by attrition observed across both conditions. Results indicated that significant improvements in depressive symptom severity ($F(2, 54.28) = 6.16, P = .004$), behavioral activation ($F(2, 41.68) = 4.21, P = 0.02$), and negative automatic thoughts ($F(2, 39.77) = 4.10, P = 0.02$) were observed over time but not by condition ($ps > .05$). Within-intervention change also indicated a significant main effect of time ($F(2, 63.88) = 21.62, p < .001$), but not condition ($p > .05$). Qualitative analyses indicated positivity about the intervention and desire for more interaction.

Conclusions: Perinatal Veterans experienced therapeutic benefit during and after the online CBT intervention. Despite value of, or desire for, interaction depending on condition, both conditions experienced improvements in the depression, the primary outcome, and the targeted therapeutic processes. Future work should continue to explore contributing components of empirically based interventions for implementation, dissemination, and scalability efforts. Clinical Trial: The study was pre-registered on ClinicalTrials.gov (NCT05196152).

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intervention. Despite value of, or desire for, interaction depending on condition, both conditions experienced improvements in the depression, the primary outcome, and the targeted therapeutic processes. Future work should continue to explore contributing components of empirically based interventions for implementation, dissemination, and scalability efforts.

Trial Registration: The study was pre-registered on ClinicalTrials.gov (NCT05196152).

Keywords: perinatal depression; internet cognitive behavioral therapy; components trial; Veteran health; rurality

Conflicts of Interest: None declared.

Data Availability: Data access is restricted in compliance with VA policy. Analytic code can be shared upon request.

Author' Contributions: EBKT was responsible for conceptualization, formal analysis, funding acquisition, investigation, methodology, project administration, resources, supervision, visualization, writing – original draft. SN was responsible for data curation, formal analysis, investigation, project administration, visualization, and writing – original draft. MWO was responsible for conceptualization, resources, and writing – review & editing. BA was responsible for data curation, methodology, software, and writing – review & editing.

Disentangling the impact of phone coaching from online intervention for perinatal Veterans:

Lessons learned from a randomized components trial with MomMoodBooster

Perinatal depression is a significant public health concern (1). Defined as a depressive episode occurring for at least two weeks during pregnancy or the postpartum period (2), perinatal depression includes impairing symptoms of dysphoria, anhedonia, suicidal ideation, and changes in sleep or appetite, among others. Research has defined the postpartum period as up to one year following delivery (3), whereas the *DSM-5-TR* (2) defines the peripartum specifier for Major

Depressive Disorder as a depressive episode onset during pregnancy or the four weeks following delivery.

Cognitive-behavioral therapy (CBT) is regarded as a first-line treatment option for perinatal depression, and medications are recommended for those without access to psychotherapy or for those with more severe symptoms (3). Despite well-validated screening measures for perinatal depressive symptoms, screening alone is insufficient, with only 22% of women who screened positive for depression initiating mental health treatment between 1999-2014 (4). A recent meta-review identified barriers and facilitators to accessing perinatal mental healthcare across individual, healthcare provider, interpersonal, organizational, political, and societal levels (5). A critical individual-level and organizational barrier was access to care (5), which may be particularly relevant for rural-dwelling child-bearing individuals.

Rural-dwelling pregnant individuals are at higher risk for perinatal depression and lack of treatment for perinatal depression. In a population-based sample, Nidey and colleagues (6) found that odds of perinatal depression were 21% higher among rural versus urban residents. A recent meta-analysis demonstrated a global pooled prevalence of perinatal depression among women in rural areas of 22.1% (7), notably higher than the global pooled prevalence of 11.9% from a prior meta-analysis including studies with participants dwelling in any area (8). Rural-dwelling individuals also experience difficulties in accessing treatment for perinatal depression. This may in part be due to the limited availability of specialty care in perinatal mental health, as 65% of rural counties in the USA do not have a psychiatrist (9). Further, in general when seeking care, rural-dwelling individuals experience greater difficulties, such as healthcare provider shortages, rural hospital closures, and longer travel times (10,11).

United States military Veterans are more likely than non-Veterans to dwell in rural areas (12), and women Veterans are a growing proportion of Veterans who are utilizing Veterans Health Administration (VHA) healthcare (13). Moreover, the number of VHA-covered deliveries increased

14-fold from 2000-2015 (13). Veterans with VHA benefits may be navigating complexities of healthcare during pregnancy, wherein they may seek care from a non-VHA obstetrician during pregnancy (paid for by VHA), a non-VHA pediatrician for their child following delivery, and return to a VHA primary care or women's health provider during the postpartum period and beyond (14). With the help of a maternity care coordinator, Veterans may navigate across-healthcare system care during this critical window for mother and child. A health services evaluation demonstrated improved prenatal care with maternity care coordination (15).

Internet-based interventions

One proposed method of increasing access is internet-based interventions (IBIs). A meta-analysis of IBIs for depression underscored effectiveness and the potential of IBIs to reduce gaps in access to care (16). A component network meta-analysis examining components of internet-CBT identified behavioral activation and non-specific treatment effects as most associated with reductions in depressive symptoms, and all internet CBT interventions were superior to waiting list controls (17). In addition, human encouragement alongside internet CBT was associated with reduced dropout and enhanced efficacy (17). A meta-analysis of computer-based psychological treatments for depression found improvements in symptoms for all interventions but showed greater effect sizes for interventions with therapist support (18). This is in line with previous research that found that support moderated the effect of treatment on depression outcomes, with supported treatments resulting in significantly greater symptom reductions (19). One trial that compared guidance from a technician versus a clinician revealed that guidance from a technician was equally as effective as guidance from a clinician (20).

With perinatal samples specifically, IBIs have also been examined. O'Mahen and colleagues found that an online CBT intervention reduced perinatal depressive symptoms significantly more than treatment-as-usual, and on average, women completed more telephone support sessions than online modules (21). Internet CBT for perinatal depression has also been found to be effective with

low-income mothers (22). A meta-analysis examining the efficacy of internet delivered depression interventions for the perinatal period found medium ($d = 0.55$, 95%, CI 0.33–0.76) to large ($d = 1.03$, 95%, CI 0.35–1.67) ($Mdn=0.46$) effect sizes for depressive symptom reductions (23).

MomMoodBooster (MMB) is an internet-delivered intervention that was first examined for efficacy in treating postpartum depression (24,25) and has since been updated with content for pregnant and postpartum women (26). MMB has also been utilized in Australia, labeled MumMoodBooster (25), where it was used as part of a nationally-funded public health resource (27). The intervention has been utilized in several different studies (24–26,28) including with Veteran samples (29,30). Our prior work has implemented MMB with postpartum Veterans, finding that the intervention was no less impactful for rural versus urban Veterans in terms of depressive symptoms, behavioral activation, and negative automatic thoughts (29). This VA study included the integration of weekly phone coaching calls alongside the six weekly online modules (29). When examining the post-intervention free-text feedback from postpartum Veterans, the interpersonal components of the intervention (i.e., the connection with the phone coach) were most often indicated as a valuable aspect of the intervention (30). The findings led to a critical question about the differential impact of the intervention components – namely, the online MMB intervention and the added phone coaching calls.

Dismantling or component trial designs allow for the examination of an intervention's components in terms of their impact upon key outcomes (31). Given prior studies that have examined effective components of internet CBT for depression, combined with evidence for MMB in perinatal individuals, the critical next step in this work was to identify whether the phone coaching component of the MMB intervention was additive above and beyond the online MMB intervention in reducing depressive symptoms.

Objectives of the Present Study

The present study sought to examine the additive impact of the phone coaching component by

randomizing perinatal Veterans to MMB (online only) or MMB with phone coaching (MMBPC). Key outcomes of interest were depressive symptoms, behavioral activation, and negative automatic thoughts. Following the release of a version of MMB suitable for pregnant and postpartum women (26), the authors were eager to recruit both pregnant and postpartum Veterans for this study. Moreover, given that concerns related to access to empirically based interventions may be more pronounced among rural-dwelling Veterans, the authors overrecruited rural Veterans where possible. The study was pre-registered on ClinicalTrials.gov (NCT05196152).

Method

Participants

Childbearing Veterans with a confirmed pregnancy or live birth in their record were recruited between March 2022 and August 2023. Rural-dwelling Veterans were overrecruited in this study. Rurality was determined with Veteran's home address, which were utilized in the conversion to USDA Rural-Urban Commuting Area (RUCA) codes (32). The Veteran location data included urban, large rural, small rural, and isolated categories. The 3 rural categories were collapsed into rural-dwelling/non-rural-dwelling, and we over-sampled 2:1 (rural: non-rural) for both the live birth and pregnancy cohorts when there were sufficient rural-dwelling Veterans from which to sample.

Potential participants were mailed recruitment letters with information about the study and then contacted by phone to screen for interest and eligibility. Inclusion criteria were: age between 18-50 years, currently pregnant or no greater than 26 weeks postpartum, and having access to a smartphone or internet connection. Veterans were screened with the Patient Health Questionnaire-9 (PHQ-9), which has been validated for use in perinatal and Veteran samples (33–37). The recommended minimum score of 10 for inclusion (38) was utilized, with Veterans scoring 10 or more being eligible for the study. The Mini International Neuropsychiatric Interview (M.I.N.I.) was used to screen for manic and psychotic symptoms (39). Individuals that endorsed current or past manic, current hypomanic episodes, or current or past psychotic symptoms were ineligible for the study. If

individuals endorsed suicidal intent or plan, they were referred to emergency care as applicable, but this was not an exclusion criterion. See CONSORT diagram in *Figure 1*.

Procedures

Following IRB approval (Protocol #: 202102537 & 202104724), eligible Veterans were mailed a written informed consent document and 10-0493 Authorization for Use and Release of Individually Identifiable Health Information Collected for VHA Research form. Veterans completed a baseline assessment prior to randomization to intervention condition. Conditions included online intervention without phone coach (MMB) and online intervention plus phone coaching calls (MMBPC). Conditions were randomly assigned by a non-interventionist at a 1:1 ratio. Veterans were then assigned a phone coach and began engagement in their assigned condition. The program involved a welcome call and 6 online modules for both conditions. Phone coaching condition Veterans received weekly phone calls that were to be completed after reviewing the online modules. Booster calls were also available for both conditions at 3 and 6 months after enrollment.

Veterans were mailed questionnaires 3 and 6 months after enrollment in the program. Follow-up assessments included questionnaires and open-ended questions to elicit feedback about the helpfulness of the program, what worked, and what could be improved. Similar questions were asked of Veterans assigned to the phone coaching condition to elicit feedback regarding the coaching calls specifically.

Online Intervention Content. The MomMoodBooster intervention (26) includes six modules over the course of six weeks, with one module introduced each week. The sessions include: 1) Get Started, 2) Manage Mood, 3) Increase Pleasant Activities, 4) Manage Negative Thoughts, 5) Increase Positive Thoughts, and 6) Plan for the Future (24). The program utilizes text, audio, video, self-reflective exercises, and homework.

Booster Session Online Content. Veterans had the choice to participate in two booster sessions in addition to the 6-week intervention. Booster sessions were offered at 3 and 6 months after

completion of the 6-week intervention. The focus of these sessions was on reiterating the topics that were focused on in the intervention and extending to topics such as self-compassion. The booster session content was hosted on a different site than the MMB primary intervention, and it was created for use in the Veteran cohorts specifically.

Randomization. Veterans were randomized to conditions as described below:

- 1) **MMBPC.** Veterans assigned to MMBPC received weekly calls to apply the content to their current context. The phone calls lasted 15-30 minutes. Calls were focused on monitoring the Veteran's mood, encouraging them to use the program, and practicing the recommended strategies. Veterans who had not completed the online content were encouraged to do so. On weeks 1, 3, and 5, coaches administered the PHQ-9 to assess depressive symptom severity. Text message reminders were sent to Veterans 24 hours before their scheduled phone call.
- 2) **MMB:** Veterans assigned to the MMB condition received calls during weeks 1, 3, and 5 of the online intervention to assess depressive symptom severity with the PHQ-9. Text reminders were sent to Veterans 24 hours before the scheduled phone call. These calls did not include discussion of the intervention content. Veterans who had not completed the online content were encouraged to do so.

Suicidality. When administering the PHQ-9 in both conditions, a suicidality protocol was in place if Veterans endorsed item 9 assessing suicidal ideation on the PHQ-9. If endorsed, the phone coach administered the Columbia Suicide Severity Rating Scale to determine risk level and next steps. Safety plans were created as appropriate. Emergency phone numbers or resources were provided to Veterans as applicable.

Measures

Depressive symptoms. The PHQ-9 was utilized to assess depressive symptom severity (40). This is a 9-item measure that assesses the severity of depressive symptoms. This scale has been

validated for use in normative (41) and psychiatric samples (42). Internal consistencies in this study were adequate (week 1 $\alpha = 0.73$; week 3 $\alpha = 0.78$; week 5 $\alpha = 0.73$).

Internalizing symptoms. The Inventory for Depressive and Anxiety Symptoms, expanded version, was utilized to measure depressive and anxiety symptoms (43). The IDAS-II is a self-report questionnaire that assesses symptoms of depressive and anxiety symptoms, including posttraumatic stress, panic, social anxiety, and obsessive-compulsive symptoms. The General Depression composite scale includes symptoms from depressive subscales and was the primary outcome of interest in this study. The IDAS-II has available norms (44) and clinical significance thresholds (45). Internal consistencies in this study were adequate (baseline $\alpha = 0.88$; 3-month follow-up $\alpha = 0.80$; 6-month follow-up $\alpha = 0.89$).

Behavioral activation. Changes in behavioral activation were assessed utilizing the Behavioral Activation for Depression Scale (BADs) (46). This 25-item self-report measure consists of a total score and four subscales. This scale has been validated in non-depressed samples (46) and a sample with elevated depressive symptoms (47). Internal consistencies in this study were adequate (baseline $\alpha = 0.89$; 3-month follow-up $\alpha = 0.90$; 6-month follow-up $\alpha = 0.81$).

Automatic thoughts. Negative automatic thoughts were assessed utilizing the Automatic Thoughts Questionnaire (48). This is a 15-item self-report questionnaire that assesses the severity of automatic thoughts in individuals suffering from depression. This scale has been validated to discriminate between depressed and non-depressed groups (49). Internal consistency in this study was adequate (baseline $\alpha = 0.94$; 3-month follow-up $\alpha = 0.95$; 6-month follow-up $\alpha = 0.93$).

Qualitative Data Collection Procedures

Veterans were sent follow-up questionnaires at 3-months and 6-months following study enrollment. The questionnaires included outcome measures and two to four open-ended questions about the program, depending on program condition. Veterans in MMBPC were asked four questions about the program and the phone coaching calls. Veterans in the MMB condition were asked two

questions about the program. Veterans were free to skip any questions they did not wish to answer. Several Veterans chose to not respond to any of the qualitative questions, and some Veterans answered select questions. All responses were included in the analysis. The questions are referenced throughout the manuscript using the headings: 1) program helpful, 2) program improve, 3) coach helpful, and 4) coach improve. The language for each question is detailed below:

1. Program helpful: “In what ways did you find the MomMoodBooster most helpful?”
2. Program improve: “How do you think the MomMoodBooster could have been improved?”
3. Coach helpful: “In what ways did you find the phone coaching calls helpful?”
4. Coach improve: “How do you think the phone coaching calls could have been improved?”

Statistical Analyses

Quantitative Analysis. Linear-mixed effects modeling was used to model changes across time as a result of the intervention condition. RStudio (version 4.3.2, 10/31/2023) was utilized to conduct analyses using packages *lme4* (50) and *lmerTest* (51). Significance was calculated using Satterthwaite’s method to estimate degrees of freedom and *p*-values for mixed models (51). REML estimates of variance components were used. Estimated marginal means were utilized in figures.

Attrition between assessments was considerable, with only 14 Veterans completing all measurements. All Veterans who completed the welcome call ($N = 46$) were included in the analysis, as the welcome call was necessary to login to the intervention. 46 completed the baseline assessment, 22 Veterans completed follow-up 1, and 18 Veterans completed follow-up 2. Within-intervention change analyses using the PHQ-9 at weeks 1, 3, and 5 were considered more reliable as compared to baseline and follow-up assessments given significant attrition.

The model formula was Depressive Symptom Severity $\sim$ Time + Condition + Time*Condition + (1|Veteran). The main effect of time examined change in depressive severity over time, and the main effect of condition examined depressive symptom differences between the MMB and MMBPC conditions. The interaction examined changes in depressive symptoms over time by

condition. The random effect of Veteran controlled for individual variability in depressive symptom severity. Effect sizes Cohen's d were calculated using the 'effectsize' package for R. The within-intervention outcome was depressive symptom severity measured at weeks 1, 3, and 5 during the intervention. Moreover, outcomes of depressive symptom severity, behavioral activation, and automatic thoughts were measured at baseline, 3-month follow-up, and 6-month follow-up.

Qualitative Analysis. Coders utilized the derived from a previous trial of MomMoodBooster with postpartum Veterans (Solness et al, 2023). Two coders individually coded each qualitative response into identified themes and/or subthemes. Upon completion, the coders discussed and attempted to resolve any discrepancies in coding. The outcome of coding resulted in an interrater reliability Kappa of 0.863 and percent agreement of 98.9%.

Results

Engagement in the intervention

Engagement was measured among those who completed at least one call as part of the intervention, which was required to convey login information. Regardless of condition assignment, Veterans completed the PHQ-9 at weeks 1, 3, and 5 during the intervention. For Veterans in the MMBPC condition, the six coaching calls additionally reinforced the skills conveyed in the online component and applied the skills to the Veteran's ongoing context. The within-intervention phone calls had better response rates than the mailed follow-up assessments. For week 1, 80.4% completed (84.6% MMB, 75% MMBPC); for week 3, 70.6% completed (84.6% MMB, 54.2% MMBPC); and for week 5, 66.7% completed (80.8% MMB, 50% MMBPC). Engagement with specific modules is detailed in the *Supplemental Materials*.

Change from baseline to follow-up assessments. Depressive symptom severity from baseline to follow-ups was examined, but these data were severely limited by missingness. Only 14 Veterans completed all 3 assessments. 45% of Veterans completed 3-month follow-up (46.2% MMB;

45.8% MMBPC), and 38% of Veterans completed 6-month follow-up (46.2% MMB; 29.2% MMBPC).

As such, mixed-effects models were used to be maximally inclusive of assessments that were completed. There was a significant main effect of time, $F(2, 54.28) = 6.16, P = .004$. There was not a main effect of condition, $F(1, 51.31) = 0.49, P = 0.49$. The omnibus interaction term was not statistically significant, $F(2, 54.28) = 0.22, P = 0.80$. Further investigation of specific time points indicated that there was not a significant change between baseline and 3-month follow-up, $t(54.35) = -5.15, P = 0.19$, but reductions between baseline and 6-month follow-up were significant, $t(53.84) = -3.26, P = .002$. See *Figure 2* for graphical depiction of the change between assessment time points.

[Insert *Figure 2*]

Behavioral activation and negative automatic thoughts were investigated as key targets of CBT interventions from pre-intervention to follow-up assessments. For behavioral activation, there was a significant main effect of time, $F(2, 41.68) = 4.21, P = 0.02$. There was not a main effect of condition, $F(1, 49.48) = 0.89, P = 0.35$, nor a significant time by condition interaction, $F(2, 41.68) = 0.84, P = 0.44$. Further investigation of specific change between time points indicated that there was a significant increase in behavioral activation from baseline to three-month follow-up, $t(42.19) = 2.36, P = 0.02$, but not from baseline to six-month follow-up, $t(42.13) = 1.52, P = 0.14$. For negative automatic thoughts, there was a significant main effect of time, $F(2, 39.77) = 4.10, P = 0.02$. There was not a main effect of condition, $F(1, 48.96) = 0.17, p = 0.69$, nor a significant time by condition interaction, $F(2, 39.77) = 0.48, P = 0.62$. The model including parameters for change between each assessment, neither change between baseline and three-month follow-up ($t(40.99) = -1.23, P = 0.22$), nor between baseline and six-month follow-up ($t(40.91) = -1.66, P = 0.10$), were statistically significant.

Within-intervention change. Data from the PHQ-9, administered via phone during weeks 1, 3, and 5 of the intervention, were most complete. Three items were missing in total (0.002%), and

these items were imputed using person-mean imputation. When a phone call was not answered, and thus no items were completed, no data were imputed. Linear-mixed effects modeling was used to model change in depressive symptom severity across weeks. Linear-mixed effects models have the advantage of inclusion of random effects, which control for individual variability and can utilize all available data. These analyses exclude 5 Veterans who never completed the welcome call, thus preventing them from having a login to the online intervention, as well as 1 Veteran who was not provided their assigned intervention condition.

Results indicated that there was a main effect of time, $F(2, 63.88) = 21.62, p < .001$, such that depressive symptom severity decreased over time. The main effect of condition was not statistically significant, $F(1, 37.18) = 2.94, P = 0.09$. The time by condition interaction was not significant at the omnibus level, $F(2, 63.88) = 2.27, P = 0.11$. When examining individual week parameters, there was a significant decrease in depressive symptoms over time from weeks 1 to 3 ($t(62.18) = -2.54, P = 0.013, d = -0.45$) and from weeks 1 to 5 ($t(62.55) = -3.617, p < .001, d = -0.65$). Examining changes over time by condition, there were not significant differences from weeks 1 to 3 across conditions ($t(65.01) = -0.50, P = 0.61, d = -0.14$). However, there were significant differences from weeks 1 to 5 across conditions ($t(65.38) = -2.06, P = 0.04, d = -0.61$). Estimated marginal means at week 5 indicated that Veterans in the MMB were on average experiencing moderate levels of depression ($EMM = 11.43, SE = 1.06, CI = 9.31 - 13.55$), and Veterans in the MMBPC were on average experiencing mild levels of depression ($EMM = 7.17, SE = 1.34, CI = 4.51 - 9.83$). See changes across weeks by condition in *Figure 3*.

[Insert *Figure 3*]

Qualitative Results

The sample included in the qualitative analyses consisted of Veterans enrolled in the MMB program who completed the open-ended questions in either the 3-month follow-up questionnaire, the 6-month follow-up questionnaire, or both. Veterans were included if they provided responses to at

least 1 of the free-response questions. Veterans were excluded from the analysis if they did not provide a response to any of the qualitative questions in the 3-month or 6-month questionnaire. Individual responses were excluded if they were uninterpretable or ambiguously illegible. If Veterans responded to both the 3- and 6-month questionnaires, responses were coded independently, which means that if the two responses were near identical, these responses would be coded and reported for each time point. Additionally, responses that fell under multiple codes were assigned to each code that applied. Although the modal number of codes assigned to a response was 1, 42% of responses received >1 code, and the range of codes assigned to responses was 1-4. Further, responses were coded based on content regardless of the question being asked. As such, if Veterans answered a question regarding phone coaching and mentioned the program, it was coded as a program-related code rather than a coaching code.

3-month: 21 Veterans completed 3-month follow-up program questions. 11 Veterans completed 3-month follow-up phone coaching questions.

6-month: 20 Veterans completed 6-month follow-up program questions. 7 Veterans completed 6-month follow-up phone coaching questions.

The thematic analysis resulted in a final structure consisting of five domains based upon the written free-text responses: (1) program accessibility and functionality, (2) content, (3) coaching, (4) change processes, and (5) barriers. Each is described further in the *Supplemental Materials*. See *Appendix 1* for further details on the domains, themes, and subthemes. Participant numbers are utilized herein to avoid conveying any identifying information.

Based on the qualitative results, Veterans enjoyed the program, content, and coaching. More specifically, 41% of all program codes were positive, with Veterans enjoying the program structure and content. For example, participant 28 wrote, “It was nice to have a reminder that I am not the only one with these feelings. I liked the videos for a visual, plus reading the articles. It was great to recognize how many things you did each day for you.” Approximately 47% of program codes fell

under the improve categories, with improving delivery mode being the most common theme at 46% of improve codes. Common areas of improving delivery modes were the desire for more guidance and more interaction with either a coach, counselor, or other participants. Thus, desire for interaction and guidance were prominent. 71% of coaching codes were positive, and the only suggestion for improvement was desire for more coaching calls. A quote that demonstrates the importance of the coaching calls read: “The counseling alongside MomMoodBooster made the program. Without that human interaction it wouldn’t be as easy to incorporate, it would just be head knowledge. They are there to discuss, answer questions, provide guidance and support. I solve problems all day in my head; actually taking action steps is entirely another ball game.” In terms of differences between conditions, there were a larger proportion of responses from Veterans in the MMB condition, with 64% of the program specific question responses being from MMB condition Veterans (48 vs. 27). Those in the MMB condition also had a higher percentage of the program improve codes, with 70.2% of the improve codes being from Veterans in the MMB condition (29 vs. 8).

Discussion

Perinatal depression remains a major public health concern, impacting the birthing parent and family unit (1). Access to empirically based treatments is particularly limited in rural areas, and IBIs are one solution to increase accessibility and scalability of interventions. However, key components of these interventions are critical to explore in dismantling trials to characterize the aspects of the intervention that contribute to change and are valued by Veterans.

The current study aimed to evaluate the impact of the addition of phone coaching to the MomMoodBooster program by randomizing individuals into one of two conditions: MMB or MMBPC. To examine the impact, we collected data regarding depressive symptoms, behavioral activation, and negative automatic thoughts. Moreover, qualitative responses were collected from Veterans to determine impressions of the program, coaching, and areas for improvement. Further, we were interested in examining the MMB program with pregnant and postpartum Veterans as previous

trials included postpartum Veterans only. Additionally, recognizing that rural-dwelling Veterans may face greater barriers to accessing evidence-based interventions, the authors overrecruited rural-dwelling Veterans.

Results indicated that depressive symptoms decreased across assessments over time for both conditions. There were no between-group differences by condition, nor was there a significant condition by time interaction. The findings for behavioral activation and automatic thoughts mirrored the depressive symptom changes over time. Within-intervention findings indicated a main effect of time, such that depressive symptoms decreased during the intervention. There was a significant difference in change between conditions from weeks 1 to 5, such that the MMBPC had greater decreases in depressive symptoms. Clinically significant reductions in depressive symptoms across weeks of the intervention were observed, such that Veterans in the MMB condition were experiencing moderate levels of depression on average at week 5, and Veterans in the MMBPC condition were on average experiencing mild levels of depression at week 5. Notably, these findings are based upon the PHQ-9, a self-report measure of depressive symptom severity, not a structured interview.

Our results are consistent with literature that indicates that both guided and unguided interventions have been found to decrease depressive symptoms (52). A recent meta-analysis indicated that CBT interventions had larger effect sizes, and therapist-guided interventions were more effective than non-guided interventions (53). Critically, our study integrated quantitative outcomes (i.e., depressive symptoms, behavioral activation, automatic thoughts) with qualitative outcomes (i.e., helpful aspects of program and coaching, areas for improvement). Beyond improvements in symptoms and therapeutic processes, it is critical how the program is perceived by participants. Our findings indicated that across the duration of the study, Veterans improved in terms of reduced depressive symptom severity regardless of condition. Veterans in the phone coaching condition had greater reductions in depressive symptom severity between weeks 1 and 5 of the

intervention.

The qualitative findings indicated that Veterans in the MMB condition expressed desire for interaction, and some Veterans in the MMBPC condition desired more interaction with the coach. There was a larger proportion of qualitative responses from Veterans in the MMB condition, with 64% of the program-specific question responses being from the MMB condition. The Veterans in the MMB condition also made up 70.2% of the program improve codes. Moreover, the highest proportion of codes from the qualitative analysis were those in the improve category, and delivery mode was the most common subtheme. Many MMB-condition Veterans reported a desire for more structured interaction with a coach throughout this intervention. For MMBPC, the qualitative responses were highly positive, with 71% of coaching codes falling under the positive codes. When asked about the amount of coaching calls, every responder indicated wanting more time with the phone coach. This is in line with previous work with Veterans utilizing the MMB program, wherein analyses found that three times as many Veterans indicated wanting more time with the phone coach compared to those who indicated the opposite (Solness et al, 2023). Thus, although the MMBPC condition did not report greater reductions in depressive symptom severity at follow-up than the MMB condition, the Veterans found benefit from, or when absent desired, the interactive component of the interaction. As such, there may be benefits to the coaching that were only captured via the qualitative analysis.

In terms of change processes, when asked about the program specifically, intrapersonal factors were cited as the most common code among responders. For the coaching condition Veterans, change processes that cited the coach specifically mentioned practical assistance and accountability the most. This is in contrast with prior work, where authors found that 60% of coach codes were related to interpersonal processes, and more than 40% were related to coach qualities (Solness et al, 2023). This may be due to individual differences in the Veterans, wherein some had more practical questions about working with the website or the content, and others enjoyed being held accountable

to keep up with the content. Critically, the version of the MomMoodBooster intervention that was employed was altered to meet VA security requirements in research, such that frequent text reminders to implement the skills were not offered, which may have altered impressions of the intervention implementation.

One challenge in this study was recruiting and retaining sufficient Veterans for reliable analyses. We recruited via mailed letter and follow-up phone calls, and this resulted in a large proportion of our potential participant pool being unresponsive to our contact attempts. This broad-based recruitment strategy was largely ineffective in reaching potentially interested Veterans. One possibility is that email recruitment or utilization of electronic surveys may have reduced barriers to participation. Self-report questionnaire data were also mailed to Veterans, and there were several instances in which questionnaires were not received by Veterans or arrived to the research team well after the mailed date. Electronic completion options may have increased likelihood of questionnaires being returned. In the future, utilizing email for recruitment and sending surveys would likely improve recruitment efforts and survey responses.

Beyond the individual and familial impacts of interventions that reduce human suffering, one study estimated that untreated perinatal mood and anxiety disorders in 2017 cost the United States \$14 billion from conception through 5 years postpartum (54). Access to empirically based interventions may have wide-ranging, longitudinal impacts on pregnant and postpartum women, as well as their families. IBIs offer an important solution for increasing access, and investigating the active ingredients of these interventions is critical to furthering implementation science.

Limitations & Strengths

This study's findings should be considered in the context of several limitations. We did not measure depressive symptom severity using a structured interview, nor was diagnostic information gathered. Self-report measures were utilized, which introduces possible bias related to the measures that were selected or repeated administration of these measures. Moreover, significant attrition was

observed at the two follow-up time points, which limits the ability to draw conclusions about the entire sample. The results across the study assessments should be interpreted with caution, and within-intervention assessments are considered more reliable as attrition was less prominent. Moreover, between-condition differences were not observed in the main effects; we may have been underpowered to observe such effects. Use of mailed assessments may have been one reason for attrition and lower recruitment rates. Low recruitment rates may also indicate that self-selection played a role in who chose to enroll in our study, making our findings less generalizable. Finally, in the VA context, the MMB online intervention was adapted to remove some of the components, including text reminders, that may have impacted impressions of the conditions. As such, these findings are considered a reflection of this implementation of MMB but are not reflective of other versions of this intervention.

Strengths of the present study include over-recruitment of rural-dwelling Veterans, who are at higher risk for psychiatric symptoms and have poorer access to specialty care services. The present study utilized an empirically tested intervention that has demonstrated efficacy in prior studies, and the current work focused on dismantling components of the intervention to guide future implementation efforts. This intervention is relatively low burden, can be accessed at the Veteran's convenience, and has been altered over time to improve inclusivity of the many experiences that women experience throughout pregnancy and the postpartum period (26). Including coaches adds significant expense in terms of time for the Veteran and the coach, as well as financial expense for any health system. These results bear on the sustainability of implementing a coach-guided intervention for perinatal Veterans. Moreover, the intervention adjusts to whether the participant is pregnant or in the postpartum period, and both pregnant and postpartum Veterans were recruited herein. Finally, the study collected quantitative and qualitative data, and assessments were collected at pre-intervention and follow-up time points, as well as during the intervention.

Conclusions

In conclusion, the present study sought to compare an online CBT intervention condition alone to an online CBT intervention with phone coaching among women Veterans experiencing perinatal depression. The results bear on scalability and sustainability of the intervention in the VHA context, and quantitative and qualitative feedback were collected. The findings indicated that Veterans improved throughout the course of the study, but between-condition differences were not observed. The within-intervention findings indicated that the MMBPC condition experienced greater reductions in depressive symptoms from weeks 1 to 5 than the MMB condition. The qualitative findings suggest that despite notable between-condition differences from pre-intervention to follow-up time points, Veterans report appreciation for (in MMBPC) or desire for (in MMB) interpersonal connection with a coach throughout the intervention. The findings suggest that the coaching aspect of the intervention may increase desirability of the intervention for Veterans, but it may not be necessary to improve symptom-related outcomes over time. In summary, this dismantling trial wherein we randomized Veterans to one of two intervention conditions found that the intervention resulted in reduced depression, change in CBT-specific processes, and general satisfaction with the intervention. Future research could benefit from continued investigations, both qualitative and quantitative, into components of behavioral interventions that contribute to changes in symptoms, therapeutic processes, adherence to the intervention, and satisfaction with the intervention. Continued work with women Veterans, and particularly those who are in the perinatal period and dwell in rural areas, is of the utmost importance as the population of women Veterans continues to increase.

Abbreviations:

MMB = MomMoodBooster.

MMBPC = MomMoodBooster + PC.

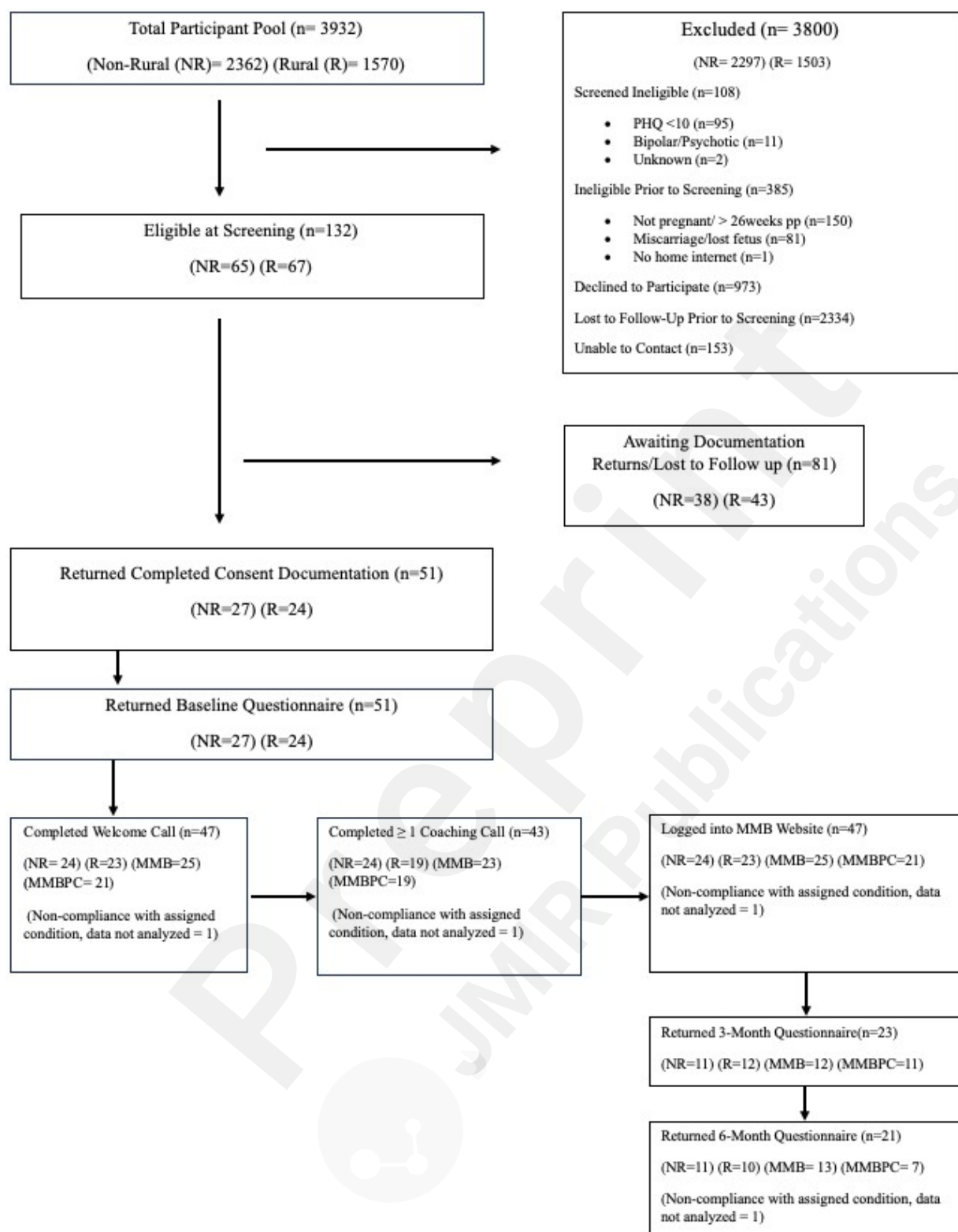
CBT = Cognitive Behavior Therapy.

VHA = Veterans Health Administration.

IBIs = Internet-Based Interventions.

PHQ-9 = Patient Health Questionnaire – 9.

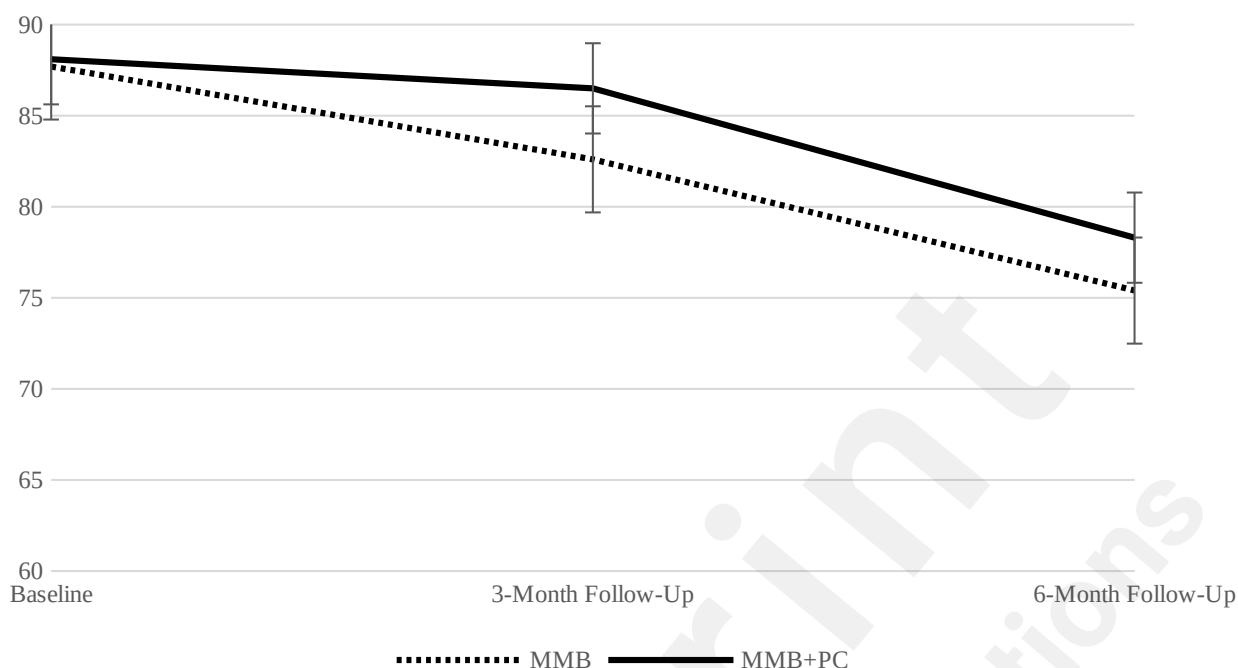
Figure 1. *Consort diagram.*



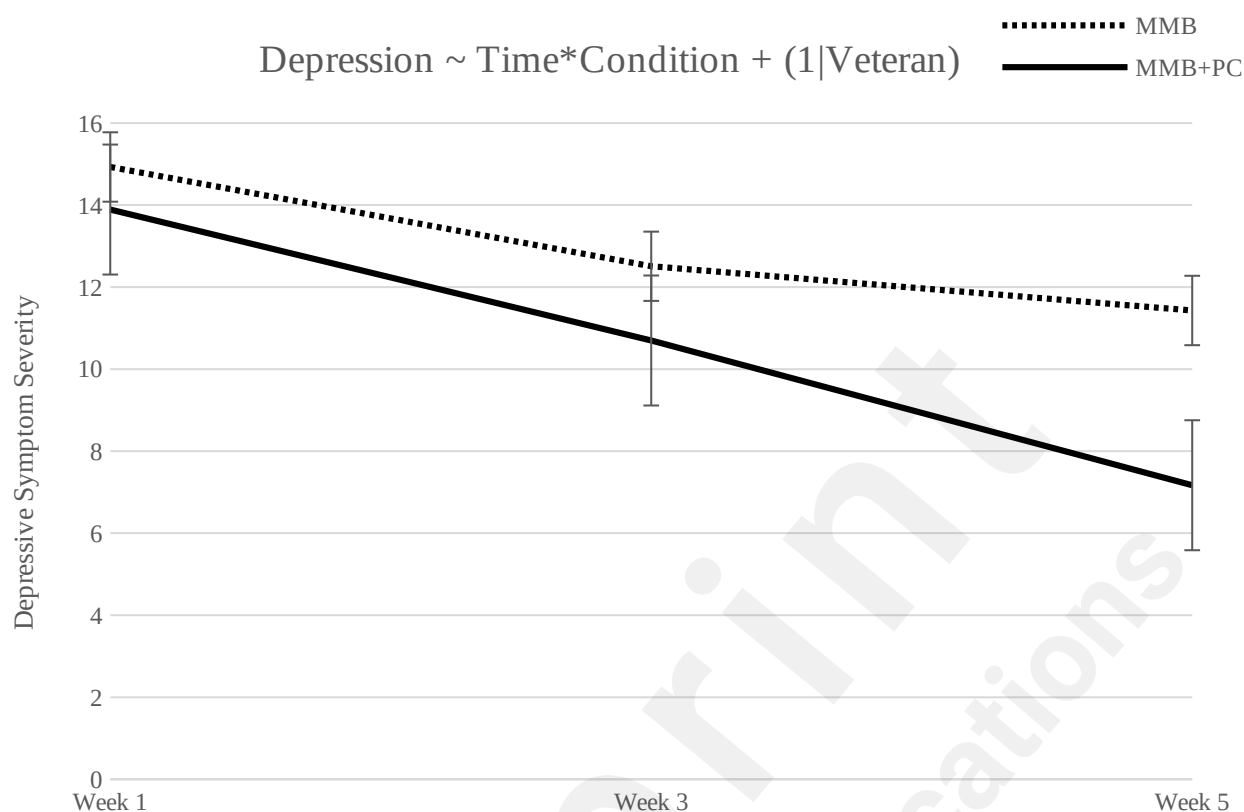
Note. NR = Non-rural, R = Rural. MMB = MomMoodBooster only condition. MMBPC = MomMoodBooster + Phone Coaching condition. *Non-compliance with assigned condition = interventionist delivered the incorrect condition due to misreading the random assignment.

Figure 2. Change in depressive symptom severity from baseline to 3- and 6-month follow-up assessments.

General Depression Scores from Baseline to Follow-Ups



Note. MMB = MomMoodBooster online only condition. MMBPC = MomMoodBooster and phone coaching condition. Depressive symptom severity was measured with the Inventory for Depressive and Anxiety Symptoms – II, General Depression composite scale. There was a significant main effect of time, $F(2, 54.28) = 6.16$, $P = .004$. There was not a main effect of condition, $F(1, 51.31) = 0.49$, $P = 0.49$. The omnibus interaction term was not statistically significant, $F(2, 54.28) = 0.22$, $P = 0.80$. Further investigation of specific time points indicated that there was not a significant change between baseline and 3-month follow-up, $t(54.35) = -5.15$, $P = 0.19$, but reductions between baseline and 6-month follow-up were significant, $t(53.84) = -3.26$, $P = .002$. However, these analyses were severely limited by attrition at the follow-up assessments.

Figure 3. Depressive symptom severity throughout the intervention across conditions

Note. MMB = MomMoodBooster online only condition. MMBPC = MomMoodBooster and phone coaching condition. Depressive symptom severity was measured with the Patient Health Questionnaire-9. Week conveys week of the intervention, and PHQ-9 was administered during weeks 1, 3, and 5 of the intervention. Graph conveys the estimated marginal means from the linear mixed models. As is visible in the error bars, there were significant differences from weeks 1 to 5 across conditions ($t(65.38) = -2.06$, $P = 0.04$, $d = -0.61$).

Table 2. Descriptive characteristics and participation metrics across total sample and by assigned condition

M(SD) or N(%)		
Total	MMB	MMBPC

Age, years	33.47 (5.76)	31.6 (5.5)	35.6 (5.4)
Race			
Asian	2 (3.92%)	2 (7.4%)	0 (0.0%)
Black or African American	9 (17.6%)	3 (11.1%)	6 (25.0%)
Indigenous, Native American, or Alaska Native	1 (1.96%)	1 (3.7%)	0 (0.0%)
Pacific Islander	1 (1.96%)	0 (0.0%)	1 (4.2%)
White or Caucasian	36 (70.6%)	21 (77.8%)	15 (62.5%)
Missing	3 (5.9%)	1 (3.7%)	2 (8.3%)
Ethnicity			
Hispanic/Latina/o/e/x	7 (13.72%)	2 (7.4%)	5 (20.8%)
Non-Hispanic/Latina/o/e/x	43 (84.31%)	24 (88.9%)	19 (79.2%)
Missing	1 (1.96%)	1 (3.7%)	0 (0.0%)
Rurality			
Rural	24 (47.06%)	15 (55.6%)	9 (37.5%)
Urban	27 (52.94%)	12 (44.4%)	15 (62.5%)
Pregnancy status at enrollment			
Pregnant	9 (17.65%)	5 (18.5%)	4 (16.7%)
Postpartum	42 (82.35%)	22 (81.5%)	20 (83.3%)
Intervention engagement characteristics			
Welcome call completed	46 (90.2%)	25 (96.2%)	21 (87.5%)
Logged onto MMB Website	46 (90.2%)	25 (96.2%)	21 (87.5%)
Completed ≥1 online module	45 (88.2%)	24 (92.3%)	21 (87.5%)
Completed ≥1 Call	42 (82.4%)	23 (88.5%)	19 (79.2%)
Total phone calls	3.7 (2.4)	3.5 (1.6)	3.8 (2.9)
Total website visits	19.5 (17.0)	22.0 (20.3)	16.2 (12.3)
Session 1, Depressive symptom severity (PHQ-9)	14.5 (5.0)	15.2 (5.0)	13.9 (5.3)
Session 3, Depressive symptom severity (PHQ-9)	11.9 (5.2)	12.7 (5.4)	10.4 (4.9)
Session 5, Depressive symptom severity (PHQ-9)	9.7 (4.6)	11.7 (4.6)	6.3 (2.3)
Baseline behavioral activation	69.3 (24.2)	72.8 (25.1); N=26	65.8 (23.7); N=24
Baseline negative automatic thoughts	33.3 (10.1)	32.8 (10.8); N=25	33.9 (9.6); N=24
Baseline depressive symptom severity (<i>T</i> -score)	88.1 (11.0); N=51	87.84 (11.99); N=26	88.4 (10.2); N=24
3-Month behavioral activation	78.9 (25.5); N=23	83.58 (24.76); N=12	73.73 (26.47); N=11
3-Month negative automatic thoughts	30.5 (10.5); N=23	28.33 (10.47); N=12	32.82 (10.56); N=11
3-Month depressive symptom severity (<i>T</i> -score)	84.4 (10.0); N=22	82.58 (11.80); N=12	86.60 (7.21) ; N=10
6-Month behavioral activation	84.0 (19.2); N=21	83.69 (21.63); N=13	87.29 (14.93); N=7
6-Month negative automatic thoughts	27.7 (9.1); N=21	27.92 (11.07); N=13	25.71 (2.43); N=7
6-Month depressive symptom severity (<i>T</i> -score)	75.4 (16.0); N=21	75.08 (20.04); N=13	74.71 (5.94); N=7

Note. Conditions: MMB = MomMoodBooster only. MMBPC = MomMoodBooster + Phone Coach. PHQ-9 = Patient Health Questionnaire – 9. Depressive symptom severity (*T*-score) = Inventory for Depressive and Anxiety Symptoms – II General Depression composite *T*-score. Total phone calls includes assessment (PHQ-9) and coaching calls.

Table 3. Qualitative response frequency by timepoint

	3-month follow-up	6-month follow-up
Program helpful	19	20
Program improve	18	18
Coach helpful	11	5
Coach improve	5	2

Table 4. *Qualitative code frequency by timepoint*

Code	3-month follow-up	6-month follow-up
Program		
All program codes	44-45	42
A1. Positive	6	8
A2. Improve	16-17	19
1. Access	2 (11.8-12.5%)	1 (4.3%)
2. Delivery mode	10-11 (63.6%)	9 (47.4%)
1. Desire for coach	1-2	1
2. Desire for counselor	3	2
3. Desire for group	3	3
4. Desire for app	2	2
5. Desire for face-to-face	1	1
3. Functionality	3 (17.6-18.75%)	2 (10.5%)
4. Technical	1 (5.9-6.3%)	7 (36.8%)
A3. Content	21	11
1. Positive	6 (28.6%)	2 (18.2%)
2. Improve	5 (23.8%)	3 (27.3%)
3. Specific helpful content	9 (42.9%)	5 (45.5%)
4. Did not engage	1 (4.8%)	1 (9.1%)
Coaching		
All coaching related codes	9	12
B1. General positives	8 (88.9%)	7 (58.3%)
B2. Amount	1 (11.1%)	5 (41.7%)
1. Increase	1	5
2. Did not want, did not receive, or got no benefit	0	0
3. Decrease	0	0
Change processes		
C1. Program	10	7
1. Intrapersonal	6 (60%)	4 (57.1%)
2. Coach	3 (30%)	2 (28.6%)
3. Accountability	1 (10%)	1 (14.3%)
C2. Coach	16	8
1. Intrapersonal	3 (18.8%)	1 (12.5%)
2. Relationship or interpersonal	2 (12.5%)	0 (0.0%)
3. Qualities	4 (25%)	1 (12.5%)
4. Practical assistance	3 (18.8%)	4 (50%)
5. Accountability	4 (25%)	2 (25%)
C3. Barriers	10	2
1. Time	3 (30%)	1 (50%)
2. Motivation and mood	0 (0%)	1 (50%)
3. Contextual factors	2 (20%)	0 (0%)
4. Scheduling or rescheduling problems	3 (30%)	0 (0%)
5. Coaching delivery mode	2 (20%)	0 (0%)

Note. Percentages are expressed in a range when the two coders had different numbers of total codes (different denominators).

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Supplementary Files