1-1-2023

Time-out for well-being: A mixed methods evaluation of attitudes and likelihood to engage in different types of online emotional well-being programmes in the perinatal period

Jacqueline A. Davis

Amy L. Finlay-Jones

Natasha Bear

Susan L. Prescott
Edith Cowan University

Desiree T. Silva

See next page for additional authors

Authors

Jacqueline A. Davis, Amy L. Finlay-Jones, Natasha Bear, Susan L. Prescott, Desiree T. Silva, and Jeneva L. Ohan

Time-out for well-being: A mixed methods evaluation of attitudes and likelihood to engage in different types of online emotional well-being programmes in the perinatal period

Jacqueline A Davis[1,2,3] 🆔 **, Amy L Finlay-Jones[1], Natasha Bear[4],**
Susan L Prescott[1,2,5,6,7], Desiree T Silva[1,2,5,6]
and Jeneva L Ohan[2]

Abstract

Background: Positive maternal mental health during the perinatal period contributes to general well-being and positive emotional bonds with the child, encouraging an optimal developmental trajectory. Online interventions to enhance maternal well-being and develop coping skills, such as meditation-based interventions, can be a low-cost way to improve mother and child outcomes. However, this depends on end-user engagement. To date, there is limited evidence about women's willingness to engage and preferences for online programmes.

Objectives: This study explored pregnant women's attitudes towards and likelihood to undertake minimal online well-being training programmes (mindfulness, self-compassion, or general relaxation), engagement barriers and enablers, and programme structure preferences.

Design: A mixed methods triangulation design was undertaken using a validating quantitative model. Quantile regressions were applied to the quantitative data. Content analysis was undertaken for the qualitative data.

Methods: Consenting pregnant women ($n = 151$) were randomized equally to read about three online programme types. Participants were sent an information leaflet, tested by a consumer panel prior to distribution.

Results: Participants generally held positive attitudes about all three types of interventions, with no statistically significant differences in preferences between programme types. Participants appreciated the importance of mental health and were receptive to fostering skills to support their emotional well-being and stress management. The most frequent perceived barriers were lack of time, tiredness, and forgetfulness. Programme structure preferences indicated one to two modules per week, less than 15 min in duration, and over 4 weeks. Programme functionality, such as regular reminders and easy accessibility, is important to end users.

Conclusion: Our findings reinforce the importance of determining participant preferences in designing and communicating engaging interventions for perinatal women. This research contributes to the understanding of population-based interventions that can be provided as simple, scalable, cost-effective, and home-based activities in pregnancy for the benefit of individuals, their families, and society more broadly.

[1]Telethon Kids Institute, The University of Western Australia, Perth, WA, Australia
[2]The University of Western Australia, Perth, WA, Australia
[3]Curtin University, Perth, WA, Australia
[4]Notre Dame University, Perth, WA, Australia
[5]Joondalup Health Campus, Perth, WA, Australia
[6]Edith Cowan University, Perth, WA, Australia
[7]Nova Institute for Health, Baltimore, MD, USA

Corresponding author:
Jacqueline A Davis, Telethon Kids Institute, 15 Hospital Avenue, Nedlands, WA 6009, Australia.
Email: jackie.davis@telethonkids.org.au

Abstract

Plain language summary

Title: Exploring ways to design appealing online programmes for pregnant women that reduce stress and develop positive coping skills

Poor maternal mental health in pregnancy and during the first few years of a child's life can affect negatively on mother and child. As researchers, we want to look at accessible ways to support future mothers as early as possible, to assist both the woman and developing child. The Internet provides easy, low-cost access to support for online well-being programmes that reduce stress and develop positive coping skills. However, people frequently drop out of online programmes, particularly those that have minimal contact.

Our research explored the likelihood of pregnant women undertaking web-based well-being programmes. We provided information to 151 pregnant women about three different types of brief, positive well-being programmes: a mindfulness skills programme, a programme developing self-compassion skills, and a programme for developing general relaxation skills. We asked the women a series of questions so that we could understand their interest, prospect of participating in the programmes, and what programme design appealed to them.

The women in our study were generally positive about all three programme types and saw the benefits of developing skills to build their mental well-being and to manage stress. However, they felt they were time-poor and often tired. The women indicated preferences for programmes of one to two modules per week, less than 15 min long, over 4 weeks. They also indicated that regular reminders and easy accessibility are important.

Pregnant women have a desire to use programmes to support their well-being and find meditation and relaxation practices acceptable. However, there are specific aspects of programme design that women prefer. This research contributes to understanding online programmes targeted to pregnant women which are simple and accessible and provide support at a critical life point for the mother and her child. Ignoring these preferences is likely to lead to poor initial engagement and high dropouts.

Background

There is growing evidence that positive, 'flourishing' well-being protects against mental illness and psychopathology.[1,2] 'Flourishing' is defined as promotion and maintenance of genuine positive mental health.[3] Over time, positive mental health enables resilience and protects against physical and mental illness and disease.[4–6] Congruent with the Developmental Origins of Health and Disease (DOHaD) hypothesis,[7–9] flourishing mental health can provide a positive buffer during times of psychological distress,[4,10] including perinatal stress which can adversely influence both maternal well-being and long-term outcomes for her developing child. Positive prenatal mental health, such as positive affect and optimism, has been shown to protect against postpartum depression[11] and diminished birth outcomes.[12] For example, Bos et al.[13] found that positive affect (defined as frequency of experienced positive emotions) plays a protective role in preventing depression and is associated with length of gestation and lowered risk of preterm birth, whereas negative affect predicts postpartum depression. Maternal mental health issues, such as postnatal depression and anxiety, are prevalent during the perinatal period (pregnancy and

the first postnatal year), affecting up to 20% of women[14–17] and are associated with a range of immediate and long-term negative outcomes for women, children, and families.[18–21] Therefore, it is important to promote positive mindsets antenatally to support the well-being of the mother and her developing child.

There are a number of ways in which women can be supported antenatally to enhance emotional well-being. Screening for perinatal depression symptoms during pregnancy enables healthcare professionals to implement preventive and clinical measures. Antenatal classes provide theoretical knowledge and practical preparation of women and their partners for birth and parenting.[22] There is evidence that antenatal education equips participants with appropriate resources and practical coping skills for pregnancy, childbirth, and parenthood.[23,24] Thus, antenatal classes can be a potential protective factor in preventing emotional problems postnatally,[22] equipping women with self-efficacy skills during pregnancy.[25] Antenatal classes can be offered both in person and online, with online delivery having the potential to increase utilization of perinatal care compared to the routine approach.[26]

Intervention approaches based on contemplative practice, such as mindfulness-based interventions (MBIs) and

compassion-based interventions (CBIs), are examples of interventions that aim to alleviate distress and cultivate well-being.[27–29] MBIs focus on cultivating non-judgmental awareness and acceptance of present-moment experiences[30,31]; CBIs involve the intentional cultivation of positive affective states (e.g. love, kindness, compassion, and joy).[32] Both MBIs and CBIs are encouraging approaches for improving mental health and reducing psychological distress in the perinatal period. A systematic review and meta-analysis of MBIs suggests that among healthy perinatal populations, MBIs had smaller effects than those found in other populations.[33] This review recommended more robust investigation that considers strategies to enhance practice and explore intervention engagement.[33] CBIs might be more appropriate in perinatal populations because they extend to enhanced feelings towards oneself and others. Self-compassion has been systematically demonstrated to be positively related to flourishing, positive mental health and negatively related to poor mental health in various populations, with limited studies targeting perinatal women.[34,35] In sum, both MBI and CBI approaches have potential benefits for perinatal women, but further work needs to consider factors related to intervention uptake.

Engagement in interventions requires consideration given the issues of accessibility faced by women during the perinatal period,[36,37] particularly during the COVID-19 pandemic which has magnified mental health concerns, altered engagement preferences,[35] and exacerbated mental health concerns. Interventions aimed to optimize well-being and coping skills have been shown to be effective when delivered in a digital format.[38,39] Greater accessibility and flexibility afforded by delivering interventions online may enhance engagement, providing a cost-effective approach with public health benefits for mother and child.[39] However, few studies of web-based interventions have followed expectant mothers from pregnancy through childbirth.[40] The available evidence from web-based MBI studies highlights issues with intervention feasibility and high attrition rates in some studies.[41] In one study by Krusche et al.[41] that examined the impact of an online mindfulness course on perceived stress and mood during pregnancy, the completion rate was only 21%. This suggests issues with programme feasibility and acceptability for the majority of participants and highlights the need to increase engagement and address the barriers. The authors suggested mixed methods research with open questions about the time intensity of the course, the mode of content delivery, adequate minimum dose amount, or specific course elements.[41] However, there remains a need for strategies that increase engagement[42] and improve intervention success and the quality of mental health treatments.[43]

The concept of 'engagement' is a multidimensional construct, combining cognitive, behavioural, and affective components, and can be viewed as a predictor for digital health intervention effectiveness.[44,45] Researchers continue to consider models that capture the degree of interest, affect, attention, and preferences in interventions.[46] The CAPE model[47] (Connect, Attend, Participate, and Enact) studies parent engagement patterns in child mental health programmes. CAPE includes behavioural, cognitive, and affective engagement indicators from the level of interest in an intervention among those eligible (Connect), to having a continuous presence in the intervention (Attend), to actively engaging with the intervention content (Participate), and finally to using knowledge or strategies learned during the intervention in daily life (Enact). Issues with limited engagement have arisen consistently across digital psychological interventions.[48] Before decisions can be made about developing, selecting, and implementing a programme, it is vital to understand women's preferences, attitudes towards, and engagement in MBIs and CBIs, particularly perinatal women to determine if this target audience differs considerably to other groups. In this study, the term 'engagement' refers to intention to participate in a specific online well-being intervention. End-user intervention preferences, such as type, format, and duration, along with barriers and enablers to participation will ultimately assist researchers and app developers to create nuanced and efficacious interventions.

The intention of this study was to determine if pregnant women's self-reported motivation to engage in online programmes varies according to the types of well-being programmes – specifically self-compassion, mindfulness, or general relaxation programmes. While our primary interest is in CBIs and MBIs, we employed a general relaxation strategy (progressive muscle relaxation (PMR)) as a comparator, given that this is a behavioural/non-cognitive positive psychology intervention with a plethora of evidence, including evidence in perinatal populations.[49,50] We randomized pregnant women to read about each of the three programme types (i.e. MBI, CBI, or PMR) before asking them about their perspectives. Women were stratified by parity and whether they had previously undertaken online well-being programmes. To enhance the design of this study, materials were tested for understandability and actionability by an independent consumer panel prior to commencement, as this has been shown to be a rigorous approach for consistent messaging.[51]

Aim and objectives

The overall aim of this study was to understand women's motivation to engage in three different types of online contemplative practice interventions, including their attitudes, perceived motivation, and perceived barriers to engagement. We aimed to determine whether this differs by type of intervention – MBIs, CBIs, or PMR. Specifically, our objectives were to: (1) describe and compare attitudes and willingness to engage among pregnant women randomly

assigned to read about three different online well-being intervention conditions; (2) assess perceived barriers and enablers to engagement for that intervention; and (3) determine a feasible programme structure that supports women's engagement.

Methods

Study setting and participants

This study was nested within the ORIGINS Project (ORIGINS). ORIGINS is a longitudinal, prospective pregnancy cohort study tracking 10,000 Western Australian families enrolled during pregnancy and followed over the first 5 years of life. ORIGINS is examining ways to optimize health potential of individuals and communities, going beyond disease prevention, to the conditions that facilitate flourishing from an early age. It is taking a broader approach to the protective and buffering factors that enhance resilience and reduce allostatic load.[52] ORIGINS aims to improve the health and quality of life of the next generation through improved pathways to enrich the early environment and reduce adversity by promoting primary prevention, early detection, and early intervention.

Eligible women for this study were pregnant women already consented to participate in ORIGINS who attended their second antenatal visit at Joondalup Health Campus (JHC) or via telehealth (i.e. post 28 weeks' gestation) between July 2020 and October 2021. During this period, there were service restrictions due to the COVID-19 pandemic, but pregnant women continued their antenatal care, predominantly in person, since there were reduced lockdowns in Western Australia, and heavy travel restrictions resulting in a COVID-free community relative to other national and international regions. Approximately, 300 women were eligible to participate during this time. Inclusion criteria were: (1) English speaking, (2) regular access to the Internet, and (3) willingness to undertake an online survey. There were no specified exclusion criteria to participate in this study. During their routine antenatal ORIGINS appointment, women were provided with a participant information form (see Supplementary File 1) about the study and a research assistant registered if the woman expressed an interest in participating.

All interested women were stratified by parity and previous completion of well-being training. After programme allocation, an email was sent to women with an electronic information leaflet/description of one of three e-intervention programmes according to their random allocation. The women were asked to read the leaflet and to complete a short-form online survey.

Materials, measures, and procedure

Prior to the commencement of the online questionnaire, information explaining the purpose and procedures of the study was provided, followed by a consent statement outlining the implications, risks, and benefits of participation. Participants provided electronic consent through REDCap, V12.2.4 (Vanderbilt University, Nashville, TN, USA).

The three participant programme leaflets were developed with similar content, format, and tone, to be as comparable as possible, only differing by intervention approach. The leaflets were of similar reading levels (Flesch–Kincaid Grade Levels[53] ranging from 11 to 12 which is appropriate for 16- to 18-year olds). To further ascertain acceptability of the language, we asked participants in each group if the language was easy to understand along with their confidence that they understood the programme. In total, 90% of all participants agreed that the language was easy to understand and 85% felt confident they understood the programme, with no notable differences between programmes.

We sought consumer input from members of the ORIGINS' Participant Reference Group (May 2020) on the three programme leaflets using questions adapted from The Patient Education Materials Assessment Tool (PEMAT), which is a systematic method to evaluate and compare the understandability and actionability of patient education materials. It is designed as a guide to help determine whether patients (or participants) will be able to understand and act on information.[54] For this study, questions were adapted from the audio-visual materials as the leaflets were provided online. Question topics include content, word choice and style, organization, layout and design, and use of visual aids and actionability.

Anonymous feedback was collected via Survey Monkey and Participant Reference Group members were reimbursed for their time. The majority of respondents agreed with all statements for each flyer; however, where there were disagreements the leaflets were reviewed and adapted. For example, only 75% agreed that the material made its purpose completely evident in the mindfulness leaflet. An extra sentence was added to the leaflet to clarify that the purpose was to encourage participation in an online well-being and stress reduction programme, which could be beneficial during pregnancy. General comments included the recommendation to direct participants to additional supports; consequently, all three leaflets were adapted to include contact numbers for community support services (see Supplementary Files 2–4 for copies of the participant leaflets.)

Data collection (quantitative and qualitative)

We undertook a mixed methods approach, collecting both quantitative and qualitative data through an online questionnaire and triangulating the results to provide a more robust appraisal. The participant survey assessed participants' perceived attitudes and perceived likelihood to

engage in/use the intervention, barriers, facilitators, and programme structure preferences. The survey included closed questions (e.g. whether or not participants would sign up for the online well-being programme (yes/no), were they confident they would complete the modules (yes/no), how many modules would they do (count)). The survey also included open/free text questions (e.g. what benefits they would expect from an online programme, anticipated barriers to practice, and general comments). Participants could review their answers prior to final online submission.

The survey was developed using REDCap by the first author (J.D.) in consultation with the project team specifically for this research study and was not a validated instrument (see Supplementary File 5 for survey questions relating to 'intention to participate'). There is currently a lack of validated self-report questionnaires specific to the eHealth and mHealth behaviour change intervention context.[55]

Following survey completion, if participants indicated interest to participate in a well-being intervention, they were provided with a mindfulness leaflet, as well as a link to the Smiling Mind app (https://www.smilingmind.com.au/smiling-mind-app), with an indication that this app is not specifically tailored to pregnancy.

Mixed methods data analysis

Data analytic approach

We undertook a mixed methods triangulation design, using a validating quantitative model,[56] whereby both quantitative and qualitative data were collected in one phase through an online questionnaire. The qualitative data were collected concurrently but analysed second in the sequence to elaborate on the quantitative results. A mixed methods approach was used, as in combination, quantitative and qualitative methods complement each other and allow for a more robust analysis.[57] The totality of the quantitative and qualitative data was triangulated and interpreted together.

Quantitative data

For the quantitative analysis, we describe results in three parts for the following outcomes: attitude towards the programme, likelihood to engage/undertake the programme, and programme structure feasibility. Continuous outcomes (attitude) are reported as medians and interquartile ranges given the skewed distributions. Comparisons between programmes were performed using quantile regression where median differences and their corresponding 95% confidence intervals are presented. The remaining survey questions, such as perceived benefit and confidence in being able to do the programme, were categorical and presented as frequencies and proportions. Fisher's exact tests were used to examine these. For this study, we aimed to recruit a total of 150 (50 per group). If the lowest group demonstrated a 40%

willingness to engage then another group would need to demonstrate approximately 70% willingness to engage (difference in proportions of 30%). This was determined using G*power difference in proportions (Fisher's exact test) with a power of 80% and alpha of 0.05. All statistical analysis was performed using Stata Statistical Software: Release 16 (StataCorp., College Station, TX, USA).

Qualitative data

Content analysis was undertaken on open-ended responses, regarding barriers and enablers to programme participation. Qualitative content analysis focuses on subject and context and emphasizes variation, for example, similarities within and differences between parts of the text.[58] The text was coded into content categories and conceptual analysis was undertaken, coding the data into explicit and implicit categories (phrases, sentences, and themes) using NVivo (Release 1.5). Initial coding looked for concepts, then frequency of concepts to determine if there were repeated themes. Reliability of the data coding process was ensured through cross-reference with a separate coder. Validity of the coding process was ensured as the analysis was consistent and coherent in the codes. Themes were derived within each category and ordered in the analysis by frequency of themes, including examples of participant comments, until themes reached saturation, as agreed by the authors (Tables 2 and 3 for categories and themes; Tables 8 and 9 in the Appendix 1 include additional comments). As there were no significant differences between the programme arms in the initial quantitative analysis, we coded all qualitative data as a homogeneous participant group.

Results

In total, 289 ORIGINS study participants indicated interest in this study, with a final participant completion of $n = 151$ (i.e. 52% of participants who registered an expression of interest went on to participate in the study). The 151 participants were randomly distributed equally across programme type (i.e. mindfulness programme (MP): $n = 51$, loving kindness & compassion programme (LKCP): $n = 51$, and progressive muscle relaxation programme (PMRP): $n = 49$), with matched profiles in terms of age, parity, and prior exposure to online well-being programmes (Table 1).

Quantitative data

Attitude and likelihood towards programme type

Participants were asked to rate their immediate attitude, or first impression, to the programme type using a 100-point scale (ranging from 0 = highly negative to 100 = highly positive). Median attitude ranged from 75 in the PMRP

Table 1. Participant demographics.

	MP (*n* = 51)	LKCP (*n* = 51)	PMRP (*n* = 49)	*p* Value
Age				
Mean (SD)	31.5 (4.2)	32.9 (5.0)	32.9 (4.5)	0.234
Apart from your current pregnancy, do you already have children?				
Yes	25 (49.0%)	25 (49.0%)	25 (51.0%)	0.999
No	26 (51.0%)	26 (51.0%)	24 (49.0%)	
Have you completed an online well-being programme before?				
Yes	5 (9.8%)	5 (9.8%)	7 (14.3%)	0.767
No	46 (90.2%)	46 (90.2%)	42 (85.7%)	

MP: mindfulness programme; LKCP: loving kindness & compassion programme; PMRP: progressive muscle relaxation programme; SD: standard deviation.

Table 2. Comparison of attitude (100-point scale) according to group (programme type) allocation.

Group (programme)	Median (IQR)	Median differences (95% CI)		
		MP versus LKCP	MP versus PMR	LKCP versus PMRP
MP	79 (71–98)	2 (−7.7–11.7)	−4 (−13.7–5.7)	−6 (15.6–3.6)
LKCP	80 (70–99)	*p* = 0.684	*p* = 0.414	*p* = 0.219
PMRP	75 (70–94)			

IQR: inter quartile range; CI: confidence interval; MP: mindfulness programme; LKCP: loving kindness & compassion programme; PMR: progressive muscle relaxation; PMRP: progressive muscle relaxation programme.

group, to 79 in the MP group, and to 80 in the LKCP group. There was no statistical difference detected in median attitude between the groups, all comparisons were non-significant, *p* > 0.05; see Table 2 for attitude ratings by group allocation.)

Participants were also asked categorical questions, including perceived benefit of the programme in the short and long term, likelihood to sign up for the programme, and their likelihood of undertaking independent practice. In general, women were inexperienced with these types of interventions but held mostly positive perceptions (e.g. more than half saw short- and long-term benefits to the interventions), although their willingness to engage in self-directed practice was divided between 'possibly' and 'likely'. Across all groups, *n* = 80 (53%) believed this intervention could benefit them in the short-term and *n* = 90 (61%) in the long term. There was no significant difference between any groups (see Table 3).

Programme structure feasibility

Questions about programme structure included participants' perceived time commitment, duration, and time of day. Although there was wide variability for each measure, there was a tendency for participants to indicate that they desired fewer and shorter modules; the majority indicated they preferred online modules over 2–4 weeks, of 15 min or less, with a preference to complete in the morning or evening evenly distributed. There were no significant differences between groups for programme structure (see Table 4).

Qualitative data

Perceived barriers

Most participants (*n* = 130, 86%) responded to perceived barriers to undertaking an online well-being programme (i.e. 'please describe some of the potential barriers that might prevent you from undertaking this online programme'). The primary perceived barrier was lack of time due to other children, work, or additional commitments, 'I'm about to have my second child and unsure how crazy life is about to become'; 'Busy juggling work and study'; and 'Demands of newborn baby and being first time mum'. Tiredness and insufficient sleep were also frequent barriers, for example, 'Levels of fatigue which are increasing as pregnancy progresses could be a factor that could influence whether someone is able to dedicate a particular time to the program'.

Other perceived barriers include forgetfulness, either due to pregnancy-related forgetfulness or that the programme would not be a priority. For some it was not appealing (e.g. 'It feels like another thing to get done'), or they were not committed (e.g. 'Myself and my procrastination would be the only barrier'). For other women, they did

Table 3. Comparison of likelihood to engage/undertake training by group (programme type) allocation.

	MP (*n* = 51)	LKCP (*n* = 51)	PMRP (*n* = 49)	*p* Value
I have undertaken something similar before				
No	41 (80.4%)	47 (92.2%)	43 (87.8%)	0.220
Yes	10 (19.6%)	4 (7.8%)	6 (12.2%)	
I think this could benefit me short term				
No	20 (39.2%)	24 (47.1%)	27 (55.1%)	0.288
Yes	31 (60.8%)	27 (52.9%)	22 (44.9%)	
I think this could benefit me long term				
No	18 (35.3%)	21 (41.2%)	20 (40.8%)	0.834
Yes	33 (64.7%)	30 (58.8%)	29 (59.2%)	
I think my partner would be supportive				
No	25 (49.0%)	17 (33.3%)	21 (42.9%)	0.281
Yes	26 (51.0%)	34 (66.7%)	28 (57.1%)	
If offered this programme, how likely are you to sign up for it?				
Very likely	11 (22.0%)	14 (28.0%)	9 (18.4%)	0.587
Likely	27 (54.0%)	20 (40.0%)	21 (42.9%)	
Neutral	9 (18.0%)	12 (24.0%)	16 (32.7%)	
Unlikely	2 (4.0%)	4 (8.0%)	2 (4.1%)	
Very unlikely	1 (2.0%)	0 (0.0%)	1 (2.0%)	
Do you think you are likely to undertake independent practice (i.e. unguided, self-directed practice in your own time)?				
Definitely/likely	21 (41.2%)	14 (28.0%)	14 (28.6%)	0.490
Probably/possibly	25 (49.0%)	31 (62.0%)	28 (57.1%)	
Probably not	5 (9.8%)	5 (10.0%)	5 (10.2%)	
Definitely not	0 (0.0%)	0 (0.0%)	2 (4.1%)	

MP: mindfulness programme; LKCP: loving kindness & compassion programme; PMRP: progressive muscle relaxation programme.

Table 4. Comparison of programme structure feasibility by group (programme type) allocation.

	MP (*n* = 51)	LKCP (*n* = 51)	PMRP (*n* = 49)	*p* Value
How many weeks do you think you could commit to undertaking different learning modules?				
Only 2 weeks	6 (12.0%)	11 (22.0%)	6 (12.2%)	0.872
2–4 weeks	15 (30.0%)	12 (24.0%)	17 (34.7%)	
4–6 weeks	8 (16.0%)	10 (20.0%)	9 (18.4%)	
6–8 weeks	9 (18.0%)	6 (12.0%)	7 (14.3%)	
8 or more weeks	12 (24.0%)	11 (22.0%)	10 (20.4%)	
What is a reasonable length of time for completing an online module?				
Less than 10 min	16 (31.4%)	16 (32.0%)	16 (32.7%)	0.997
10–20 min	26 (51.0%)	26 (52.0%)	23 (46.9%)	
20–30 min	8 (15.7%)	8 (16.0%)	8 (16.3%)	
30–45 min	0 (0.0%)	0 (0.0%)	1 (2.0%)	
Up to one hour	1 (2.0%)	0 (0.0%)	1 (2.0%)	
How many modules do you think you would complete each week?				
1–2	40 (78.4%)	37 (74.0%)	38 (79.2%)	0.135
3–4	11 (21.6%)	12 (24.0%)	6 (12.5%)	
5–7	0 (0.0%)	1 (2.0%)	4 (8.3%)	
How much time do you think is reasonable to spend on practicing the programme independently?				
5–10 min	28 (54.9%)	27 (55.1%)	23 (46.9%)	0.505
10–15 min	22 (43.1%)	22 (44.9%)	23 (46.9%)	
20+ min	1 (2.0%)	0 (0.0%)	3 (6.1%)	
What time of day do you think you would be most likely to undertake practice?				
Early morning	6 (11.8%)	4 (8.3%)	6 (12.2%)	0.793
Morning	15 (29.4%)	15 (31.2%)	13 (26.5%)	
Afternoon	6 (11.8%)	9 (18.8%)	8 (16.3%)	
Early evening	9 (17.6%)	4 (8.3%)	10 (20.4%)	
Late evening	15 (29.4%)	16 (33.3%)	12 (24.5%)	

MP: mindfulness programme; LKCP: loving kindness & compassion programme; PMRP: progressive muscle relaxation programme.

not see any personal need, 'If I were to suffer from stress, I would be more likely to commit but it isn't really a problem for me so I wouldn't have the determination to complete the programme'. For a few, they simply would prefer a different format or type of program, 'Would personally do better in an in-person course'. Table 5 summarizes perceived barriers by theme.

Perceived enablers

In total, $n = 119$ (79%) of participants provided a free text response to perceived enablers to undertaking an online well-being programme. The specific online question was, 'please describe some of the things that might encourage you to undertake this online program'. All responses to this question have been interpreted as enablers.

The majority of participants believed it would improve their well-being, specifically their mental health, 'I am very interested in looking after my mental health and this looks like it would help towards that'. They perceived that the benefits could extend to their baby, 'Knowing that it will have possible benefits for me and my baby', and that it would develop personal skills, 'Techniques to be more in tune with how I'm feeling and mindfulness and learning how to switch off and relax'. Stress management was another key motivator, both to reduce stress, 'I would love to be less stressed and tense!' Some women recognized how this training could help them cope with potential postnatal depression, 'Also knowing that I have had issues with depression and anxiety in the past, having tools like this to possibly combat or at least acknowledge and understand the signs of postpartum or postnatal depression would be significant'.

Programme functionality was important, especially automated reminders, 'Having an alarm or reminders for daily practice', as well as a brief programme, 'Not having to commit too much time'. The programme also needs to be easily accessible with frequent interruptions likely to be experienced by new mothers, 'Ability to complete the program at any time and pause / return if interrupted (by baby) during the session'. Participants could already see the benefits of doing this type of intervention and would be further motivated by seeing results or being rewarded, 'As I can see benefits of taking the program with my mental health and ability to parent, I would be happy to participate'.

Improving relationships was also a key motivating factor for engagement: 'To help me with the new journey of motherhood, to keep a positive mind-set good for myself and baby'. 'Positive changes in my interactions with others'. A community of practice was appealing to some women, 'If there is a small community of women involved, or a Facebook page related to it'. Additional perceived enablers included access to an instructor, a supportive partner, and endorsement from a healthcare provider (see Table 6 for a summary of perceived enablers by theme.)

Triangulation

Triangulation refers to using multiple, different approaches to generate better understanding of a given theory or phenomenon and to contribute to our understanding more broadly.[59] In this study, we gathered both quantitative data and qualitative data. Table 7 summarizes the triangulated themes that were extrapolated from both sets of data.

Discussion

The perinatal (antenatal and postnatal) period can be a time of increased psychological distress[60] and a time when maternal well-being can have significant implications for both mother and baby. While digitally delivered contemplative practice interventions can be effective in treating and preventing mental health problems, there are indications of engagement issues that hamper uptake at scale and there remains a lack of evidence around how to increase engagement with evidence-based programmes.[42] The aim of the study was to understand and compare pregnant women's attitudes towards and likelihood of engaging/undertaking different types of online well-being programme types. In addition, we aimed to understand pregnant women's perceived barriers and enablers to engaging with online well-being programmes and a feasible programme structure that would support programme engagement. The main findings indicate generally positive attitudes to all intervention types, with a preference for brief modules of limited duration. There were no statistically significant differences between programme types on any of the measures. This could indicate that it is not necessarily the type of intervention that appeals to this audience (at least within those based on contemplative practice and cognitive and/or behavioural psychology principles) but rather the feasibility and functionality, as well as the messaging or promotion to the target audience.

Across all programme types, two-thirds of participants indicated that they were 'very likely' or 'likely' to sign up for the programme, and they believed undertaking an emotional well-being programme would help them in the long term. This likelihood was further underscored in participants' appreciation of the importance of mental health and receptiveness to fostering skills to support their emotional well-being. This is consistent with previous literature and self-efficacy theory, whereby self-efficacy allows people to perceive self-competency in dealing with potential situations, master challenges, and face stressful events.[25,61] Although women are likely to express enthusiasm about trying/signing up for these programmes, there is likely to be a large number of discontinuations and little self-directed practice, and for this reason, digital mental health intervention designs should consider their needs and preferences in order to promote continued engagement and the enactment of the learned strategies in daily life.

Table 5. Perceived barriers to online well-being programme (coded by frequency).

Category	Lack of time	Tiredness	Forgetfulness	Not appealing	No perceived barriers	Other barriers
Themes	Other children work Newborn issues Other commitments: housework, family, study, and volunteering Other reasons Other children	Too tired during the day Insufficient sleep	Pregnancy related Not a priority	Sense of duty Lack of personal motivation Uncertain of benefits	No perceived barriers	No apparent need Other priorities Prefer another format Using other programmes

Table 6. Perceived enablers (themes) to online well-being programme (coded by frequency).

Category	Improved well-being	Stress management	Functionality	Track benefits	Improve relationships	Community of practice	Other enablers
Themes	Mental health Perceived benefit Skills development Self-care and development Mindfulness Relaxation Supportive tool	Stress reduction Techniques to deal with emotions Prevent PND	Automated reminders Brief Accessible Other functional considerations	Seeing results Being rewarded	Benefit my children Other relationships	Connection with others Access to instructor	Partner support Healthcare provider Opportunistic

PND: postnatal depression.

While we found no significant differences between programme preferences, evidence drawn from observational and experimental studies illustrates the potential benefits of MBIs and CBIs in reducing distress and promoting well-being in the perinatal period. However, for Internet delivered MBIs, there are some issues with intervention feasibility and high attrition rates in some studies.[41] A pilot RCT (Mums Minds Matter) investigated the feasibility and engagement in a randomized controlled trial protocol comparing three meditation-based interventions delivered on the Internet during pregnancy.[62] In addition, the Mums Minds Matter study explored barriers and enablers to online well-being training, along with engagement in other types of well-being practices.[63] Our analysis of Mums Minds Matter, along with this current study will be used to design an appropriately tailored mobile app for a future full-scale randomised controlled trial (RCT) comparing mental health outcome in perinatal women who undertake an online mindfulness, loving kindness, or general relaxation programme. These results could be used to develop evidence-based, scalable, and low-cost interventions that promote well-being and reduce psychological distress among pregnant women.

The most frequent perceived barriers were lack of time, followed by tiredness and forgetfulness. This is in line with research on actual barriers to intervention efficacy among postnatal women,[64] as well as barriers such as lack of knowledge as to when to seek support, highlighting the importance of health literacy.[65] In terms of a feasible programme structure, there was variability in the weeks that participants indicated they could commit to undertaking different learning modules. The importance of having short modules with limited practice was underscored by our qualitative analysis of barriers, which found that time was a frequently cited barrier to undertaking a well-being programme. One of the key enablers to programme engagement was programme functionality, including automated reminders and easy accessibility. This information is valuable in guiding the development of online programmes that are brief, targeted, and acknowledge women's context such as limited available time (antenatally) and the frequent interruptions of a newborn baby (postnatally).

Women frequently experience mood instability (MI), such as sudden and extreme mood fluctuations, in their reproductive years, particularly during pregnancy and postpartum,[66,67] MI, including stress, is a risk factor for psychiatric disorders; however, there is limited research on perinatal MI.[68] Emotional well-being and positive coping strategies, such as meditation, sleep, and exercise, can alleviate MI and stress during the perinatal period.[68,69] Stress management was a primary motivator for many participants in our study who perceive this as negative and want to learn effective coping skills. Stress plays a crucial role in early development, with evidence supporting transmission occurs in utero as well as during the first years in life.[70] Maternal mindfulness during pregnancy has been

Table 7. Triangulated themes, evidence, and interpretation.

Theme	Evidence (quantitative and qualitative)	Interpretation/recommendation
General positive attitude to all	Attitude was positive towards all three programmes 61% perceived long-term benefit for this type of programme General belief that this would improve well-being	Generally, women in the perinatal period have a positive attitude to undertaking a brief online emotional well-being programme
No differences between programme type	There was no significant difference detected in attitude between the groups In open responses, comments did not tend to mention particular programme content	Overall, a standard brief online emotional well-being programme using contemplative practices for perinatal women should be appropriately promoted with clear messages about the potential benefits
Likelihood to undertake this type of training	Two-thirds (68%) indicated that they were 'very likely' or 'likely' to sign up for the programme Women identified existing enablers in their lives to engagement and ways to overcome barriers in programme design	If appropriately targeted, it is likely women will participate, with benefits at a public health scale
Barriers and enablers	Three quarters ($n = 113$, 75%) of participants indicated that their partner would be supportive. There was a recognition that independent practice may not be realistic for some women, needing access to an instructor, a supportive partner, and endorsement from a healthcare provider.	Ensure materials are appropriately targeted to partners too. Establishing a community of practice with tailored support may enhance uptake and practice.
Programme structure	About one-third (29%) would commit to undertaking different learning modules between 2 and 4 weeks and 18% over 4–6 weeks. 76% would complete 1–2 modules per week 15 min or less is a reasonable length of time for undertaking regular practice Time limitations and tiredness were frequent perceived barriers to undertaking training	Recommended programme design should consider brevity where possible: • Maximum duration of programme 6 weeks or less • Maximum number of modules per week 4 or less • Each module should take a maximum of 15 min
Programme functionality	Perceived barrier was forgetfulness Request for automated reminders Participants were keen to see the benefits by seeing results or being rewarded	Programme must include regular prompts/reminders The programme should include rewards or some evidence that this is beneficial
Programme promotion	Perceived barriers were a sense of duty and lack of personal motivation Perceived benefit to individual and developing baby Just over half of participants saw short- and long-term benefits to these interventions Perceived help to deal with stress and depression Perceived opportunity to improve relationships, either as a mother or in another relationship	Key promotional messages: • Programme could aid sleep • Programme could alleviate stress and prevent depression • Programme could improve relationships • Programmes can benefit mother and child in short and long terms

associated with better infant social-emotional development.[71] Even if mindfulness practice is not sustained long term, reducing stress during pregnancy may be a crucial intervention point during the development of the foetus.

Furthermore, research is needed to look at timing and uptake in different groups of perinatal women,[72] including those with elevated psychological distress. A recent RCT undertaken by Loughnan et al.[73] explored an Internet-delivered mental health treatment programme for postpartum women and concluded that additional research is required to determine such factors as optimal duration, number of sessions, and to understand what aspects promote adherence and influence programme completion. Generally, more studies are needed on tailored and targeted strategies to better engage participants in intervention programmes,[74] particularly for those at risk or with elevated psychological distress. These may include a range of interventions, delivered digitally or in traditional formats, including screening, antenatal classes, and self-efficacy programmes. In addition, it is recommended that increased efforts are made in co-designing engagement strategies with this target group.

There is a lack of systematic methodologies to assess intervention engagement, and the key factors reflecting the success of interventions, such as engagement, are often hard to compare across studies.[75,76] Therefore, the application of structured engagement frameworks, such as the CAPE model,[47] can make comparison more meaningful.[77] To aid understanding of programme engagement, researchers need to continuously identify and address barriers to technology-supported interventions – in particular those initial connections to programmes – and consider strategies to improve participation, which can lead to a better outcome,[74] sustained over time.

The Time Out for Wellbeing study explores the foundational aspect of the CAPE framework: connect, that is, assessing how many people express interest in engaging in an intervention out of those who are eligible. In our study, while 289 expressed interest in participating, 151 women actually completed the study. This 'connect' metric is a useful measure in intervention design to determine real-world uptake. Frequently reading about an intervention through a leaflet is the first (and often only) point of connection with a participant/patient or consumer to inform their decisions about signing up/commencing in a programme. This underscores the importance of ongoing dialogue with consumers in study designs. Future studies could be enriched with pregnant women undertaking leaflet reviews, to guide visual design and content, then comparing uptake of different programmes.

Given that all later stages of engagement cannot happen without this step, knowing what motivates women at this first stage is crucial. Our study delves deeper to understand initial perceptions in order to ensure the subsequent intervention is optimized for the target audience. We contend that this formative exploratory investigation enhances design and aids the other CAPE model stages – attend, participate, enact – supporting increased engagement, intervention efficacy, and longer-term sustained practice. Attrition rates for online programmes can be high, so enabling a continuous engagement pathway from initial connection to implementation of practice will ensure the full benefits of the programme are realized.

In Australia, the recently published National Preventive Strategy 2021–2030[78] argues there is a risk that advances made in recent decades to improve overall health could be reversed if Australia does not increase its focus on preventive health and health promotion. The strategy emphasizes that when a community flourishes, its health tends to flourish too, enabling individuals to achieve their full potential.[78] This is due to the close relationship between people's health and the circumstances in which people grow, live, work, play, and age – the wider determinants of health.[79] Expectant mothers and partners, before and during pregnancy, present opportunities to build resilience, and positive mindsets to protect developing biological systems from the disruptive effects of adversity.[80] Ostensibly, investing in accessible mental health tools will strengthen individuals and communities, but they must be engaging and enduring as well as effective.

Limitations, strengths, and further research

A limitation of this study was our inability to look at whether or not women's attitudes and perceived barriers and enablers were linked to actual engagement in an online programme. Furthermore, research should consider the differences between motivation, actual initial, and sustained engagement in order to develop and target appropriate engagement strategies. Future research could include a control group comparing online to in-person intervention preferences. In addition, further investigation into the leaflet design may yield different results, such as how motivating participants found the leaflet, or if the leaflet was credible, logical, and perceived as beneficial. Different study designs may have provided more robust conclusions, but all three leaflets were comparable across conditions as we were trying to isolate the characteristics of the intervention itself. Regarding the differences between interventions in attitudes and willingness to undertake each programme, a design where all women read the three leaflets, give their feedback, and choose one intervention would add more information. Presenting a particular programme's description may influence the participants' responses about an ideal programme structure and how much time they are willing to spend on an online intervention. Future work might consider: (1) testing design across other types of advertising materials, (2) manipulating motivational content of the advertising material, and (3) manipulating content regarding the intervention to parse out these different effects.

A strength and potential limitation of this study is that it was nested within an established longitudinal cohort study, The ORIGINS Project. Using an established infrastructure enabled us to test the materials with a consumer panel that provided constructive feedback prior to commencement of the study. Nonetheless, a limitation may be in the ORIGINS cohort themselves who are generally motivated to participate in research but also exposed to a range of studies and may be fatigued, thus limiting our generalizability. This study would be further enriched through inclusion of perinatal women belonging to different socio-cultural and linguistic backgrounds. In addition, future research should also consider accessibility to local web health services by participants.

It is a strength of this study to report on enrolment as a proportion of interested participants, which could be further strengthened by reporting on proportion of eligible participants. We acknowledge that participants in this study may not be representative of the ORIGINS cohort and the wider population. From a total of 300 potential participants in this study, only half ($n = 151$) went on to participate; within this cohort, 130 participants responded to 'perceived barriers' and 119 to 'perceived enablers'. Although this can be interpreted as a limitation of this study, this is also an indication of intervention and/or research compliance, which is a useful measure of real-world uptake.

This study was strengthened by the use of a mixed method design. In analysing quantitative data collection initially and finding no significant differences between intervention arms, we analysed the qualitative data as a uniform data set. Our interpretation of both sets of data was more robust than exploring either set in isolation. To enrich the study further, additional questions could be included about the role of partners in supporting emotional well-being programmes and enabling regular practice.

Consideration should be given to the unknown impacts of the COVID-19 pandemic during this time. Throughout this study, there were periods of enforced lockdown restrictions, both locally and globally. This context may have affected women's attitudes towards undertaking the training and perceived benefits, as well as increased reliance and acceptance of digital interactions. Positive mindsets may be protective against psychological distress for the mother and her child, suggesting that meditation-based or similar training might help support expectant and post-birth mothers during times of crisis such as the COVID-19 pandemic.[35]

Conclusion and implications

According to the World Health Organization (2022),[81] 'Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. Reaching this human potential depends on enhancing protective influences during critical or sensitive developmental stages and reducing or buffering adverse environmental elements. This means that promoting physical and emotional resilience in pregnancy and the early perinatal period requires special attention. Women are uniquely vulnerable in the perinatal period and benefit from targeted, accessible information and support with clear promotional messaging about the potential benefits. A 'toolbox of skills' to apply positive emotions in everyday settings may greatly assist, particularly in challenging times. Our findings reinforce the importance of determining participant preferences in designing engaging interventions. This is particularly pertinent when considering the specific needs of the end users and for minimal contact interventions such as those delivered online. Our findings contribute to the information required to design practical, cost-effective, engaging, and effective programmes that support lasting positive mental health, while also preventing symptoms of mental health problems. This information is not only useful for researchers and app developers but also commissioners, ensuring investments are made in well-designed, pragmatic programmes. Enabling flourishing in the perinatal period – for the mother and her child – is of critical importance for public health, to the benefit of individuals, their families, and society more broadly for generations to come.

Declarations

Author contribution(s)

Jacqueline A Davis: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Software; Visualization; Writing – original draft.
Amy L Finlay-Jones: Conceptualization; Methodology; Supervision; Validation; Writing – review & editing.
Natasha Bear: Data curation; Formal analysis; Software; Validation; Visualization; Writing – review & editing.
Susan L Prescott: Conceptualization; Funding acquisition; Resources; Supervision; Validation; Writing – review & editing.
Desiree T Silva: Funding acquisition; Project administration; Resources; Writing – review & editing.

Jeneva L Ohan: Conceptualization; Formal analysis; Methodology; Supervision; Validation; Visualization; Writing – review & editing.

Competing interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Availability of data and materials

The non-identifiable data presented in this study are available on reasonable request from the corresponding authors.

ORCID iD

Jacqueline A Davis https://orcid.org/0000-0003-3590-431X

Supplemental material

Supplemental material for this article is available online.

References

1. Schotanus-Dijkstra M, Drossaert CHC, Pieterse ME, et al. An early intervention to promote well-being and flourishing and reduce anxiety and depression: a randomized controlled trial. *Internet Interv* 2017; 9: 15–24.
2. Wolbert L, de Ruyter D and Schinkel A. The flourishing child. *J Philos Educ* 2021; 55(4–5): 698–709.
3. Keyes CL. Promoting and protecting mental health as flourishing: a complementary strategy for improving national mental health. *Am Psychol* 2007; 62(2): 95–108.
4. Trompetter HR, de Kleine E and Bohlmeijer ET. Why does positive mental health buffer against psychopathology? An exploratory study on self-compassion as a resilience mechanism and adaptive emotion regulation strategy. *Cognit Ther Res* 2017; 41(3): 459–468.
5. Barbara LF. The broaden-and-build theory of positive emotions. *Philos Transe R Soc B* 2004; 359(1449): 1367–1377.
6. Kok BE, Coffey KA, Cohn MA, et al. How positive emotions build physical health: perceived positive social connections account for the upward spiral between positive emotions and vagal tone. *Psychol Sci* 2013; 24(7): 1123–1132.
7. Barker DJ. In utero programming of chronic disease. *Clin Sci (Lond)* 1998; 95(2): 115–128.
8. Barker DJ. The fetal and infant origins of adult disease. *BMJ* 1990; 301: 1111.
9. Dubos RJ. *Man adapting* (Mrs. Hepsa Ely Silliman memorial lectures). New Haven, CT: Yale University Press, 1965.
10. Carona C, Xavier S, Canavarro MC, et al. Self-compassion and complete perinatal mental health in women at high risk for postpartum depression: the mediating role of emotion regulation difficulties. *Psychol Psychother* 2022; 95: 561–574.
11. Voellmin A, Entringer S, Moog N, et al. Maternal positive affect over the course of pregnancy is associated with the length of gestation and reduced risk of preterm delivery. *J Psychosom Res* 2013; 75(4): 336–340.
12. Brugha TS, Morrell CJ, Slade P, et al. Universal prevention of depression in women postnatally: cluster randomized trial evidence in primary care. *Psychol Med* 2011; 41(4): 739–748.
13. Bos SC, Macedo A, Marques M, et al. Is positive affect in pregnancy protective of postpartum depression? *Braz J Psychiatry* 2013; 35(1): 5–12.
14. Yin X, Sun N, Jiang N, et al. Prevalence and associated factors of antenatal depression: systematic reviews and meta-analyses. *Clin Psychol Rev* 2021; 83: 101932.
15. Emmanuel E and St John W. Maternal distress: a concept analysis. *J Adv Nurs* 2010; 66: 2104–2115.
16. Buist AE, Austin M-P, Hayes BA, et al. Postnatal mental health of women giving birth in Australia 2002–2004: Findings from the beyondblue National Postnatal Depression Program. *Aust N Z J Psychiatry* 2008; 42(1): 66–73.
17. Australian Institute of Health and Welfare. Experience of perinatal depression: data from the 2010 Australian national infant feeding survey. Information paper, AIHW, Canberra, ACT, Australia, 2012.
18. Newman L, Judd F and Komiti A. Developmental implications of maternal antenatal anxiety mechanisms and approaches to intervention. *Transl Dev Psychiatry* 2017; 5(1): 1309879.
19. Stein A, Pearson RM, Goodman SH, et al. Effects of perinatal mental disorders on the fetus and child. *Lancet* 2014; 384(9956): 1800–1819.
20. Howard LM and Khalifeh H. Perinatal mental health: a review of progress and challenges. *World Psychiatry* 2020; 19(3): 313–327.
21. Shorey S and Chan V. Paternal mental health during the perinatal period: a qualitative systematic review. *J Adv Nurs* 2020; 76(6): 1307–1319.
22. Kucab A, Barnaś E and Błajda J. Assessment of the postpartum emotional wellbeing among women participating and not participating in antenatal classes. *Int J Environ Res Public Health* 2022; 19(8): 4476.

23. Lent BP, Lowdermilk DL, Bobak IM, Perry SE. *Maternity & women's health care*. 6th ed. Mississauga, ON, Canada: The College of Family Physicians of Canada, 1998, p. 851.

24. Pinar G, Avsar F and Aslantekin F. Evaluation of the impact of childbirth education classes in Turkey on adaptation to pregnancy process, concerns about birth, rate of vaginal birth, and adaptation to maternity: a case-control study. *Clin Nurs Res* 2018; 27(3): 315–342.

25. Tsai YJ, Hsu YY, Hou TW, et al. Effects of a web-based antenatal care system on maternal stress and self-efficacy during pregnancy: a study in Taiwan. *J Midwifery Womens Health* 2018; 63(2): 205–213.

26. refaa Aly R, Badia TS, Mohamed HM, et al. Effectiveness of online antenatal educational classes on pregnancy outcome. *Int Egypt J Nurs Sci Res* 2022; 3(1): 516–536.

27. Felder JN, Lemon E, Shea K, et al. Role of self-compassion in psychological well-being among perinatal women. *Arch Womens Ment Health* 2016; 19(4): 687–690.

28. Hanley A, Warner A and Garland EL. Associations between mindfulness, psychological well-being, and subjective well-being with respect to contemplative practice. *J Happiness Stud* 2015; 16(6): 1423–1436.

29. Keng SL, Smoski MJ and Robins CJ. Effects of mindfulness on psychological health: a review of empirical studies. *Clin Psychol Rev* 2011; 31(6): 1041–1056.

30. Trautwein FM, Kanske P, Böckler A, et al. Differential benefits of mental training types for attention, compassion, and theory of mind. *Cognition* 2020; 194: 104039.

31. Spijkerman MP, Pots WT and Bohlmeijer ET. Effectiveness of online mindfulness-based interventions in improving mental health: a review and meta-analysis of randomised controlled trials. *Clin Psychol Rev* 2016; 45: 102–114.

32. Fredrickson BL, Boulton AJ, Firestine AM, et al. Positive emotion correlates of meditation practice: a comparison of mindfulness meditation and loving-kindness meditation. *Mindfulness (N Y)* 2017; 8(6): 1623–1633.

33. Lever Taylor B, Cavanagh K and Strauss C. The effectiveness of mindfulness-based interventions in the perinatal period: a systematic review and meta-analysis. *PLoS ONE* 2016; 11(5): e0155720.

34. Chio FHN, Mak WWS and Yu BCL. Meta-analytic review on the differential effects of self-compassion components on well-being and psychological distress: the moderating role of dialecticism on self-compassion. *Clin Psychol Rev* 2021; 85: 101986–101986.

35. Davis JA, Gibson LY, Bear NL, et al. Can positive mindsets be protective against stress and isolation experienced during the COVID-19 pandemic? A mixed methods approach to understanding emotional health and wellbeing needs of perinatal women. *Int J Environ Res Public Health* 2021; 18(13): 6958.

36. Drozd F, Haga SM, Brendryen H, et al. An internet-based intervention (Mamma Mia) for postpartum depression: mapping the development from theory to practice. *JMIR Res Protoc* 2015; 4(4): e120.

37. Sayakhot P and Carolan-Olah M. Internet use by pregnant women seeking pregnancy-related information: a systematic review. *BMC Pregnancy Childbirth* 2016; 16(1): 65.

38. Andrews G, Cuijpers P, Craske MG, et al. Computer therapy for the anxiety and depressive disorders is effective, acceptable and practical health care: a meta-analysis. *PLoS ONE* 2010; 5(10): e13196.

39. Ashford MT, Olander EK and Ayers S. Computer- or web-based interventions for perinatal mental health: a systematic review. *J Affect Disord* 2016; 197: 134–146.

40. Drozd F, Haga SM, Lisøy C, et al. Evaluation of the implementation of an internet intervention in well-baby clinics: a pilot study. *Internet Interv* 2018; 13: 1–7.

41. Krusche A, Dymond M, Murphy SE, et al. Mindfulness for pregnancy: a randomised controlled study of online mindfulness during pregnancy. *Midwifery* 2018; 65: 51–57.

42. Batterham PJ, Calear AL, Sunderland M, et al. A brief intervention to increase uptake and adherence of an online program for depression and anxiety: protocol for the enhancing engagement with psychosocial interventions (EEPI) randomized controlled trial. *Contemp Clin Trials* 2019; 78: 107–115.

43. Haine-Schlagel R and Walsh NE. A review of parent participation engagement in child and family mental health treatment. *Clin Child Fam Psychol Rev* 2015; 18(2): 133–150.

44. Kelders SM, van Zyl LE and Ludden GDS. The concept and components of engagement in different domains applied to ehealth: a systematic scoping review. *Front Psychol* 2020; 11: 926–914.

45. Kelders SM, Kip H and Greeff J. Psychometric evaluation of the TWente Engagement with Ehealth Technologies Scale (TWEETS): evaluation study. *J Med Internet Res* 2020; 22(10): e17757.

46. Perski O, Blandford A, West R, et al. Conceptualising engagement with digital behaviour change interventions: a systematic review using principles from critical interpretive synthesis. *Transl Behav Med* 2017; 7(2): 254–267.

47. Piotrowska PJ, Tully LA, Lenroot R, et al. Mothers, fathers, and parental systems: a conceptual model of parental engagement in programmes for child mental health – connect, attend, participate, enact (CAPE). *Clin Child Fam Psychol Rev* 2017; 20(2): 146–161.

48. Arnold C, Villagonzalo KA, Meyer D, et al. Predicting engagement with an online psychosocial intervention for psychosis: exploring individual- and intervention-level predictors. *Internet Interv* 2019; 18: 100266.

49. Rajeswari S and SanjeevaReddy N. Efficacy of progressive muscle relaxation on pregnancy outcome among anxious Indian primi mothers. *Iran J Nurs Midwifery Res* 2020; 25(1): 23–30.

50. Zendehdel M, Elyasi F, Jahanfar S, et al. Effectiveness of progressive muscle relaxation technique on anxiety caused by Covid-19 in pregnant women: a randomized clinical trial. *Neuropsychopharmacol Rep* 2022; 42(2): 158–165.

51. Kirby PL, Reynolds KA, Walker JR, et al. Evaluating the quality of perinatal anxiety information available online. *Arch Womens Ment Health* 2018; 21(6): 813–820.

52. Silva D, Hagemann E, Davis JA, et al. Introducing the ORIGINS project: a community-based interventional birth cohort. *Rev Environ Health* 2020; 35: 281–293.

53. Flesch R. A new readability yardstick. *Journal of applied psychology* 1948; 32(3): 221–233.

54. Agency for Healthcare Research and Quality. *The patient education materials assessment tool (PEMAT) and user's guide*. Rockville, MD: Agency for Healthcare Research and Quality, 2013.

55. Short CE, DeSmet A, Woods C, et al. Measuring engagement in eHealth and mHealth behavior change interventions: viewpoint of methodologies. *J Med Int Res* 2018; 20(11): e292.

56. Creswell JW and Plano Clark VL. *Designing and conducting mixed methods research*. 2nd ed. Thousand Oaks, CA: Sage, 2011.

57. Ivankova NV, Creswell JW and Stick SL. Using mixed-methods sequential explanatory design: from theory to practice. *Field Methods* 2006; 18(1): 3–20.

58. Graneheim UH, Lindgren BM and Lundman B. Methodological challenges in qualitative content analysis: a discussion paper. *Nurse Educ Today* 2017; 56: 29–34.

59. Turner SF, Cardinal LB and Burton RM. Research design for mixed methods: a triangulation-based framework and roadmap. *Organ Res Methods* 2015; 20(2): 243–267.

60. Law KH, Jackson B, Guelfi K, et al. Understanding and alleviating maternal postpartum distress: perspectives from first-time mothers in Australia. *Soc Sci Med* 2018; 204: 59–66.

61. Bandura A. Self-efficacy mechanism in human agency. *Am Psychol* 1982; 37(2): 122–147.

62. Finlay-Jones AL, Davis JA, O'Donovan, et al. Comparing web-based mindfulness with loving-kindness and compassion training for promoting well-being in pregnancy: protocol for a three-arm pilot randomized controlled trial. *JMIR Res Protoc* 2020; 9(10): e19803.

63. Davis JA, Ohan J, Gregory S, et al. Perinatal women's perspectives and engagement in digital emotional well-being training: a mixed methods study. *J Med Int Res* 2023. (Manuscript under review)

64. Cramp AG and Bray SR. Understanding exercise self-efficacy and barriers to leisure-time physical activity among postnatal women. *Matern Child Health J* 2011; 15(5): 642–651.

65. Fonseca A, Gorayeb R and Canavarro MC. Women's help-seeking behaviours for depressive symptoms during the perinatal period: socio-demographic and clinical correlates and perceived barriers to seeking professional help. *Midwifery*. 2015; 31(12): 1177–1185.

66. Wilson M. *Mood swings: managing anger, anxiety and low mood*. London: RCN Publishing Company Limited, 2017, pp. 34–34.

67. Toffol E, Heikinheimo O and Partonen T. Hormone therapy and mood in perimenopausal and postmenopausal women: a narrative review. *Menopause* 2015; 22(5): 564–578.

68. Li H, Bowen A, Bowen R, et al. Mood instability across the perinatal period: a cross-sectional and longitudinal study. *J Affect Disord* 2020; 264: 15–23.

69. Bowen R, Balbuena L, Baetz M, et al. Maintaining sleep and physical activity alleviate mood instability. *Prev Med* 2013; 57(5): 461–465.

70. Lönnberg G, Jonas W, Bränström R, et al. Long-term effects of a mindfulness-based childbirth and parenting program – a randomized controlled trial. *Mindfulness* 2021; 12: 476–488.

71. Braeken MA, Jones A, Otte RA, et al. Potential benefits of mindfulness during pregnancy on maternal autonomic nervous system function and infant development. *Psychophysiology* 2017; 54(2): 279–288.

72. Ayers S, Fitzgerald G and Thompson S. Brief online self-help exercises for postnatal women to improve mood: a pilot study. *Matern Child Health J* 2015; 19(11): 2375–2383.

73. Loughnan SA, Butler C, Sie AA, et al. A randomised controlled trial of 'MUMentum postnatal': internet-delivered cognitive behavioural therapy for anxiety and depression in postpartum women. *Behav Res Ther* 2019; 116: 94–103.

74. Lee Y and Cho S. Technology-supported interventions for pregnant women: a systematic review. *Comput Inform Nurs* 2019; 37: 1.

75. Panter-Brick C, Burgess A, Eggerman M, et al. Practitioner review: engaging fathers – recommendations for a game change in parenting interventions based on a systematic review of the global evidence. *J Child Psychol Psychiatry* 2014; 55(11): 1187–1212.

76. May CD, St George JM and Lane S. From presence to participation: engagement with an SMS program for fathers of children on the autism spectrum. *J Child Fam Stud* 2021; 30(1): 29–37.

77. Davis JA, Ohan J, Gibson LY, et al. Understanding engagement in digital mental health and wellbeing programs for women in the perinatal period: a Systematic Review without Meta-Analysis (SWiM). *J Med Int Res* 2022; 24: e36620.

78. Department of Health. National preventive health strategy: 2021-2030, 2021, https://www.health.gov.au/sites/default/files/documents/2021/12/national-preventive-health-strategy-2021-2030_1.pdf

79. Gama e Colombo D. Closing the gap in a generation: health equity through action on the social determinants of health. Final report of the Commission on Social Determinants of Health. *Rev Direito Sanit* 2010; 10(3): 253.

80. Shonkoff JP, Boyce WT, Levitt P, et al. Leveraging the biology of adversity and resilience to transform pediatric practice. *Pediatrics* 2021; 147(2): e20193845.

81. World Health Organization (WHO). *WHO Constitution*, 2023, https://www.who.int/about/governance/constitution

Appendix I

Table 8. Perceived barriers to online well-being programme (coded by frequency).

Category	Themes	Participant comments
Lack of time	Other children	• I'm about to have my second child and unsure how crazy life is about to become. • Time would be my only barrier with having three children. • Being overwhelmed with kids schedules or tiredness • Time out for little me time . . . non-stop appointments and a high need child on my own with combined ADHD and other soon to be diagnosis limits my time
	Work	• Busy juggling work and study • Shift work, unpredictable patterns
	Newborn issues	• Demands of newborn baby and being first time mum
	Other commitments: housework, family, study, volunteering	• Everyday household chores • Family commitments
	Other reasons	• Health • Partner working away • Time management
Tiredness	Too tired during the day	• Levels of fatigue which are increasing as pregnancy progresses could be a factor that could influence whether someone is able to dedicate a particular time to the program • Exhausted and too tired and busy
	Insufficient sleep	• Lack of sleep
Forgetfulness	Pregnancy related	• Sometimes the increased level of progesterone can cause forgetfulness, even with one reminder through the app or program, it could be a matter of minutes before the task is forgotten about again.
	Not a priority	• Forget- last thing on my mind/to do list • Remembering to incorporate it into every day
Not appealing	Sense of duty	• It feels like another thing to get done. • Staying committed, pressure to stay accountable and if I missed one day here or there is the program invalid/have I failed or my information no longer valuable
	Lack of personal motivation	• Personal laziness • Myself and my procrastination would be the only barrier.
	Uncertain of benefits	• If I feel like it's not benefiting me, I may not be as keen to continue.
No perceived barriers	No perceived barriers	• Nothing, I am a counsellor so regularly do meditation myself and encourage my clients too as well • None at this stage
Other barriers	No apparent need	• I am quite a lazy, laid back person and I can't see myself completing a program like this. • If I were to suffer from stress, I would be more likely to commit but it isn't really a problem for me so I wouldn't have the determination to complete the program
	Other priorities	• My children they come first • Building a house
	Another format	• Would personally do better in an in-person course
	Using other programs	• I am currently very exhausted and focusing on my hypnobirthing mindfulness tracks. It may be too much to add in another program while doing hypnobirthing

ADHD: attention deficit hyperactivity disorder.

Table 9. Perceived enablers to online well-being programme and participant comments (coded by frequency).

Category	Themes	Participant comments
Improved well-being	Mental health	• Improved mental health and general outlook • I am very interested in looking after my mental health and this looks like it would help towards that • Mental well-being is something I think I could benefit from so I am keen to see what I can do to help myself • Having a positive mindset, not wanting to be depressed
	Perceived benefit	• Knowing that it will have possible benefits for me and my baby • The long-term benefits mentally and physical • Cause it'll make me feel better
	Skills development	• Skills that can be learnt to cope with stress beyond pregnancy • Techniques to be more in tune with how I'm feeling and mindfulness and learning how to switch off and relax.
	Self-care and development	• Positive mind frame, time to work on myself/self-growth • Self-care
	Mindfulness	• I already know of the benefits of mindfulness. I think this is an important field. • I know the benefits of mindfulness and meditation
	Relaxation	• The benefits such as feeling more relaxed • To be more relaxed
	Supportive tool	• The tools I'll learn from it to support me even more through pregnancy • Possibly helping my breast-feeding journey
Stress management	Stress reduction	• I used to really enjoy meditation pre babies and I know I could really benefit from managing my stress levels better and help improve my mood • Would like to spend some time working on stress reduction and heading into parenthood calm and relaxed • Skills that can be learnt to cope with stress beyond pregnancy • I would love to be less stressed and tense!
	Techniques to deal with emotions	• Techniques to be more in tune with how I'm feeling and mindfulness and learning how to switch off and relax. • Learning how to deal with my emotions
	Prevent PND	• Also knowing that I have had issues with depression and anxiety in the past, having tools like this to possibly combat or at least acknowledge and understand the signs of PPD/PND would be significant.
Functionality	Automated reminders	• Automated reminders (notifications) through the app • Having an alarm or reminders for daily practice
	Brief	• Knowing it was short and sharp with opportunities to extend • Not having to commit too much time • If it is done in short sessions so could be completed during baby's nap time or whilst feeding
	Accessible	• Accessibility (on my phone app) • If it's easy to access • Convenient
	Other functional considerations	• it's free • Ability to complete the program at any time and pause/return if interrupted (by baby) during the session. • Suggested time of day to complete
Track benefits	Seeing results	• As I can see benefits of taking the program with my mental health and ability to parent I would be happy to participate • Clear benefit
	Being rewarded	• If there were small rewards for say doing 5 days in a row with no gaps etc • Gift vouchers
Improve relationships	Benefit my children	• Knowing that it may help/benefit future children and my child • To help me with the new journey of motherhood, to keep a positive mindset good for myself and baby • The safety and well-being of my babies (pregnant with twins) would encourage me to undertake the program
	Other relationships	• Positive changes in my interactions with others • If I can help someone else

(Continued)

Table 9. (Continued)

Category	Themes	Participant comments
Community of practice	Connection with others	• If there is a small community of women involved or a Facebook page related to it • Community forum with other users • Some face-to-face components along the way to keep self-accountable
	Access to instructor	• If it was a zoom meeting where there was an instructor. Then you have more accountability. • Assistance when required, immediate contact for help
Other enablers	Partner support	• Support from my partner to focus on my well-being
	Healthcare provider	• Recommendation from healthcare provider
	Opportunistic	• When baby is feeding

PND: postnatal depression; PPD: postpartum depression.