



# Online Intervention Targeting Postnatal Depression and Anxiety in Chilean First-Time Mothers: Feasibility Trial

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## Abstract

**Objective:** Internet-based interventions may positively impact maternal symptoms of postnatal depression and anxiety. This study assessed the feasibility, acceptability, perceived usefulness, and preliminary effectiveness of an m-Health version of “What Were We Thinking?” (m-WWWT).

**Methods:** A mixed-methods with a 2-arm randomized parallel design was used. From a total of 477 women, 157 met the inclusion criteria. 128 first-time mothers of full-term infants, aged 4–10 weeks, who received health care at primary public health centers in Chile, were randomly assigned to the experimental (EG,  $n = 65$ ) or control (CG,  $n = 63$ ) groups; data of 104 of them (53 and 51, respectively) was analyzed. We used percentages and rates to measure feasibility outcomes and mixed analysis of variance (ANOVA) and latent class analyses (LCA) to assess preliminary effectiveness. Participants completed questionnaires on mental health, social support, and maternal self-efficacy upon recruitment and 3 months after completing the intervention. For the qualitative component, 12 women from the EG were interviewed.

**Results:** Quantitative results show good feasibility outcomes, such as high recruitment (82%), low attrition (EG = 12% and CG = 17%), and high follow-up (EG = 97% and CG = 91%) rates. Qualitative results indicate high acceptability and perceived usefulness of m-WWWT. Mixed ANOVA did not show significant differences between the groups (all  $p > .05$ ). However, multinomial regression analysis in LCA showed that women with low baseline symptoms of depression and anxiety benefit from the intervention ( $B = 0.43$ , 95% confidence interval 1.09–2.16).

**Conclusion:** m-WWWT is feasible to be implemented in Chile; future studies are needed to assess the intervention’s effectiveness.

**Keywords:** anxiety; depression; m/Health; parents; primary care; psychosocial intervention.

## Introduction

The transition to parenthood, despite being usually seen as a positive event, entails multiple challenges for women that may increase the risk of developing mental health difficulties. Internationally, the incidence and prevalence of postpartum depression reached 12% and 17%, respectively (Shorey et al., 2018). In Chile, it is estimated that 16%–20% of women are at risk of presenting postpartum depression within the first 6 months after childbirth (Coo et al., 2021).

Postpartum depression negatively impacts maternal emotional well-being, infant development, and breastfeeding practices. Infants of depressed mothers are at higher risk of presenting socioemotional (Apter-Levy et al., 2013) and, in some cases, cognitive difficulties (Liu et al., 2017). Also, women who present symptoms of depression and anxiety tend to breastfeed their infants for shorter periods of time and are more likely to combine breastmilk with formula than

women with no mental health difficulties (Figueiredo et al., 2013). This may limit the multiple benefits of exclusive breastfeeding for healthy child development and positive mother-infant bonding.

Despite the existence of effective screening protocols to identify women at risk of developing mental health difficulties and the availability of effective treatments, new mothers seldom access professional help due to several barriers (Hansotte et al., 2017; Rojas et al., 2015). It is worth noting that most interventions are delivered face-to-face; however, the development of telemedicine, which relies on the use of technology to facilitate healthcare communication and delivery (Colbert et al., 2020), has allowed the development of internet-based, mental health interventions for this population (Nair et al., 2018). The development of these interventions has significantly grown over the past years, and there is some preliminary, international evidence indicating their

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effectiveness in reducing symptoms of maternal depression (Nair et al., 2018).

In Latin America, internet-based mental health interventions have also increased, partly due to the limited availability of mental health services and the increased access to the internet in the general population (Martínez et al., 2018). Particularly, guided internet-based interventions, which include contact with a facilitator, have the potential to increase the reach of psychological interventions to promote mental health at a reduced cost for health providers (Martínez et al., 2018). Preliminary evidence suggests that these interventions are considered useful and acceptable by users, yet additional studies are needed to assess their effectiveness (Jiménez-Molina et al., 2019).

The recent COVID-19 pandemic has negatively impacted maternal mental health and has limited the access to mental health services, partly due to mobility restrictions (Ellis et al., 2021). In Chile, health services were strongly focused on the management of the COVID-19 crisis (MINSAL, 2022a) and the prevalence of symptoms of depression in first-time mothers dramatically increased (Coo et al., 2023). In this context, internet-based interventions for new mothers may have a role in promoting maternal mental health in Chile.

The current study builds on a body of research on the “What Were We Thinking” (WWWT) program (Rowe & Fisher, 2010). WWWT is a psychoeducational, preventive intervention for parents of first babies that targets modifiable risk factors for the development of postpartum symptoms of depression and anxiety in first-time mothers. These include interpersonal relationships and self-efficacy in caring for a newborn. Rowe and Fisher (2010) argue that maternal postpartum symptoms of depression and anxiety are related to unmet needs for change and adaptation in close relationships (i.e., particularly partner relationships) following the birth of a child and to the need to develop the necessary skills to look after a newborn infant. In this regard, support, empathy, shared problem-solving and encouragement from significant individuals, particularly the partner- if present -, as well as maternal self-efficacy promote maternal mental health (Rowe and Fisher 2010; Fisher et al., 2016). The two mentioned risk factors are more effectively addressed after childbirth, partly because during gestation women may be more focused on delivery than on infant care, and also because most of the interpersonal changes related to becoming a parent arise in the postpartum period and are triggered by the challenges inherent to looking after a newborn infant (Rowe and Fisher, 2010). Therefore, WWWT is delivered in the early postpartum period. A previous randomized control trial conducted in Australia shows that WWWT effectively reduces the risk of developing mental health problems in new mothers (Fisher et al., 2016).

This intervention was culturally adapted and piloted in Chile (Coo et al., 2021) and has been recently adapted as an m-Health intervention (m-WWWT), relying on web-based text messaging (i.e., WhatsApp) for the purpose of this study (Pérez et al., 2022). The cultural adaptation of WWWT involved simplifying the wording of the contents according to the literacy levels of the general Chilean population, including an explicit infant mental health approach consistent with the Chilean Infancy Policy, and including local metaphors and examples. However, core aspects of the original intervention, such as targeting interpersonal relationships and maternal self-efficacy as change mechanisms, were maintained (see

Coo et al., 2021 for a detailed description of the cultural adaptation process). Following this adaptation work, the goals of this mixed-methods study were (a) to quantitatively assess the feasibility, acceptability and preliminary effectiveness of m-WWWT in a community sample of Chilean first-time mothers and (b) to qualitatively examine the participants’ experience and subjective perceptions about the intervention.

## Methods

This study used a mixed-methods design to assess several aspects of the m-WWWT intervention. A quantitative approach was used to measure feasibility, acceptability, integrity of the information delivered (i.e., the percentage of experimental group participants who received all the components of the intervention: videos, text messages and who were invited to the group session), and attrition rate. We also assessed preliminary effectiveness using a two-arm randomized parallel-arm design, which included experimental and control groups (experimental group and control group, respectively). The data analyst was blinded, but not the intervention facilitator and the participants of the study. Additionally, we aimed to assess the user’s experience of the intervention with a qualitative approach. The data of this study are available on request.

## Participants

Participants were adult (>18 years), first-time mothers to a full-term infant between 4 and 10 weeks old. Both infants and mothers presented no medical conditions that required treatment and/or hospitalization, and received health care in the primary public health system. To be eligible for the study women had to have access to a mobile phone with an instant messaging service (i.e., WhatsApp) and be fluent in Spanish. Exclusion criteria included presenting (1) severe mental health problems (i.e., schizophrenia, actual substance abuse), current psychiatric diagnosis of a mental health disorder (regardless of treatment status), and/or psychosocial problems (i.e., domestic violence problems, cognitive disability), as reported by the psychologists of the involved health centers at the moment of recruitment. Women whose scores in the screening measure (i.e., The Edinburgh Postnatal Depression Scale [EPDS]) were above the cut-off score were referred to their health centers for assessment and treatment. Among them, those who received a clinical diagnosis and/or initiated treatment were excluded from the study. Women who started mental health treatment while receiving the intervention were also excluded from the analyses.

## Procedure

Participants were recruited at two public primary health centers in Santiago, Chile. Health centers provided the research team with the contact details of new mothers who delivered a full-term infant with no medical complications between February 2021 and April 2022. This timeframe allowed us to recruit a sufficient number of participants to meet our initial requirements of a minimum of 90 women (45 in each of the groups), as suggested by the power analysis. Research assistants, who were qualified psychologists, contacted the potential participants by phone within 4–8 weeks after childbirth and explained the study to them. Women who agreed to participate were randomized into the experimental group or

control group at a rate of 1:1 with permuted blocks of random size, using a computer-generated randomization schedule. All the women received treatment as usual (TAU) provided by health centers, which involved health checks for mothers and their infants. Women in the experimental group received the m-WWWT intervention, which lasted 5 weeks, in addition to TAU. Women in the control group conformed to a waiting list and received the intervention after completing the final assessment.

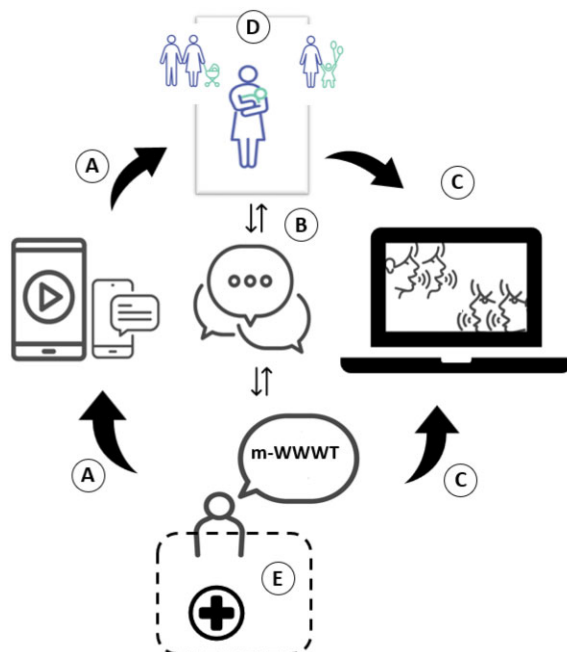
For the quantitative component of the study, feasibility indicators of eligibility and recruitment rates, reasons for study refusals, the integrity of the intervention delivered, participant attrition and follow-up rates were estimated. As secondary outcomes, participants completed self-report, and online questionnaires on mental health, social support, and maternal self-efficacy upon recruitment and 3 months after finishing the intervention (i.e., approximately 4 months after the first assessment). The follow-up assessment was completed in September 2022.

For the qualitative component of the study, we aimed to recruit 12 women from the experimental group (20% of the experimental group), only one woman of a total of 13 who were contacted for this purpose refused to participate. This purposive sample was selected seeking women with different degrees of involvement with the intervention, relationship status and perceived well-being. Involvement in the intervention was defined according to the degree of interaction with the facilitator, specifically, the group included 6 participants who used the chat to comment on their experience and to ask for specific information from the facilitator and 6 participants who did not (just greeted or thanked the received videos). In terms of relationship status, nine women who either lived with their partner or were married and three single mothers (no partner or did not live with their partner) were included. Lastly, seven women who reported no depressive

symptoms and five who reported mild depressive symptoms were included. The facilitator of the intervention identified potential participants who met these criteria. These women were contacted one month after finishing their participation in the intervention and were invited to participate by a research assistant who had no previous contact with them and was blind to their characteristics. This timeframe was selected to allow women some time to elaborate and assimilate their experience during the intervention. The maximum variation sampling strategy was used according to the completion and use of the intervention. Semistructured interviews were conducted by members of the research team who had no previous contact with the participants. The interviews explored the mothers “experience of the intervention, including its acceptability and perceived usefulness”. The thematic script was constructed by the research team and reviewed after the four first interviews to ensure that the questions were appropriate and well understood by the participants. The interviews lasted 40–60 min, were conducted remotely (via Zoom) and were audio-recorded and transcribed for analysis. A detailed description of the study protocol has been published elsewhere (Pérez et al., 2022).

### Ethics and Clinical Trial Registration

All participants provided informed consent before joining the study and received a small economic compensation to cover the cost of internet use (USD 15). Women who were interviewed did not receive an additional compensation. The participation did not involve any known harm to the mothers and their infants. Ethics approval was obtained from the Ethics Committee of the Eastern Metropolitan Health Service, Santiago. The trial registration number is NCT04847076 (April 2021).



- (A) Participants receive a psychoeducational video through instant messaging services (IMS) for mobile phones 3 times a week for a four-week period, along with questions to promote reflection and to assess the perceived usefulness of the information received.
- (B) Participants can contact the program trained facilitator by IMS as needed. Mothers may ask questions that arise from the topics addressed in the psychoeducational videos and share their personal experiences. The facilitator responses focus on promoting the understanding and elaboration of the contents based on prototypical responses.
- (C) Participants –and their partners or significant others– are invited to participate in a 1-hour virtual group to share their parenthood experiences, as well as to develop a support network.
- (D) Participants can share the psychoeducational information received with their partner or significant others.
- (E) The program facilitator can communicate with the health services to refer the participants, as needed.

**Figure 1.** Components of m-WWWT. Published as “Components of m-WWWT” Figure 1. (p. 6), “Online intervention to prevent postnatal depression and anxiety in Chilean new mothers: Protocol for a feasibility trial,” by Pérez, J. C., Aldoney, D., García, M. I., Olhaberry, M., Fernández, O., Alamo, N., Franco, P., Pérez, F., Fisher, J., Rowe, H., & Coo, S, 2022, *Health Informatics Journal*, 28(4), 14604582221135440, used under CC BY 4.0.

**Table I.** Weekly Intervention Contents

<b>Week 1</b> Each baby is different: recognizing and understanding the infant's temperament	But You Have a Healthy Baby: Recognizing and sharing positive and negative emotion associated to the birth experience	Understanding Baby's Crying: how to understand and respond to infant's cry
<b>Week 2</b> What We Thought: parents' expectation before the birth of their child versus the real experience	The Feed—Play—Sleep Routine: How to organize the infant's routine	Losses and Gains: Recognizing the emotions associated to what parents gained and loose after the birth of their child
<b>Week 3</b> Breastfeeding: expectation and challenges associated to breastfeeding, the importance of asking for specialized help when necessary. <sup>a</sup>	The Things You Say and Do and parents workload: assertive communication in the couple when facing the challenges associated to early parenthood.	Enough sleep: Patterns of normal infant sleep.
<b>Week 4</b> When the baby is awake: positive parent-infant interaction when the infant is awake.	You're Family: Relevance of parent's family of origin.	Help and Support and Speaking Up For Yourself: relevance of social support and assertive communication.
<b>Week 5</b> Maternal mental health, when to ask for help: Distinguishing normal versus clinical emotional experience <sup>a</sup>		

Note. Published as "Weekly content of the psychoeducational material" Table 1 (p. 5), "Online intervention to prevent postnatal depression and anxiety in Chilean new mothers: Protocol for a feasibility trial," by Pérez, J. C., Aldoney, D., García, M. I., Olhaberry, M., Fernández, O., Alamo, N., Franco, P., Pérez, F., Fisher, J., Rowe, H., & Coó, S, 2022, *Health Informatics Journal*, 28(4), 14604582221135440, used under CC BY 4.0.

<sup>a</sup> Modules added to the original program.

## Intervention

The adapted, m-Health version of WWWT includes three components (see Figure 1): (a) Psychoeducational information about infant care and about the interpersonal challenges that women and their partners—if present—face during the transition to parenthood. This information was delivered in 14 modules with a 3- to 5-min video, and an invitation to read and discuss some questions to promote self-reflection (see Table I). The modules were delivered 3 times a week for a 5-week period via WhatsApp and included animated images as well as videos of parents and infants from image banks. The script was developed by the research team based on the original WWWT content and the audio was recorded by a professional actress; (b) Individual contact with the program facilitator to ask questions that arose from the psychoeducational modules. The facilitator was a psychologist with experience in perinatal mental health who contributed to the adaptation of the intervention. Women initiated contact voluntarily and the facilitator tailored the answers according to women's individual needs. Participant-facilitator interaction was conducted via WhatsApp; (c) a group, 1-hr virtual meeting with the program facilitator to offer participants and their partners (or support person) the opportunity to share their experiences about parenthood with other mothers. This group session was offered three times to women in the EG, who were grouped in cohorts of 15–20 participants. A detailed description of the m-WWWT intervention has been published elsewhere (Pérez et al., 2022).

## Measures

**Sociodemographic and Obstetric Information.** A questionnaire was developed to assess sociodemographic characteristics, history of psychopathology, and perceived social support during pregnancy on a 7-point Likert scale. In the postpartum assessments, the questionnaire included questions about delivery, breastfeeding, and the child's health.

**Edinburgh Postnatal Depression Scale (Cox et al., 1987).** Is a 10-item, self-report instrument that screens for symptoms of depression over the past week using a 4-point scale. Higher scores are indicative of risk for presenting postpartum depression. The EDPS has been validated in Chilean populations, cut-off scores of 13 and 11 are recommended for pregnancy and the postpartum period, respectively (Cronbach's alpha: .77) (Jadresic et al., 1995).

**The Perinatal Anxiety Screening Scale (PASS; Somerville et al., 2014a).** Is a 31-item instrument that assesses maternal anxiety during the past month. The scale uses a 4-point Likert scale (0 = Never to 3 = almost always), with higher scores suggesting higher anxiety (Cronbach's alpha: .96). The PASS has been validated in Chile and has good psychometric properties (Cronbach's alpha: .92) (Coó et al., 2022).

**The Parental Evaluation Scale (Farkas-Klein, 2008).** Is a self-report questionnaire that includes 10 items rated on an 11-point scale (0 = strongly disagree; 10 = strongly agree) to measure motherhood-related satisfaction and self-efficacy. The instrument was developed in Chile and has good psychometric properties (Cronbach's alpha = .85).

**The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1990).** Is a self-report instrument with 12 items organized in 3 subscales that address perceived social support from family, friends, and significant others, which are rated on a 7-point Likert scale (1 = very strongly disagree; 7 = very strongly agree) (Cronbach's alpha = .85 in prepartum sample). The MSPSS has been adapted to be used in Chile—but not specifically in perinatal populations. The adapted scale is Cronbach's alpha of .88, and values for the family, friends and significant others dimensions range from .85 to .89 (Gomez & Iluffi, 2020).

**Semistructured Interviews.** The interviews explored the participants' experience during the intervention, addressing topics of acceptability (i.e., how frequently they accessed the intervention components and how easy/difficult this was); the general perception of the intervention (i.e., images, language, and usefulness of the videos), the relationship with the

facilitator (i.e., contact frequency, communication quality, emotional attunement) and the group session (i.e., participation and perceived usefulness).

## Analysis

We used descriptive statistics (percentages and rates) to assess our primary outcomes related to the intervention feasibility.

For the qualitative analysis, expert coders who were also clinical psychologists analyzed the transcripts of the interviews, according to the Grounded Theory guidelines (Corbin & Strauss, 1990); open and axial coding were conducted. Each interview was coded by two members of the research team, independent codes were later conciliated. Disagreements on the codes were triangulated in team meetings where agreement was reached to define the final categories of the analysis. These were organized in relation to the perceived acceptability and usefulness of m-WWWT, an emergent category was also included. The coding was conducted using ATLAS.TI v7.

A series of mixed analysis of variance (ANOVA) assessed our secondary outcomes, related to possible differences in mental health, perceived social support and maternal self-efficacy between women in the experimental and control groups. Also, we used latent class analysis (LCA) as a post hoc analysis within the experimental group to identify if participants reported improvement, decline or no change in the post-intervention assessment in comparison to their baseline assessment. Class indicators were post-intervention changes in symptoms of depression and anxiety, parental self-efficacy, and social support from family and others. In the first step, the Model was estimated by the Maximum Likelihood Restricted method using Mplus versions 8.9 (Muthén & Muthén, 1998–2021). Estimation and model identification for all LCA models was checked using 1,000 initial stage starts and 250 final stage starts. An assessment of solutions that comprised 1–4 clusters was performed considering indicators of model fit and interpretability of the clustering solution (Berlin et al. 2014; Nylund-Gibson & Choi, 2018). Model fit indicators used were the Akaike information criterion (AIC; Akaike 1974), Bayesian information criterion (BIC; Schwarz 1978), and sample size-adjusted BIC (SABIC; Sclove 1987), on which lower values indicate better relative fit (Vermunt & Magidson, 2016). Also, the Bootstrap Likelihood Ratio test (BLRT) was used to compare models that differ in the number of classes by indicating that the model with K-1 classes should be rejected in favor of the model with K classes (Lo et al., 2001). Finally, entropy values of .80 or greater provide supporting evidence that profile classification of individuals in the model occurs with minimal uncertainty (Ferguson et al. 2020; Tein et al., 2013).

Once the number of classes was selected, significant predictors of class membership were estimated. In the estimated model these included baseline symptoms of depression and anxiety and the control variables were education level and not having a current partner. A three-step approach called BCH approach (Asparouhov & Muthén, 2014) to carry out the LCA Model with covariate analysis was conducted. In the first step the latent profiles without including the covariates in the model were established (Clark & Muthén, 2009). In the second step, the participants' individual class probabilities are used to specify their probability of membership into each latent class. Lastly, the profiles' membership was regressed on covariates by multinomial logistic regression. Data analysis was done in MPLUS 8.9.

## Results

### Participants Characteristics

Of the 477 mothers who delivered a baby between February 2021 and April 2022, and accessed health care in the centers involved in the study, 128 were randomized. The rest refused to participate ( $n=29$ ), could not be contacted ( $n=78$ ), or did not meet inclusion criteria. Of the 242 women who did not meet the inclusion criteria, 97% (235/242) had previous children, 2% (5/242) were teenage mothers, and 1% (2/242) were not fluent in Spanish. In terms of assessment, 88% (57/65) of the experimental group and 83% (52/63) of the control group mothers completed the follow-up assessment (Figure 2). The women who failed to complete the final assessment reported less perceived support from friends at baseline ( $t = -3.34$  (1),  $p = .00$ ) and were less likely to have higher education ( $\chi^2 = .02$  (2)). No other significant differences were found in terms of mental health and sociodemographic characteristics.

The women allocated to the experimental and control groups ( $N=116$ ) had a mean age of 25 years, all of them were Latin American and the great majority were Chilean. Most of the participants were unmarried but cohabited with their partners. The majority of women gave birth in a public hospital, most of them reported that their pregnancy was unplanned and approximately half of them had a cesarean section; which is consistent with the high rates of cesarean deliveries observed in the country (MINSAL, 2022b) (see Table II).

During the baseline assessment, 40% of the participants screened positive for depressive symptomatology according to the EPDS, and 27% and 27% reported severe and moderate anxiety symptoms, respectively, according to the PASS. These women were referred for assessment and treatment, among them, 5 were excluded due to confirmed diagnosis of a mental health disorder and initiation of treatment. No significant differences were identified among the sociodemographic and mental health variables between the experimental and control groups at the baseline assessment.

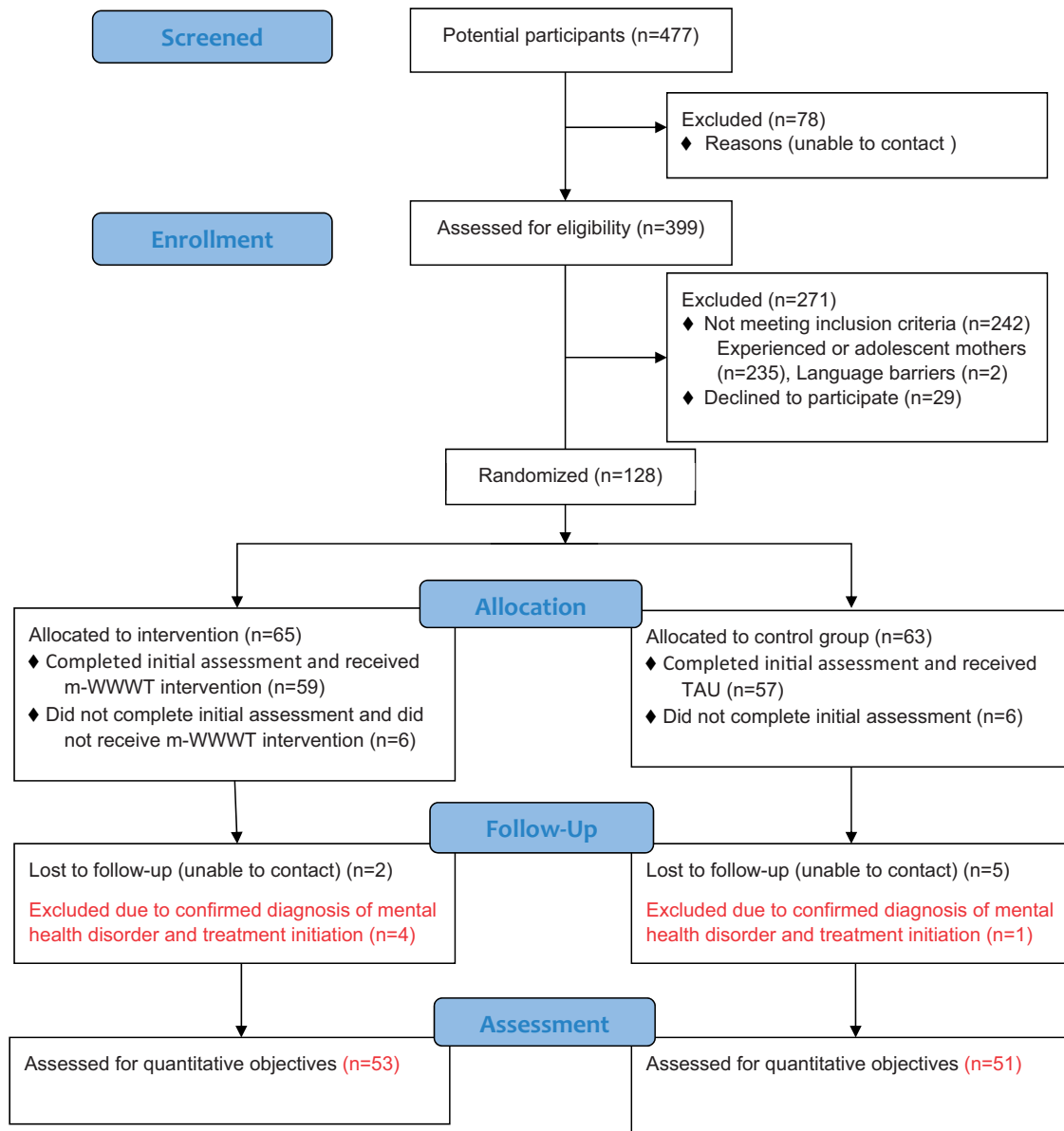
The 12 mothers who participated in the qualitative component of the study had a mean age of 25 ( $SD=2.75$ ) years, 8 of whom were Chilean. Among them, eight women were married or cohabited with their partner, one was separated, and the remaining three had a partner, but did not share a household with him. In terms of education, one woman did not finish school, three had finished high school, four had incomplete higher education, and the remaining women had completed higher education. Nine women had male infants.

### Feasibility and Acceptability (Quantitative Information)

**Eligibility Rate:** 33% (157/477), corresponds to the proportion of women who met inclusion criteria compared with the total number of new mothers registered during the recruitment period in the associated primary health centers.

**Recruitment Rate:** 82% (128/157) shows the proportion of women who accepted the invitation to join the study from those who met eligibility criteria.

**Integrity of the Intervention Delivered:** All experimental group participants received the 14 psychoeducational videos and 82% of them reported having watched all of them. Only two mothers expressed difficulties accessing the videos at the beginning of the intervention, which were resolved with the



**Figure 2.** Flowchart of participants.

help of the facilitator. Also, 91% of the women contacted the facilitator at least once to share their experience, comment on the information received, or pose a question. Only 12% of the women in the experimental group participated in the group session. No partners or support persons attended the group session, despite being invited.

**Participant Attrition:** 12% (8/65) and 17% (11/63) of the mothers in the experimental and control groups failed to finish the second assessment, respectively.

**Follow-up Rates:** 97% (57/59) and 91% (52/57) of the mothers were retained at the follow-up measurement in the experimental and control groups, respectively.

### Feasibility and Acceptability of m-WWWT (Qualitative Information)

The qualitative analysis of the interviews allowed the identification of three main themes, namely the context in which the experience of first-time mothers unfold (i.e., described as context), the characteristics of the program (perception of videos

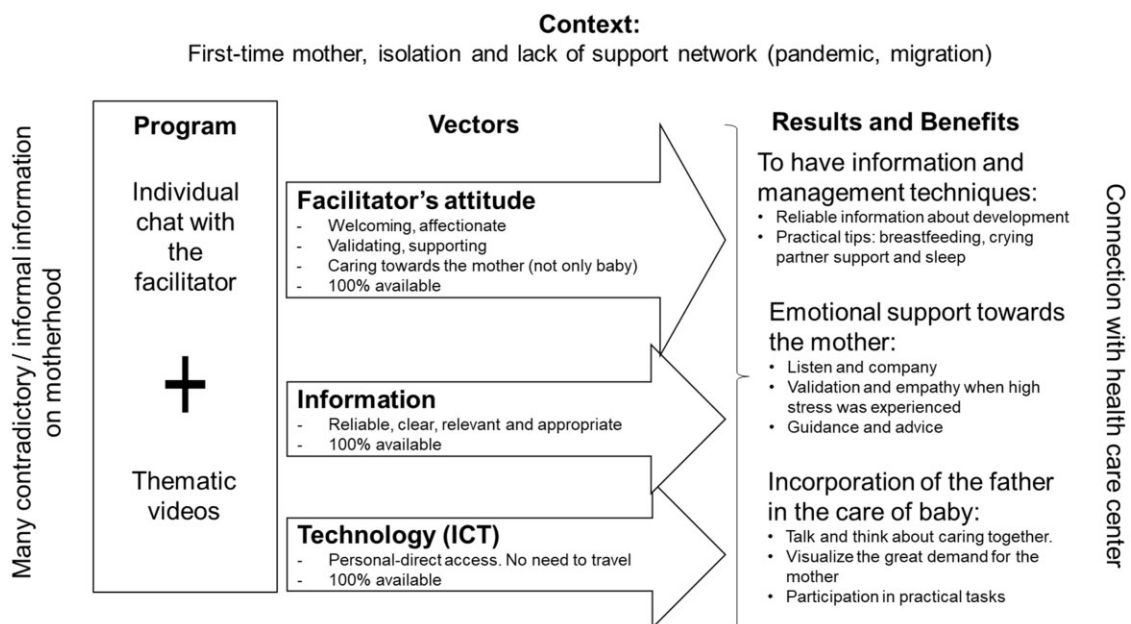
and chat and facilitator characteristics) and its perceived benefits (see [Figure 3](#)).

The women described the high acceptability and feasibility of the intervention, and all of them considered the use of WhatsApp and the characteristics of both videos and messages as highly appropriate. The mothers described the contents as clear, delivering reliable and useful information, relevant to their experience “Really good, in the sense that the videos they sent were totally what was happening to me at that time” (M9, p. 2) and with an appropriate duration, language and. Also, they valued the flexibility of the videos, which could be accessed at “any moment and place” and could be shared with other significant individuals. In this regard, a participant comments:

It’s a good source of communication (...) I don’t answer the phone much, and I keep it silent, then I see the phone at night or when I am breastfeeding (...). But WhatsApp can be answered at any time (M43, p. 69)

**Table II.** Sociodemographic and Obstetric Characteristics of the Participants

	Experimental Group (N = 59)	Control Group (N = 57)	
<b>Mothers sociodemographics characteristics</b>			
Age	25.56 (DE = 4.1) N (%)	24.98 (DE = 5.2) N (%)	$\chi^2$
Nationality			
Chile	52 (88.1)	49 (86)	.01 (.94)
Venezuela	5 (8.4)	2 ( )	
Argentina	1 (1.6)	1 (1.7)	
Colombia	0 (0)	3 (5.3)	
Perú	0 (0)	1 (1.7)	
Haití	1 (1.6)	1 (1.7)	
Marital status			
Married	5 (8.5)	4 (7)	3.56 (3)
Cohabiting	30 (50.8)	37 (64.9)	
Single	9 (15.3)	6 (10.5)	
Other (doesn't live with partner)	14 (22)	10 (17.5)	
Educational level			
Incomplete schooling	6 (10.2)	5 (8.8)	7.65 (4)
Complete high school	13 (22)	21 (36.8)	
Incomplete university or technical studies	14 (23.7)	17 (29.8)	
Complete technical studies	15 (25.4)	10 (17.5)	
Complete university studies	11 (18.6)	4 (7)	
Work situation			
Paid job	30 (50.8)	29 (50.9)	.04 (1) t (df)
Secondary outcomes			
Depression (EPDS)	8.2 (4.9)	8.9 (5.4)	-.71 (114)
Anxiety (PASS)	28.07 (20.2)	29.98 (21.25)	-.5 (114)
Parental self-efficacy	74.41 (16.33)	73.33 (19.4)	.14 (114)
Support (family)	13.85 (2.84)	12.77 (3.4)	1.85 (109.05)
Support (friends)	11.92 (4.34)	10.42 (4.38)	1.85 (114)
Support (other)	14.02 (2.24)	13.32 (3.02)	1.42 (103.22)
Obstetric characteristics			$\chi^2$
Planned pregnancy			
Yes	14 (23.7)	19 (33.3)	.98 (1)
Type of birth			
Vaginal	27 (45.8)	26 (45.6)	1.44 (2)
C-section	31 (52.6)	28 (49.1)	
Assisted (e.g. forceps)	1 (1.7)	3 (5.3)	
Infant's gender			
Male	32 (54.2)	31 (54.4)	.45 (1)



**Figure 3.** Core results of qualitative analysis.

When women were asked specifically about improvements or modifications to the videos' content, they suggested incorporating information about formula feeding and parenting/rearing without a partner. These specific themes reflected some of the participants' particular life situations.

All of the interviewed women mentioned the facilitator and the high quality of the communication they established with her. The participants valued the possibility of having someone willing to listen and support them. They considered that the facilitator responded promptly, providing a space to address their doubts and offering clear and empathic responses. Also, the facilitator was perceived as being interested in the mothers themselves and not only in the babies. One mother tells us:

Her concern about my mental state, not only my baby, she was concerned about how I felt (M23, p. 8).

The mothers also described the facilitator as welcoming, affectionate, close, and caring and proactive in her communication. Another participant stated:

I felt she was like my friends, I felt that I could tell her and ask her whatever and she would answer me. Yes, close, very close, (...) my conversation was very close, I really needed to talk to someone and it's great that she was there to hear me (M32, pp. 35–37).

Regarding the *benefits and usefulness of the intervention*, all the interviewed women described m-WWWT as positive and beneficial. The mentioned benefits were grouped into three main areas, the first being (a) Receiving practical and reliable information and advice on caring for their baby and helping to clarify doubts about childrearing and infant development. This information was positively valued, because the mothers considered themselves inexperienced and/or surrounded by contradictory information. In this regard, one participant mentions:

You don't know what to do in those moments when he cried, or he wanted to be glued to my chest, he just wanted to be with me. I said, 'My milk is not enough'. But since they sent me all the modules every week, I learned how to hold him, the bathing times, everything. The videos were a great help (M8, p. 2).

The second type of benefit associated with m-WWWT is related to (b) "Mother's emotional support". Most women (90%) mentioned that the messages provided emotional support and positive feedback regarding their feelings of isolation and loneliness during the pandemic-related confinement, as well as regarding their worries and insecurities about being a mother. These worries contrasted with their idealized vision of motherhood. Accordingly, two participants commented:

It was like what you needed to hear and the way you needed to hear it (M18, p. 100).

Because you need support, you need to talk and somehow give vent to what is happening, because it is all new for you. I idealized motherhood in a way that is different to what being a mother is now (M32, p. 3).

The third group of benefits associated with m-WWWT was c) to facilitate father involvement in parenting. Most of the

participants (75%) indicated that the educational material (i.e., videos) was easy to share with the child's father. This provided an opportunity to talk together and allowed the father to be more actively involved in the babies' care. One participant mentioned:

In the sense that later I showed it (the video) to my partner, ... and it is useful to talk about it. He didn't understand me much at first. So, I showed him the video and told him that this was true and that I needed time for myself, that it was a difficult period and also as a couple. And that both of us needed to collaborate to make it work (M9, p. 48).

### Preliminary Effectiveness

A series of mixed ANOVA showed no significant interaction between time by groups in our secondary outcomes, including symptoms of depression, anxiety, perceived support and maternal self-efficacy. Only a Time Effect was found to family support, showing a decrease from baseline to follow-up in both groups (see [Table III](#)).

### Post Hoc Analysis

The LCA results showed a three-cluster classification as the optimal solution for the experimental group participants. This solution presented the lowest BIC, AIC, and SABIC model fit values, the BLRT indicated that the solution with three classes outperformed the two-class solution. The solution entropy was .93, indicating that profile classification of participants in the model occurred with minimal uncertainty (see [Table IV](#)).

Two of the three clusters included participants who did not benefit from the intervention (class 1 and class 2), and who had a high probability to increase their symptoms of depression and anxiety in the second assessment. In cluster 1, the women had a high probability of perceiving a decrease in social support, whereas in cluster 2, the participants showed a high probability of reporting a decrease in self-efficacy. In contrast, the participants in cluster 3—which included 44% of the experimental group—did benefit from the intervention and presented a high probability to reduce their symptoms of depression and anxiety and improve their parental self-efficacy and perception of support from others (see [Table V](#)).

Lastly, the post hoc study results indicated that preintervention depression levels were related to the class 1 membership (i.e., increase in depression and anxiety and lower perception of social support). Experimental group participants who reported high levels of baseline depression had higher odds of belonging to this latent cluster (odds ratio [OR] = 1.54,  $p < .001$ , 95% confidence interval [CI] 1.09–2.16) with respect to belonging to class 3 (i.e., women who benefited from the intervention). No other relationships were significant (see [Table VI](#)).

### Discussion

This study is the first to assess the feasibility of an m-Health intervention targeting postpartum emotional well-being in Chilean first-time mothers. Our primary outcomes suggest that m-WWWT is an attractive intervention for new mothers, who perceived it as useful and were highly motivated to participate, reaching high completion rates. This is particularly

**Table III.** Mixed ANOVA Assessing Possible Differences in Mental Health, Self-Efficacy, and Perceived Support Between Experimental and Control Groups

	Preintervention	Post-Intervention	Within Subjects' Effect <i>F</i> (df)		Between-Groups Effect Group
			Time	Time × Group	
Depression					
Experimental group	8.2 (4.93)	8.84 (5.76)	.35 (1)	.63 (1)	.02 (1)
Control group	8.67 (5.2)	8.63 (5.72)			
Anxiety					
Experimental group	27.93 (20.51)	30.46 (23.42)	.1 (1)	.99 (1)	.03 (1)
Control group	29.17 (21.08)	27.85 (22.62)			
Self-efficacy					
Experimental group	37.54 (7.95)	36.75 (8.83)	.38 (1)	2.45 (1)	.37 (1)
Control group	37.13 (9.63)	38.94 (8.81)			
Support—family					
Experimental group	13.77 (2.89)	12.63 (3.3)	13.73 (1)**	.92 (1)	1.48 (1)
Control group	12.83 (3.41)	12.15 (3.5)			
Support—friends					
Experimental group	12.07 (4.32)	11.64 (4.08)	3.43 (1)	.48 (1)	3.45 (1)
Control group	10.96 (4.17)	10.02 (4.53)			
Support—other					
Experimental group	13.91 (2.25)	12.82 (3.25)	10.19 (1)*	.26 (1)	.27 (1)
Control group	13.5 (2.83)	12.71 (3.55)			

Note: *N* = Experimental group = 53, Control Group = 51.

\* =  $p < .05$ , \*\* =  $p < .01$

**Table IV.** Model Fit Statistics of Latent Profile Analysis of Experimental Group Participants

Model	AIC	BIC	SABIC	Entropy	Smaller Class %	BLRT
1-cluster	536.96	557.21	525.78			
2-cluster	498.03	540.56	474.56	.95	45	<.001
3-cluster	<b>495.49</b>	<b>560.31</b>	<b>459.74</b>	.93	27	<.02
4-cluster	502.26	589.35	454.20	.94	13	.34

Note. Model selected is bolded. *N* = 53.

AIC = Akaike's Information Criterion; BIC = Bayesian Information Criterion; BLRT = Bootstrap Likelihood Ratio test; SABIC = sample size-adjusted BIC.

relevant because interventions targeting mothers often report high attrition rates, probably due to the high demands that are often placed on this population. For instance, MacKinnon et al. (2022) assessed the feasibility and preliminary effectiveness of an online intervention to promote emotional awareness and mental health in mothers of preschool children. The authors reported high levels of attrition, with approximately half of the participants in the intervention group lost to the follow-up assessment.

Interestingly, the high number of videos watched by the participants and their high contact with the intervention facilitator stands in contrast with the limited number of women who attended the group session. This may be related to the high flexibility and acceptability of the first two components of the intervention and the difficulty of participating in a fixed scheduled activity when caring for a newborn. In this regard, our qualitative results show that women valued the possibility of accessing the psychoeducational videos whenever it was possible for them. Previous research shows that access at any time/anywhere is one of the main advantages of digital interventions (Newby et al., 2021). This benefit may be particularly appealing for postpartum women, in whom the perceived lack of time and infant care demands are described as significant barriers to obtaining professional

help for depression or anxiety (Goodman, 2009). Moreover, evidence shows that women who have participated in digital interventions to prevent or treat perinatal depression positively evaluate their flexibility, accessibility, and convenience (Pugh et al., 2015; Sawyer et al., 2019). Digital interventions also benefit individuals reluctant to seek help because of stigma (Lau et al., 2022). Having a baby is generally considered a joyous event, thus mothers may be reluctant to talk about their symptoms of depression and anxiety (Goodman, 2009).

Our participants regarded the contents of the videos as useful, informative and appropriate to their circumstances. Some of the mothers commented that they shared the information with their partners and that it promoted a larger involvement of fathers in childcare practices. Also, some women stated that the intervention videos gave them valuable information to better understand and care for their infants, which may contribute to their feelings of self-efficacy. Although this positive perception probably contributed to the high intervention adherence, it may not be sufficient to explain our low attrition rates. The role of the intervention facilitator was probably a key factor in promoting the participant's adherence, given that she was described as available, supportive, and interested in their personal circumstances.

Accumulating evidence indicates that digital interventions for depression that include guidance result in better adherence and outcomes than unguided ones (Moshe et al., 2021). Postpartum women value the inclusion of some form of human support and can even perceive a strong therapeutic relationship (Pugh et al., 2015). Accordingly, participants from Pugh et al. study (2015) reported that the therapist's support made the program "more personal". According to Shim et al. (2017), for guidance to be beneficial in digital interventions targeting depression, the facilitator doesn't need to spend much time with each participant (contact can be minimal), communicate synchronously, or have much expertise. Yet, our findings suggest that the facilitator's prompt and thoughtful responses were highly valued. This

**Table V.** Indicator's Probabilities the Three-Cluster Solution

	Class 1 Symptom Increase and Decrease in Social Support	Class 2 Symptom Increase and Decrease in Parental Self-Efficacy	Class 3 Symptom Reduction and Increase in Parental Self-Efficacy and Social Support
Depression			
Symptom decrease	0%	0%	93%***
No change	10%	11%	7%
Symptom increase	90%***	89%***	0
Anxiety			
Symptom decrease	30%*	7%	73%***
No change	0%	0%	4%
Symptom increase	70%***	94%***	0
Parental self-efficacy			
Increase	53%***	0%	84%***
No change	0%	28%	0
Decrease	47%***	71%***	16%**
Family social support			
Increase	35%	44%***	63%***
No change	0%	56%***	29%**
Decrease	65%***	0%	8%
Others social support			
Increase	31%	35%**	70%***
No change	0	45%***	30%**
Decrease	69%***	20%***	0%
Cluster percentage N (%)	13 (23)	18 (32)	25 (44)

Note. N = 53.  
\*\*\* p < .001, \*\* p < .01, \* p < .05.

**Table VI.** Multinomial Regression Parameters of Profile Membership Model

	B	SE	OR	95% CI	
				LL	UL
Class 1					
No partner	-0.85	.94	0.43	0.07	2.68
Education <sup>a</sup>					
<12 years of formal education	-0.67	1.76	0.51	0.02	16.07
12 years of formal education	0.56	1.27	1.75	0.14	20.98
Preintervention depression symptoms	0.43*	0.17	1.54	1.09	2.16
Preintervention anxiety symptoms	-0.05	0.03	0.95	0.89	1.02
Intercept	-2.75*	1.06			
Class 2					
No partner	-0.87	1.03	0.42	0.06	3.13
Education <sup>a</sup>					
<12 years of formal education	-0.87	1.35	0.42	0.03	5.90
12 years of formal education	1.68	0.96	5.34	0.81	35.08
Preintervention depression symptoms	0.22	0.15	1.24	0.93	1.65
Preintervention anxiety symptoms	-0.04	0.03	.97	0.91	1.03
Intercept	-1.21				

Note. N = 53.  
<sup>a</sup> Reference category = Tertiary Education on Universidad (complete or incomplete). CI = confidence interval; LL = lower limit; OR = odds ratio; UL = upper limit; Reference Profile = Cluster-3 (symptom reduction and increase in parental self-efficacy and social support).  
\*\*\* p < .001, \*\* p < .01, \* p < .05.

has relevant implications for the selection and training of future m-WWWT facilitators, particularly the ability to keep a balance between the practical information to be delivered

and the interpersonal abilities required to engage the participants and respond to their needs.

Although our primary outcomes support m-WWWT's high feasibility and acceptability, our initial analyses on preliminary effectiveness did not show an effect on maternal mental health or assessed mediators (i.e., maternal self-efficacy and perceived social support), because the women reported no significant differences in their symptoms of depression and anxiety across groups and assessment times. This must be interpreted with caution due to our small sample size, which despite being sufficient for a pilot feasibility study, was probably not large enough to find differences between groups. Previous interventions targeting new mothers (Slade et al., 2020), mothers of preschool children (MacKinnon et al., 2022) and high-risk mother-infant dyads (Sidor et al., 2015) have also found no significant effects of the interventions delivered on maternal mental health, although changes in other aspects, such as attachment, infant development and quality of mother-infant interactions were reported (Sidor et al., 2015; Slade et al., 2020).

Despite these preliminary results, our post hoc analyses suggest that there is a group of women who may have benefited from the intervention (i.e., class 3) and who showed a decrease in their symptoms of depression and anxiety and an increase in parental self-efficacy and support from others after the intervention. It may be possible that the intervention facilitator contributed to the perception of support from others who are not family members and friends. Interestingly, the women who presented with high symptoms of baseline depression were less likely to report improvements in mental health, parental self-efficacy, and support. This is in line with earlier evidence about WWWT's effectiveness in women who do not report having a history of serious mental health problems (Fisher et al., 2016).

Despite being a community sample, a large proportion of the mothers in our study reported symptoms of depression and anxiety. Also, most of the women reported their pregnancy was unplanned, and a majority of them were not married to the baby's father, which might reflect less stable couple relationships and support. These characteristics may increase the risk of developing mental health difficulties in the perinatal period (Qiu et al., 2020), and it may be possible that some of the mothers had developed mental health symptoms during pregnancy, which have contributed to their postpartum symptoms. From a contextual perspective, it is worth noting that our study was conducted during the COVID-19 pandemic, which imposed several contact and mobility restrictions on the mothers and had an overall, negative impact on maternal mental health (Coo et al., 2023). Considering the vulnerable profile of our participants and the diversity of contextual and individual factors that may underlie their symptoms of depression and anxiety, more complex and intense interventions may be needed to reduce mental health problems, as shown by recent studies (Lau et al., 2022). These could also include interventions addressing change mechanisms that can be targeted during pregnancy, such as emotional regulation skills.

Our results are limited by the characteristics of our sample. Although having a known diagnosis of psychiatric disorder and receiving and/or initiating mental health treatment were exclusion criteria, several women reported symptoms of depression and anxiety and psychosocial vulnerability in the screening measures; which were probably exacerbated by the COVID-19 pandemic. Also, while the study was being conducted, the country was in a period of social crisis and instability that negatively impacted the population's mental health, in addition to the consequences of the sanitary crisis. In view of this, our results may not be generalized to other populations. On another issue, the limited access to health services due to the COVID-19 pandemic-related restrictions may have increased maternal motivation to participate in the m-WWWT intervention. In this regard, we do not have demographic information about the women who refused to participate and cannot examine possible differences between the limited number of women who did not join the intervention and the large majority who did. To draw more reliable conclusions regarding the effectivity of m-WWWT intervention and justify its use in populations similar to the one assessed in this study, additional research that includes larger samples, re-evaluates the sensibility of the selected instruments to assess maternal mental health symptoms, and is performed in more stable social and sanitary circumstances are necessary. Despite these limitations, our results could inform possible modifications to the research protocol for a future RCT. In particular, they could inform modifications to promote larger participation in the group session and the addition of measures targeting mother and infant characteristics, such as the quality of interactions or infant socioemotional development.

## Conclusion

Internet-based interventions targeting maternal mental health during the transition to motherhood are growing and may significantly contribute to maternal emotional well-being and the development of positive childrearing environments. Despite our mixed findings, our study suggests that m-WWWT is acceptable, perceived as useful and feasible to

be delivered in primary health settings in Chile. Future studies are needed to explore the effectiveness of m-WWWT to promote emotional well-being in first-time mothers.

## Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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## Author Contributions

Soledad Coo (Conceptualization [lead], Formal analysis [lead], Methodology [equal], Project administration [lead], Writing—original draft [lead]), María Ignacia García (Investigation [equal], Project administration [equal], Writing—original draft [equal], Writing—review & editing [equal]), J. Carola Pérez (Conceptualization [supporting], Formal analysis [supporting], Funding acquisition [lead], Methodology [lead], Writing—review & editing [equal]), Daniela Aldoney (Data curation [supporting], Investigation [supporting], Writing—review & editing [supporting]), Marcia Olhaberry (Data curation [supporting], Funding acquisition [supporting], Supervision [supporting], Writing—review & editing [supporting]), Olga Fernández (Formal analysis [equal], Funding acquisition [supporting], Methodology [equal], Writing—review & editing [supporting]), Nicolle Alamo (Formal analysis [equal], Writing—review & editing [supporting]), Pamela Franco (Funding acquisition [supporting], Investigation [supporting], Writing—original draft [supporting], Writing—review & editing [supporting]), Francisca Pérez (Data curation [equal], Formal analysis [supporting], Writing—review & editing [supporting]), Sofía Fernández (Data curation [equal], Formal analysis [equal]), Jane Fisher (Conceptualization [supporting], Supervision [lead], Validation [lead]) and Heather Rowe (Conceptualization [equal], Supervision [equal], Validation [equal], Writing—review & editing [equal]).

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## Conflicts of interest

None declared.

## References

- Apter-Levy, Y., Feldman, M., Vakart, A., Ebstein, R. P., & Feldman, R. (2013). Impact of maternal depression across the first 6 years of life on the child's mental health, social engagement, and empathy: the moderating role of oxytocin. *The American Journal of Psychiatry*, 170(10), 1161–1168. <https://doi.org/10.1176/appi.ajp.2013.12121597>
- Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Three-step approaches using Mplus. *Structural Equation Modeling: A Multidisciplinary Journal*, 21(3), 329–341. <https://doi.org/10.1080/10705511.2014.915181>
- Berlin, K. S., Parra, G. R., & Williams, N. A. (2014). An introduction to latent variable mixture modeling (part 2): Longitudinal latent class growth analysis and growth mixture models. *Journal of Pediatric Psychology*, 39(2), 188–203. <https://doi.org/10.1093/jpepsy/jst085>
- Clark, S. L., Muthén, B. (2009). *Relating Latent Class Analysis Results to Variables Not Included in the Analysis*. <http://hbanaszak.mjr.uw.edu.pl/TempTxt/relatinglca.pdf>
- Colbert, G., Venegas-Vera, V., & Lerma, E. (2020). Utility of telemedicine in the COVID-19 era. *Reviews in Cardiovascular Medicine*, 21(4), 583–587. <https://doi.org/10.31083/J.RCM.2020.04.188>
- Coo, S., García, M. I., Awad, N., Rowe, H., & Fisher, J. (2021). Cultural adaptation of an intervention to prevent postnatal depression and anxiety in Chilean new mothers. *Journal of Reproductive and Infant Psychology*, 39(3), 276–287. <https://doi.org/10.1080/02646838.2019.1705264>
- Coo, S., García, M. I., & Olhaberry, M. (2023). Salud mental materna y efectos en el recién nacido durante la pandemia por COVID-19. *Andes pediátrica*, (AHEAD), 0–0.
- Coo, S., Medina, F., García, M. I., & Pérez, J. C. (2022). Propiedades psicométricas de la Escala de Ansiedad Perinatal. *Ansiedad y Estrés*, 28(1), 40–46.
- Corbin, J. M., & Strauss, A. (1990). Grounded theory research: procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13(1), 3–21.
- Cox, J. L., Holden, J. M., & Sagovsky, R. (1987). Detection of postnatal depression: Development of the 10-item Edinburgh Postnatal Depression Scale. *The British Journal of Psychiatry: The Journal of Mental Science*, 150(6), 782–786. <https://doi.org/10.1192/bjp.150.6.782>
- Ellis, L. A., Meulenbroeks, I., Churrua, K., Pomare, C., Hatem, S., Harrison, R., Zurynski, Y., & Braithwaite, J. (2021). The application of e-mental health in response to COVID-19: Scoping review and bibliometric analysis. *JMIR Mental Health*, 8(12), e32948. <https://doi.org/10.2196/32948>
- Farkas-Klein, C. (2008). Escala de evaluación parental (EEP): Desarrollo, propiedades psicométricas y aplicaciones. *Universitas Psychologica*, 7(2), 457–467.
- Ferguson, S. L., Moore, E. W. G., & Hull, D. M. (2020). Finding latent groups in observed data: a primer on latent profile analysis in Mplus for applied researchers. *International Journal of Behavioral Development*, 44(5), 458–468. <https://doi.org/10.1177/0165025419881721>
- Figueiredo, B., Dias, C. C., Brandão, S., Canário, C., & Nunes-Costa, R. (2013). Breastfeeding and postpartum depression: state of the art review. *Jornal de Pediatria (Versão Em Português)*, 89(4), 332–338. <https://doi.org/10.1016/j.jpdp.2012.12.004>
- Fisher, J., Rowe, H., Wynter, K., Tran, T., Lorgelly, P., Amir, L. H., Proimos, J., Ranasinha, S., Hiscock, H., Bayer, J., & Cann, W. (2016). Gender-informed, psychoeducational programme for couples to prevent postnatal common mental disorders among primiparous women: cluster randomised controlled trial. *BMJ Open*, 6(3), e009396.
- Gomez, D. M. V. O., & Iluffi, I. I. (2020). Escala multidimensional de apoyo social percibido en adolescentes Chilenos. *Revista Liminales. Escritos Sobre Psicología y Sociedad*, 9(17), 39–58.
- Goodman, J. H. (2009). Women's attitudes, preferences, and perceived barriers to treatment for perinatal depression. *Birth*, 36(1), 60–69. <https://doi.org/10.1111/j.1523-536X.2008.00296.x>
- Hansotte, E., Payne, S. I., & Babich, S. M. (2017). Positive postpartum depression screening practices and subsequent mental health treatment for low-income women in Western countries: A systematic literature review. *Public Health Reviews*, 38(1), 1–17. <https://doi.org/10.1186/s40985-017-0050-y>
- Jadresic, E., Araya, R., & Jara, C. (1995). Validation of the Edinburgh Postnatal Depression Scale (EPDS) in Chilean postpartum women. *Journal of Psychosomatic Obstetrics and Gynaecology*, 16(4), 187–191.
- Jiménez-Molina, Á., Franco, P., Martínez, V., Martínez, P., Rojas, G., & Araya, R. (2019). Internet-based interventions for the prevention and treatment of mental disorders in Latin America: A scoping review. *Frontiers in Psychiatry*, 10, 664. <https://doi.org/10.3389/fpsy.2019.00664>
- Lau, Y., Yen, K. Y., Wong, S. H., Cheng, J. Y., & Cheng, L. J. (2022). Effect of digital cognitive behavioral therapy on psychological symptoms among perinatal women in high income-countries: a systematic review and meta-regression. *Journal of Psychiatric Research*, 146(April 2021), 234–248. <https://doi.org/10.1016/j.jpsychires.2021.11.012>
- Liu, Y., Kaaya, S., Chai, J., McCoy, D. C., Surkan, P. J., Black, M. M., Sutter-Dallay, A. L., Verdoux, H., & Smith-Fawzi, M. C. (2017). Maternal depressive symptoms and early childhood cognitive development: A meta-analysis. *Psychological Medicine*, 47(4), 680–689. <https://doi.org/10.1017/S003329171600283X>
- Lo, N., Mendell, N. R., & Rubin, D. B. (2001). Testing the number of components in a normal mixture. *Biometrika*, 88(3), 767–778. <https://doi.org/10.1093/biomet/88.3.767>
- MacKinnon, A. L., Simpson, K. M., Salisbury, M. R., Bobula, J., Penner-Goeke, L., Beard, L., Rioux, C., Giesbrecht, G. F., Giuliano, R., Lebel, C., Protudjer, J. L. P., Reynolds, K., Sauer-Zavala, S., Soderstrom, M., Tomfohr-Madsen, L. M., & Roos, L. E. (2022). Building Emotional Awareness and Mental Health (BEAM): A pilot randomized controlled trial of an app-based program for mothers of toddlers. *Frontiers in Psychiatry*, 13, 880972–880916. <https://doi.org/10.3389/fpsy.2022.880972>
- Martínez, P., Rojas, G., Martínez, V., Lara, M. A., & Pérez, J. C. (2018). Internet-based interventions for the prevention and treatment of depression in people living in developing countries: A systematic review. *Journal of Affective Disorders*, 234, 193–200. <https://doi.org/10.1016/j.jad.2018.02.079>
- MINSAL. (2022a). *COVID-19 en Chile. Pandemia. 2020-2022*. MINSAL.
- MINSAL. (2022b). *Informe glosa 04.1° Trimestre 2022. Subsecretaría de Redes Asistenciales*. MINSAL.
- Moshe, I., Terhorst, Y., Philippi, P., Domhardt, M., Cuijpers, P., Cristea, I., Pulkki-Råback, L., Baumeister, H., & Sander, L. B. (2021). Digital interventions for the treatment of depression: A meta-analytic review. *Psychological Bulletin*, 147(8), 749–786. <https://doi.org/10.1037/bul0000334>
- Muthén, L. K., & Muthén, B. O. (1998–2021). *Mplus user's guide: Statistical analysis with latent variables*. (7th ed.). Muthén & Muthén.
- Nair, U., Armfield, N. R., Chatfield, M. D., & Edirippulige, S. (2018). The effectiveness of telemedicine interventions to address maternal depression: A systematic review and meta-analysis. *Journal of Telemedicine and Telecare*, 24(10), 639–650. <https://doi.org/10.1177/1357633X18794332>
- Newby, J., Mason, E., Kladniski, N., Murphy, M., Millard, M., Haskelberg, H., Allen, A., & Mahoney, A. (2021). Integrating internet CBT into clinical practice: A practical guide for clinicians. *Clinical Psychologist*, 25(2), 164–178. <https://doi.org/10.1080/13284207.2020.1843968>
- Nylund-Gibson, K., & Choi, A. Y. (2018). Ten frequently asked questions about latent class analysis. *Translational Issues in*

- Psychological Science*, 4(4), 440–461. <https://doi.org/doi:10.1037/tps0000176>
- Pérez, J. C., Aldoney, D., García, M. I., Olhaberry, M., Fernández, O., Alamo, N., Franco, P., Pérez, F., Fisher, J., Rowe, H., & Coo, S. (2022). Online intervention to prevent postnatal depression and anxiety in Chilean new mothers: Protocol for a feasibility trial. *Health Informatics Journal*, 28(4), 14604582221135440.
- Pugh, N. E., Hadjistavropoulos, H. D., Hampton, A. J. D., Bowen, A., & Williams, J. (2015). Client experiences of guided internet cognitive behavior therapy for postpartum depression: A qualitative study. *Archives of Women's Mental Health*, 18(2), 209–219. <https://doi.org/10.1007/s00737-014-0449-0>
- Qiu, X., Zhang, S., Sun, X., Li, H., & Wang, D. (2020). Unintended pregnancy and postpartum depression: A meta-analysis of cohort and case-control studies. *Journal of Psychosomatic Research*, 138, 110259. <https://doi.org/10.1016/j.jpsychores.2020.110259>
- Rojas, G., Santelices, M. P., Martínez, P., Tomiic, A., Reinel, M., Olhaberry, M., & Krause, M. (2015). Barreras de acceso a tratamiento de la depresión posparto en centros de atención primaria de la región metropolitana: un estudio cualitativo. *Revista Médica de Chile*, 143(4), 424–432. <https://doi.org/10.4067/s0034-98872015000400002>
- Rowe, H. J., & Fisher, J. R. (2010). Development of a universal psycho-educational intervention to prevent common postpartum mental disorders in primiparous women: A multiple method approach. *BMC Public Health*, 10(1), 1–15. <https://doi.org/10.1186/1471-2458-10-499>
- Sawyer, A., Kaim, A., Le, H. N., McDonald, D., Mittinty, M., Lynch, J., & Sawyer, M. (2019). The effectiveness of an app-based nurse-moderated program for new mothers with depression and parenting problems (EMUMS Plus): Pragmatic randomized controlled trial. *Journal of Medical Internet Research*, 21(6), e13689. <https://doi.org/10.2196/13689>
- Schwarz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics*, 6(2), 461–464. <http://dx.doi.org/10.1214/aos/1176344136>
- Sclove, L. (1987). Application of model-selection criteria to some problems in multivariate analysis. *Psychometrika*, 52(3), 333–343. <http://dx.doi.org/10.1007/BF02294360>
- Shim, M., Mahaffey, B., Bleidistel, M., & Gonzalez, A. (2017). A scoping review of human-support factors in the context of Internet-based psychological interventions (IPIs) for depression and anxiety disorders. *Clinical Psychology Review*, 57, 129–140. <https://doi.org/10.1016/j.cpr.2017.09.003>
- Shorey, S., Chee, C. Y. I., Ng, E. D., Chan, Y. H., Tam, W. W. S., & Chong, Y. S. (2018). Prevalence and incidence of postpartum depression among healthy mothers: A systematic review and meta-analysis. *Journal of Psychiatric Research*, 104, 235–248. <https://doi.org/10.1016/j.jpsychores.2018.08.001>
- Sidor, A., Fischer, C., & Cierpka, M. (2015). The effects of the early prevention program “Nobody Slips Through the Net”: A longitudinal controlled study in an at-risk sample. *Mental Health & Prevention*, 3(3), 103–116. <https://doi.org/10.1016/j.mhp.2015.07.003>
- Slade, A., Holland, M. L., Ordway, M. R., Carlson, E. A., Jeon, S., Close, N., Mayes, L. C., & Sadler, L. S. (2020). Minding the Baby®: Enhancing parental reflective functioning and infant attachment in an attachment-based, interdisciplinary home visiting program. *Development and Psychopathology*, 32(1), 123–137. <https://doi.org/10.1017/S0954579418001463>
- Somerville, S., Dedman, K., Hagan, R., Oxnam, E., Wettinger, M., Byrne, S., Coo, S., Doherty, D., & Page, A. C. (2014). The Perinatal Anxiety Screening Scale: development and preliminary validation. *Archives of Women's Mental Health*, 17(5), 443–454. <https://doi.org/10.1007/s00737-014-0425-8>
- Tein, J. Y., Cox, S., & Cham, H. (2013). Statistical power to detect the correct number of classes in latent profile analysis. *Structural Equation Modeling: A Multidisciplinary Journal*, 20(4), 640–657. <https://doi.org/10.1080/10705511.2013.824781>
- Vermunt, J. K., & Magidson, J. (2016). *Technical guide for Latent Gold 5.1: Basic, advanced, and syntax*. Statistical Innovations Inc. <https://www.statisticalinnovations.com/user-guides/>
- Zimet, G. D., Powell, S. S., Farley, G. K., Werkman, S., & Berkoff, K. A. (1990). Psychometric Characteristics of the multidimensional scale of perceived social support. *Journal of Personality Assessment*, 55(3-4), 610–617. <https://doi.org/10.1080/00223891.1990.9674095>