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OBM Integrative and Complementary Medicine

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Original Research

A Mixed-Methods Pilot Study to Identify Facilitators Leading to Sustained Mindfulness Practice across the Perinatal Period

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Academic Editor: Gerhard Litscher

Special Issue: Multi-level Approaches to Preventing Perinatal Mood Disorders

OBM Integrative and Complementary Medicine
2022, volume 7, issue 3
doi:10.21926/obm.icm.2203038

Received: May 31, 2022
Accepted: August 19, 2022
Published: August 26, 2022

Abstract

Many women experience depression and/or anxiety during pregnancy and/or the postpartum period. Mind-Body Interventions (MBIs) have shown great efficacy in the mitigation of these symptoms; however, there is limited research spanning the postpartum period and exploring long-term sustainability of mindfulness practice. Furthermore, little is known about specific facilitators that contribute to sustainability. The primary objective of this mixed-methods study is to use the Theory of Planned Behavior (TPB) framework to inform multi-level factors associated with the sustainability of mindfulness practices and associated mental health outcomes in the postpartum period after participating in a prenatal MBI to inform and improve future interventions. Measures of mental health including depression, anxiety, and perceived stress were evaluated via quantitative assessments at three time points (n = 24)

across the prenatal and postpartum periods prior to and following the prenatal MBI. Interviews were conducted post-intervention (n = 10) and 5-12-months postpartum (n = 8) to identify sustainability facilitators. Measures of depression, anxiety, and perceived stress were significantly lower post-intervention than pre-intervention, and decreased levels of depression were sustained over three months postpartum. After participation, all interview participants reported intention to continue practice postpartum. In the postpartum period, 73% of participants reported weekly sustained practice. Qualitative interviews revealed significant facilitators to be informal practice (attitudes and beliefs), family and peer support (social norms), life-integration and self-compassion (perceived control) and benefits to child (intentions/ behaviors). These findings suggest that future interventions should focus on ease of integrating informal practice into daily routines, communication with support systems, self-compassion, and benefits of mindfulness practices for the child to promote sustainability.

Keywords
Perinatal; mindfulness; mental health

1. Introduction

In the perinatal period (which is defined as pregnancy and 12 months postpartum), 18-20% of women have a depressive disorder, and up to 40% report an anxiety disorder [1-6]. Many biological, physical, and psychological factors contribute to perinatal mood and anxiety disorders. Biological factors including hormone deregulation may cause changes in mood [7]. Physical challenges, such as discomfort caused by body changes, may also disrupt sleep patterns [8]. Finally, psychological factors from increased internal and external stressors, such as shifts in personal identity and family dynamics, may increase the likelihood of perinatal mood and anxiety disorders [9]. When these disorders are left untreated, the risk of long-term detrimental effects on both mother and child is elevated. These include risk of preterm birth and/or low birth weight [10-12], birth complications [13], and interruption of maternal-infant bonding [6, 14] which may also lead to developmental and cognitive delays [6, 15], behavioral problems in childhood [16], and long-term maternal depressive symptoms [17].

Mind-body interventions (MBIs) are non-pharmacological evidence-based interventions that are often used to mitigate perinatal mood disorders [18]. Prenatal MBIs have become progressively more popular as the prevalence of perinatal stress and mood disorders increase [19]. Prenatal MBIs are effective in mitigating symptoms of stress, depression, and anxiety, and focus on positive birth outcomes through breathwork and awareness of present surroundings [20, 21]. Postnatal MBIs have also shown efficacy in reducing depressive symptoms [22], though to our knowledge there is limited published research that evaluates interventions delivered in the postpartum period only. MBIs are often preferred over psychopharmaceutical treatments due to mothers' preference and comfort level regarding the conflicting evidence of the safety of medications during pregnancy and/or breastfeeding [23-25]. MBIs are typically suggested for women with histories of mental illness as an attempt to prevent pregnancy or postpartum triggered mental illness relapse [26].

Perinatal MBIs may also be used as preventative approaches to decrease the need for treatment of postpartum mood disorders [27, 28].

Though mood disorders may present at any time across the perinatal and later postpartum periods, most perinatal MBIs are conducted during pregnancy [25, 29, 30], and often only assess measures of efficacy at one time point [25]. Childbirth may trigger mood disorders [31], and often women will experience feelings of anxiety, depression, and stress in the postpartum period even if they did not present in the prenatal period; for example, a longitudinal assessment of women in the prenatal and postpartum period shows a great variation in depressive symptom onset [32]. Therefore, supporting adaptive coping behaviors, such as mindful behavior, across the prenatal and postpartum period may increase an individual's likelihood of sustaining mindfulness practices after birth and combatting postpartum mood and anxiety disorders.

Systematic reviews of perinatal MBIs reveal that while not all interventions assess sustainability data across multiple timepoints [18, 19, 29], those that do have found mixed results in terms of sustained mindfulness practices and mental health outcomes [19, 33]. One qualitative study explored the experiences of postpartum women after participating in a prenatal MBI and found that participants used mindfulness skills to address postpartum challenges and that the perceived benefits of these practices continued for these women into the postpartum year [34]. Another single arm pilot study found that improvements in mental health outcomes were maintained at 3-months postpartum and 55% of participants reported continuing to practice mindfulness [33]. An alternative study followed participants through one-year postpartum and found that 72% of participants reported practicing mindfulness greater than 5 days a week [35]. Though extant literature explores short and long-term benefits of perinatal MBIs into the postpartum period, to our knowledge there is a lack of research that identifies facilitators to sustainability of mindfulness practice into the postpartum period and beyond.

Predictors of sustained mindfulness practices after participating in prenatal MBIs and associations with postpartum mental health outcomes remain unclear. The Theory of Planned Behavior (TPB) [36] predicts a person's intended behaviors and actual behaviors based on their attitudes and beliefs combined with their perception of control [37]. According to the TPB, intentions and behaviors are determined by three factors: attitudes towards the behavior in question, subjective norms, and perceived behavioral control [36]. Attitudes towards a behavior refer to one's positively or negatively held opinions of the action; attitudes are not necessarily reflective of knowledge [37]. Subjective norms refer to the social pressures influencing whether or not to perform the behavior [38]. Finally, perceived behavioral control relates to self-efficacy, and can be used to predict both intentions and behavior as it relates to the actual degree of control that one has over the behavior [39]. If an individual's perception of control is inaccurate, perceived behavioral control will be a less precise indicator [37]. The theory posits that intentions are the most important determinant for whether a behavior is performed and, along with perceived behavioral control, drive the execution of behavior [40].

Research shows that using the TPB, MBIs that focus on subjective norms may have the greatest success in establishing a sustained practice after the intervention [41]. The TPB has been used to examine other health behaviors in the perinatal population, including initiation and duration of breastfeeding [42-44], smoking and other substance cessation [45], nutrition [46], and physical activity [47, 48]. While subjective norms predict behaviors in this population [44, 49], intention is also a significant predictor of behavioral outcomes [50]. These factors can be supported by providers'

promotion of sources of support during pregnancy and emphasizing the impact of perinatal mood disorders on the fetus [42, 45, 50, 51].

Longitudinal data collection across the prenatal and postpartum period allows for the exploration of multi-level factors that support the sustainability of mindfulness practices and the potential protective impact on postpartum mental health outcomes. The primary objective of this mixed-methods study is to use the TPB framework to inform multi-level factors that are associated with the sustainability of mindfulness practices and associated mental health outcomes in the postpartum period after participating in a prenatal MBI.

2. Materials and Methods

2.1 Methods

2.1.1 Intervention

The program used for this intervention is an example of a prenatal MBI that is rooted in mindfulness-based cognitive therapy (MBCT) [52] and mindfulness-based childbirth and parenting (MBCP) [53]. The program is based off a prenatal MBCT program focused on the prevention of perinatal depression [26, 54] and consists of six 90-minute weekly sessions. The goal of the program is to focus on emotional wellness during pregnancy to decrease the risk for postpartum depression and anxiety for women who may be at higher risk due to high-risk pregnancies, histories of depression and/or anxiety, and current psychosocial stressors during pregnancies. The program is facilitated by two licensed psychologists and covers various topics such as: mindfulness, breathwork, pregnancy-specific worries and stressors, managing anxiety, working with/accepting difficulty, yoga, pain management, and self-care strategies and exercises.

2.1.2 Participants

Participants were recruited for the prenatal MBI intervention via three mechanisms: 1) Prenatal care clinics affiliated with a large health care system in Colorado referred pregnant patients to the two licensed psychologists to screen for eligibility and interest in participating in the prenatal MBI intervention, 2) Advertisements were distributed through university-affiliated email databases and listservs, and 3) Advertisements were distributed through social media sources, such as Facebook and Instagram, including posting advertisements in Facebook groups for new mothers and birth support professionals in the greater Denver metro area. Eligibility criteria included: 1) individuals who were 18 or older and between 12 and 32 weeks pregnant at the start of the program, and 2) individuals living in Colorado. Exclusion criteria included clinically diagnosed major depressive disorder or psychosis, recent history of suicidal ideation, and substance abuse disorder (SUD). The final analytical sample for this study included individuals who participated in the remotely delivered prenatal MBI intervention from September of 2020 through December of 2021 and engaged in three timepoints of data collection (n = 24).

2.1.3 Procedure

Individuals who were interested in participating in the program were screened for eligibility by licensed psychologists. Once individuals were deemed eligible and interested, an electronic link

containing the consent and baseline survey was sent via email. All documents (consent, survey) were administered via REDCap [55]. REDCap is a secure, web-based application designed to support data capture for research studies. Once individuals completed the baseline survey, the licensed psychologists emailed information regarding the program and logistics on how to join the group sessions. Survey data was collected at three timepoints, two during pregnancy and one during the postpartum period: T1 (baseline- average gestational age 22.2 weeks), T2 (post-intervention), and T3 (3-months postpartum). Additionally, qualitative data were collected at T2 and between 5-12 months postpartum to explore factors related to the intention and sustainability of mindful behaviors and well-being in the postpartum period. Individuals were recruited for participation in the qualitative data collection using a convenience sampling design. The study team contacted participants via email after completion of the surveys to assess interest in participating in a 45–60-minute zoom interview. Individuals received a $20 electronic Target gift card for all surveys and interviews that they completed. A large university-affiliated institutional review board approved this study (IRB # 20-2138).

2.2 Instruments

2.2.1 Quantitative Data

A 34-item survey including sociodemographic information and validated measures of mindfulness, mental health and wellbeing outcomes was administered at T1, T2, and T3. Questions related to core TPB constructs, and the sustainability of mindfulness practices were also included at T2 and T3. The following validated instruments were administered to assess the primary outcomes: the Edinburgh Postnatal Depression Scale (EPDS) [56], the General Anxiety Disorder-7 (GAD-7) [57], the Cohen Perceived Stress Scale (PSS) [58]. The (EPDS) ($\alpha = 0.83$) [59] is a 10-item tool often used to screen and identify women for depression in the perinatal period [60]. It includes questions pertaining to feelings experienced over the last 7 days such as “I have been able to laugh and see the funny side of things” and “The thought of harming myself has occurred to me”. The GAD-7 is the most commonly used diagnostic tool for anxiety in the perinatal period as there has not yet been a widely-used validated tool for specific perinatal anxiety [61]. The GAD-7 ($\alpha = 0.89$) has good reliability and validity and works well in conjunction with the EPDS. It asks questions pertaining to the past two weeks including “Feeling nervous, anxious, or on edge.” The PSS ($\alpha = 0.70$) [62] is the most widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in one’s life are appraised as stressful. The questions in the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way. It includes questions such as, “In the last month, how often have you been upset because of something that happened unexpectedly?” Examples of questions related to the sustainability of mindfulness practices included, “How likely do you think you are to sustain the habits you learned in the program after giving birth?” (T2) and “On average, how regularly are you practicing?” (T3).

Demographic information collected included marital status (married, single and never married, divorced or separated), ethnicity (Hispanic or Non-Hispanic), race (Caucasian, African American, Asian or Pacific Islander, or Other), employment status (employed full time, employed part time, working without pay, unemployed, or student), total yearly household income (less than $50,000,

$50,000-$99,999, $100,000-$149,999, and $150,000 or greater), insurance coverage (full coverage or Medicaid), age (continuous), and gestational age (continuous).

2.2.2 Qualitative Data

The post-intervention (T2) and 5–12-month postpartum semi-structured interview guides were comprised of questions about sustainability regarding mindful behaviors and mental health and well-being in the postpartum period. Intention to sustain mindfulness practices after participating in the prenatal MBI intervention during pregnancy (T2) and actual behaviors postpartum were captured with interview questions such as, "How likely do you think you are to sustain the habits you learned in the program after giving birth?" (T2), "Since completing the program and after the birth of your child, how have you continued to use the techniques that were taught in the program?", and "What resources or facilitators have helped you sustain some of these habits into the postpartum period?".

3. Data Analysis

To investigate changes in the primary outcomes (e.g., depression, anxiety, stress) across three timepoints (T1, T2 and T3), we ran frequency and descriptive statistics. Next, we ran repeated measures ANOVAs to further investigate the significance of these changes across the perinatal period. Finally, post hoc comparisons were run to further explore changes in each of the outcome variables between each timepoint. Alpha (α) was set at 0.05. IBM SPSS Statistics for Windows, Version 26.0 (SPSS) [63] software was used for statistical analysis. To explore perceptions surrounding sustainability of mindfulness practices across the perinatal period, we ran univariate statistics and integrated these data with the qualitative findings.

Qualitative data analysis was conducted by a research assistant and followed best practice methods, including an inductive, data-driven approach [64, 65]. Inductive coding was also used to allow for discovery of unique themes related to the intention to sustain mindfulness practices and actual sustainability of mindfulness practices in the postpartum period including associated barriers and facilitators. The research assistant reviewed the data with the study team iteratively. If dis-concordance on the meaning of the codes and themes were present, a discussion occurred between team members to reach consensus on the coding structure. NVIVO software [66] was used for all qualitative analyses. The team then applied the TPB framework to integrate the quantitative and qualitative data and identify multi-level factors that were associated with sustainability of mindfulness practices after participating in the prenatal MBI intervention.

4. Results

As shown in Table 1, the full sample (n = 24), 87.5% identified as Caucasian, 4.17% as African American, and 8.33% as Asian, with 96.83% identifying as non-Hispanic and 4.17% as Hispanic. Approximately 8.33% of participants had completed some college, 37.5% had a college degree, and 54.17% had an advanced degree. More than ¾ of the sample (79.16%) were employed full-time, 4.17% part-time, 4.17% were working without pay, 4.17% had full-time student status, and 8.33% were unemployed. Most participants were married (79.16%), 16.67% were single, and 4.17% were divorced or separated. The breakdown of annual household income was as follows: Less than

$50,000 (8.33%), $50,000-$99,999 (29.17%), $100,000-$149,000 (29.17%) $150,000 or greater (33.33%). Almost all participants had full insurance coverage (95.83%) and 4.17% were covered by Medicaid. The average age of participants was 32 years, and the average gestation was 22.2 weeks at baseline.

Table 1 Participant Demographics.

	Quantitative Survey Sample	
Quantity	**n (24)**	**%**
Race		
Caucasian	21	87.50%
African American	1	4.17%
Asian	2	8.33%
Ethnicity		
Non-Hispanic	23	95.83%
Hispanic	1	4.17%
Education Level		
Some College	2	8.33%
College Degree	9	37.50%
Beyond College	13	54.17%
Employment Status		
Employed Full-Time	19	79.16%
Employed Part-Time	1	4.17%
Working Without Pay	1	4.17%
Full-Time Student	1	4.17%
Unemployed	2	8.33%
Relationship Status		
Married	19	79.16%
Single	4	16.67%
Divorced/Separated	1	4.17%
Annual Household Income		
<$50,000	2	8.33%
$50,000-$99,999	7	29.17%
$100,000-$149,999	7	29.17%
>$150,000	8	33.33%
Health Insurance		
Full Coverage Health Insurance	23	95.83%
Medicaid	1	4.17%
	m	**sd**
Age	32	2.6
Gestational Age	22.2	5.6

4.1 Quantitative Findings Related to Sustainability of Mental Health Outcomes

Estimated marginal means of each of the primary outcomes at each timepoint are displayed in Figure 1. A repeated measures ANOVA with a Greenhouse-Geisser correction for depression based on Mauchly's test of sphericity (χ^2 (2) = 7.05, p = 0.03) determined that mean depression (F(1.53, 30.53 = 12.65, p < 0.01), mean anxiety (F(2, 33.62) = 6.80, p < 0.01), and mean perceived stress (F(2, 38.14) = 10.91, p < 0.01) scores differed statistically significantly between all three time points (T1, T2, and T3). Post hoc analysis with a Bonferroni adjustment revealed that depression scores statistically significantly decreased from T1 to T2 (-3.48 (95% CI, -5.99 to -0.97), p < 0.01), and from T1 to T3 (-3.95 (95% CI, -6.51 to -1.39), p < 0.01). Anxiety scores statistically significantly decreased from T1 to T2 (-3.29 (95% CI, -5.44 to -1.14), p < 0.05). Perceived stress scores statistically significantly decreased from T1 to T2 (-3.43 (95% CI, -6.26 to -0.59), p = 0.02), and from T1 to T3 (-4.43 (95% CI, -7.03 to -1.83), p < 0.01).

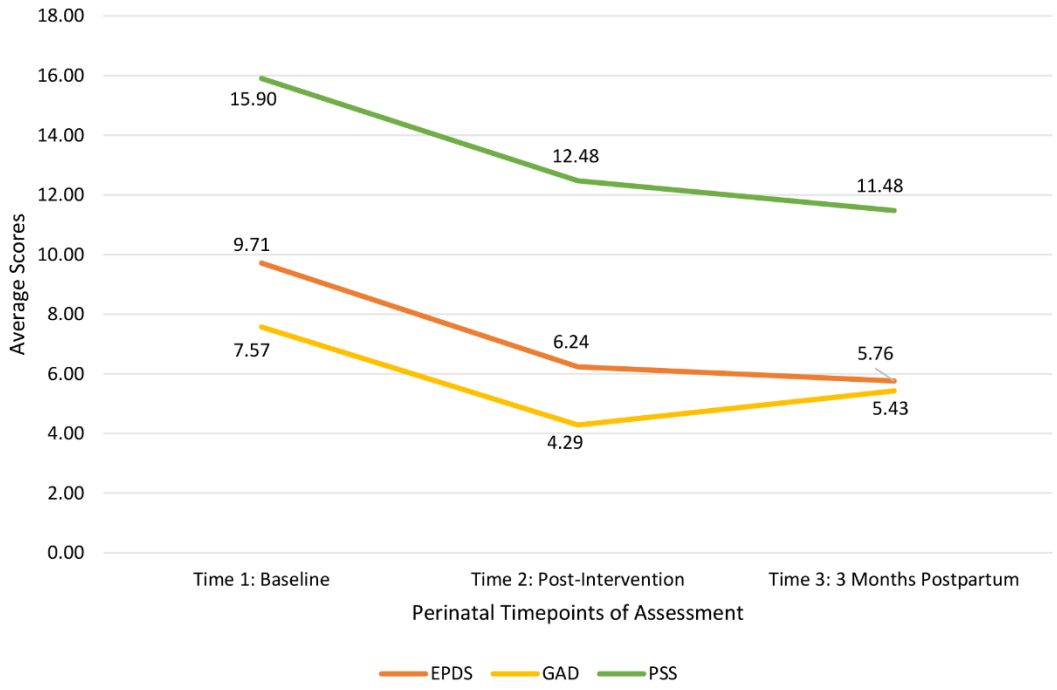

Figure 1 Changes in Mental Health and Well-being Outcomes after participating in the prenatal mind-body intervention across the Perinatal Period (n = 24). EDPS: Edinburgh Postnatal Depression Scale; GAD: General Anxiety Disorder Scale; PSS: Perceived Stress Scale.

4.2 Qualitative Themes

Table 2 describes the key themes identified in qualitative interviews and alignment with the four constructs of the TPB: behavioral beliefs/attitudes, subjective norms, behavioral control, and intention/behavior. Among participants, beliefs and attitudes related to informal practice, time management, prioritizing being present, and having been referred to the intervention by their health care provider were all identified as facilitators that supported mindfulness practice. As an example, a participant responded that feeling like she could "take just a couple of moments to breathe and get back to neutral" (informal practice) facilitated her ability to practice informal

mindfulness. Subjective norms including work, family, and peer support, were commonly mentioned by participants as themes that bolstered their ability to engage with, and sustain, mindfulness practices. As one participant said, “It was really helpful for me to have a network of other moms that were going through the same things I was” (peer support). Intentional focus and acknowledging the ease of integrating mindfulness practices into daily routines as well as one’s ability to practice self-compassion contributed to a sense of participant behavioral control. A participant pointed out, “I can control my perspective” (intentional focus), and increased social support gave participants a higher feeling of perceived control over stressful situations. Finally, the intention of behavior, which is the product of beliefs, attitudes, social norms, and perceived control, was often motivated by perceived benefits for the child, as well as their own continued wellbeing, and was a powerful factor in implementing and sustaining a mindfulness practice across the perinatal period. A participant said, “remembering that I have to be my best self in order to be present with my baby” was integral to her intention to sustain mindfulness practices.

Table 2 Themes derived using the Theory of Planned Behavior.

TPB Construct/Theme	**Codes**	**Representative Quote**
Behavioral Beliefs/Attitudes	Informal practice	"A good example is, while I'm breastfeeding, I can mindlessly scroll on my phone and picture it as a task, or instead I can get off my phone and look at her, enjoy her pulling on my face or playing with my lips and looking into her eyes and just enjoying that moment with her versus letting it pass by."
	Time	"Having less time actually helped me to stay more focused."
	Presence	"[the program] taught me techniques I can use with everything I do...stopping and enjoying the moments...mindful practice in everyday things."
	Provider Referrals	"My OB suggested I join the class because I was experiencing some anxiety."
Subjective Norms	Work support	W
	Family	"I've had great support system that has allowed me time for myself to practice mindfulness, especially in the early stages."
	Peer support	"Leading into having my first baby, it was really helpful to have a network of other moms that were going through the same things I was."
Behavioral Control	Intentional focus	"There's so much that I can't control, but I can control my perspective."

	Life integration	"If I can't incorporate [formal practice] into my busy schedule, if I have downtime by myself- like in the shower- I'll use the five senses...it's something I've learned along the way, being really present when I'm taking a shower, smelling my shower gel, describing what that smells like, and then feeling the warm water running down my back and describing those feelings."
	Self-compassion	"Learning to give myself grace."
Intention	Benefits to child	"Remembering that I have to be my best self in order to be present for my baby."

4.3 Mixed-Methods Analysis

Figure 2 displays the integration of the qualitative and quantitative findings and highlights the facilitators associated with sustainability of mindfulness practices into the postpartum period after participating in the program based on the TPB model. After participation in the intervention (T2), 88% of participants believed mindfulness to be important (behavioral beliefs and attitudes), 75% reported having access to social support resources, such as partner support (subjective norms), approximately half (53%) felt that they often or very often were in control of irritations or stressors in their lives (behavioral control/control beliefs), and 100% of participants reported that they were likely to sustain mindfulness practices into the postpartum period (intention). At three months postpartum (T3), 73% reported that they had been able to sustain a weekly mindfulness practice at least one time per week (behavior).

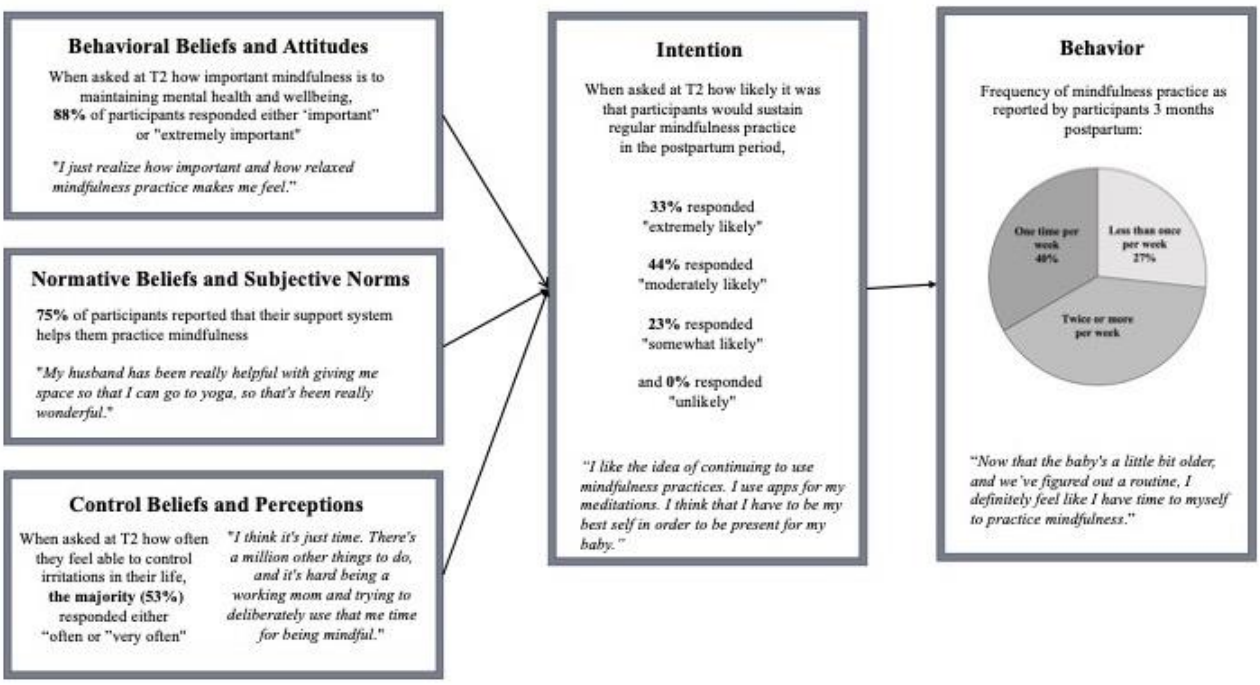

Figure 2 Mixed-methods results as applied to components of the Theory of Planned Behavior.

5. Discussion

This mixed-methods study examined prenatal and postpartum changes in depression, stress, and anxiety among individuals who participated in a remotely delivered, 6-week prenatal MBI. The TPB framework was applied to identify facilitators that contributed to beliefs and attitudes, subjective norms, perceived behavioral control, and intentions to sustain mindfulness practices during the prenatal period, and how these translated to actual sustainability of mindfulness practices in the postpartum period. We found significant changes in depression, anxiety, and stress after participating in the intervention; additionally, decreases in depression and stress were sustained into the postpartum period. On average, based on clinical cut-offs for the EPDS and GAD-7, depression and anxiety scores decreased from mild to minimal levels after participating in the MBI. Mitigating mild prenatal mood disorders before they progress to moderate or severe levels may be an effective strategy for preventing clinically-relevant depression and/or anxiety diagnoses through the postpartum period. Though anxiety slightly increased in the postpartum period, this was not a statistically significant change.

Trends in perinatal mood disorders suggest that in general, mental health worsens across the perinatal and postpartum period. A 2021 study of over 150 women found that levels of anxiety and depression increased from 24 weeks gestation to postpartum [67]. A prospective cohort study found a slight decrease in stress from the first to the third trimester but an increase in the postpartum period [68]. Finally, a longitudinal review found that 39% of women who experienced depression in pregnancy continued to have elevated depressive symptoms into the postpartum period [69]. These trends further support the preliminary efficacy of this prenatal MBI since mood disorders decreased over time in our sample. Our findings are generally consistent with current literature on perinatal MBIs. Two recent meta-analyses highlight decreased depressive and anxiety symptoms in intervention participants following MBIs in pregnancy as compared to the control group [18, 19]. These studies, however, do not explore beyond the post-intervention timepoint. The current study is novel because it examines the effects of prenatal MBIs across the trajectory of the perinatal period including sustained impacts into the postpartum period.

Themes related to **behavioral beliefs and attitudes** included the benefit of informal practice, which has been found to contribute to sustainability of mindfulness practices [68, 69]. Though some participants reported that they had less time for themselves in the postpartum period, many shared that having limited time motivated them to incorporate brief informal practices into their daily routine. Participants reported that their ability to be present was a powerful contributor to their mindfulness practice; many similar perinatal interventions focus on promoting awareness and presence during the prenatal period [19, 25]. These positive beliefs and attitudes surrounding mindfulness practices among pregnant women are reflective of the growing number of prenatal MBIs and increased focus on mindfulness in the United States. Additionally, participants reported that provider referrals encouraged them to participate which is supportive of past literature that highlights the importance of health care providers promoting MBIs as feasible and efficacious options for enhancing perinatal wellbeing [18, 19, 70-72].

Our findings suggest that work, family, and peer support contributed to positive **subjective norms** which helped participants' ability to sustain mindfulness practices into the postpartum period. Many participants reported an established practice and/or shared how mindfulness practices are positively perceived in their social networks. In our sample, the majority (75%)

reported that their partners and family support their ability to integrate mindfulness practices into their daily routines. These positive subjective norms reflect the trend in mindfulness practices in the United States, often through the vehicles of meditation and yoga, which are often considered to now be "mainstream" [73, 74]. A scoping review of facilitators and barriers to yoga participation in the general population found social influence to be a major contributing facilitator [75].

Intervention participants reported high levels of **perceived control** with the anticipation of support systems facilitating integration of mindfulness practices into routines across the perinatal period. They also acknowledged that some things may be out of their control, which calls for intentional focus on their thoughts and perspectives. A past study suggested that new parents who report partner and peer support perceive more control over health behaviors because of these reciprocal supports [76]. Higher perceived control in the general population is consistently correlated with decreased symptoms of depression and anxiety, which may be a result of mechanistic pathways related to adaptive coping behaviors, such as mindfulness [77-80]. MBIs are designed to integrate intention and awareness into everyday life [81-83]. The perinatal period is an opportune time for this integration, as mindfulness can lead to protective behaviors that contribute to maternal wellbeing during this transition and throughout the postpartum period [18, 54, 84]. A wide variety of tools exist aimed at integrating mindfulness into daily life including podcasts, guided meditations [85], and smartphone apps. For example, a recent systematic review identified over 600 smartphone apps designed to integrate mindfulness into daily life showcasing the link between daily integration and sustained mindfulness practice [86]. Self-compassion was also identified as key theme related to behavioral control; participants in this sample acknowledged that giving themselves grace translated to more positive perceptions of control. Many MBIs in the perinatal period promote self-compassion [83], which may support sustained practice and has been inversely correlated with depression and anxiety in the perinatal period [87-89].

Finally, **intention** to sustain mindfulness practices into the postpartum period was motivated by participants' desire to support their wellbeing for the benefit of their babies. After participating in Mindful-Moms-to-Be, all participants responded that they were likely to sustain mindfulness in the postpartum period. These intentions are a key component of behavior change. A recent meta-analysis examining health behaviors of new parents found that advance planning mediates the intention-behavior relationship [90], and many women who have experienced depression and/or anxiety have engaged in MBIs as a preventative measure to avoid poor mental health in the postpartum period [26].

6. Limitations

Limitations of this analysis include a small sample size. Though our findings suggested significant improvements in mental health and wellbeing measures over time, a lack of a control group limits the interpretation of these findings. Additionally, qualitative interviews were conducted with participants who were between 5 and 12 months postpartum and there may be significant variation in mindfulness practices at different timepoints across the postpartum period. The research team acknowledges that the demographics of participants were representative of demographics found in many similar studies, including a systematic review of 45 U.S. based interventions that employed Mindfulness-Based Stress Reduction (MBSR) and MBCT, which found most participants to be Caucasian and have relatively high annual household incomes [91]. When applied to lower-

resourced populations, qualitative research shows the need for judgement-free and welcoming atmospheres [92]. Recent research also highlights the need for culturally responsive MBIs, particularly for women of color [93], suggesting that the program may require further adaptations to recruitment approaches to reach a more diverse audience. The next iteration of this work includes replication with a larger and more diverse sample and control group. If findings show consistent and significant results particularly for low income/women of color, additional adaptations will be explored to expand the availability of culturally diverse MBI programs for the perinatal population.

7. Conclusions-Implications and Recommendations

Though our findings are based on a pilot study with a small sample size, our results suggest that mindfulness practices learned in the prenatal MBI were often sustained into the postpartum period, which may have translated to sustainable improvements in postpartum depression and stress. There are several factors will help support the sustainability of mindfulness practices into the postpartum period. Focus should be on informal practices and simple breath techniques, support from partners, work, and other pregnant peers, emphasizing opportunities for integration of mindfulness practices into daily living, focusing on self-compassion, and reminding participants about the importance of being their best selves for the sake of their babies. Future research should continue to evaluate the sustainability and benefits of mindfulness over the course of pregnancy and through 12 months postpartum (perinatal period) on a larger scale and with control groups to further determine long-term impacts on mental health and wellbeing outcomes across these critical periods.

Acknowledgments

The authors would like to acknowledge the participants for their time and insights.

Author Contributions

The authors assume responsibility for the complete development of this manuscript, including its initial conception, design, analysis, and writing (Dr. Farewell and Ms. Walls), development and delivery of the curriculum (Dr. Whalen and Dr. Shefferman), collection and interpretation of the data (all authors), and reviewing of the manuscript (all authors).

Competing Interests

The authors have declared that no competing interests exist.

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