

Empowering primiparous mothers with e-coaching for enhanced self-efficacy in postpartum and newborn care

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ABSTRACT

Introduction: Postpartum challenges pose significant stress and diminish maternal confidence among first-time mothers. These challenges are exacerbated by limited healthcare access, cultural influences, and logistical barriers, which complicate postpartum self-management, particularly in resource-constrained settings. Addressing these issues is essential.

Methods: The study employed an explanatory sequential mixed-methods design. The initial phase involved a quasi-experimental survey to compare self-efficacy scores between intervention and control groups, each consisting of 30 participants. Self-efficacy was measured using the Perceived Maternal Parenting Self-Efficacy (PMP S-E) scale, and the Mann-Whitney test was employed to compare group means. The second phase was a qualitative study. Participants from the intervention group were selected using simple random sampling based on odd-numbered identifiers, resulting in 15 primiparous women. Data were analyzed using thematic analysis.

Results: Participants in both groups had comparable age distributions and educational backgrounds. The intervention group achieved a significantly higher mean score (65) compared to the control group (41.8), confirmed by a Mann-Whitney test ($p < 0.001$) with a large effect size (Cohen's $d = 5.15$). Qualitative findings identified five themes and 15 categories.

Conclusions: E-coaching effectively enhances maternal self-efficacy in primiparous mothers, offering a promising approach to addressing postpartum challenges in resource-limited settings.

Keywords: e-coaching, maternal self-efficacy, mixed-methods, postpartum care, primiparous mothers

Introduction

The postpartum period presents significant challenges for first-time mothers as they adjust to their new roles (Beecher *et al.*, 2021). These challenges encompass physical recovery, psychological transitions, and caregiving responsibilities (Youseflu, Kohan, and Mostafavi, 2023). In Indonesia, where maternal and neonatal health are a priority, many mothers lack access to sufficient postpartum support systems (Ministry of Health of the Republic of Indonesia, 2018; Laksono & Wulandari, 2022).

First-time mothers around the world encounter distinct challenges in postpartum care, including a lack of knowledge and confidence regarding breastfeeding and

infant care. These struggles can heighten maternal stress and adversely affect breastfeeding rates and health outcomes for both mothers and their babies (Nazari *et al.*, 2021; O'Reilly, Buchanan, and Bayes, 2025). In Indonesia, cultural and systemic factors further complicate these issues, as healthcare resources tend to be concentrated in urban areas, creating access barriers for rural mothers. Additionally, while traditional postpartum practices can be beneficial, they may not always align with evidence-based recommendations, resulting in feelings of anxiety and inadequacy among many new mothers (Aryastami & Mubasyiroh, 2021).

Postpartum care in Indonesia has historically depended on family-centered practices, with guidance

provided by experienced relatives. However, urbanization and evolving family dynamics have weakened these vital support networks. Modern healthcare systems frequently prioritize antenatal and delivery services, leaving postpartum care underemphasized. This concern has been acknowledged by the World Health Organization (WHO), highlighting that Indonesia faces comparable challenges (WHO, 2023).

In Indonesia, maternal and neonatal mortality rates remain among the highest in Southeast Asia. The Indonesian Demographic and Health Survey indicated that nearly 30% of mothers experience complications during the postpartum period, often lacking the knowledge and resources to address these challenges effectively (BPS Statistics Indonesia, 2023). Furthermore, breastfeeding self-efficacy is low, with exclusive breastfeeding rates falling short of WHO targets (National Research Council, 2013). Enhanced postpartum support through structured education is critical, as limited healthcare resources, cultural norms, and logistical barriers leave mothers unprepared for effective self-management and newborn care. Addressing these gaps, innovative solutions like e-coaching empower first-time mothers, fostering self-efficacy and improving outcomes during this pivotal period (Daehn *et al.*, 2024; Lewkowicz *et al.*, 2024).

However, self-efficacy training programs have demonstrated the ability to enhance mothers' confidence in breastfeeding and newborn care (Abdelaziz Ahmed *et al.*, 2020; Azizi *et al.*, 2020). E-coaching through digital platforms presents an accessible solution, particularly in rural areas where smartphone usage is prevalent (Karaçay Yıkar & Nazik, 2024). E-coaching programs combine the accessibility of digital technology with evidence-based educational content (Geissler, Melanie Hasenbein, and Stella Kanatouri, 2014; Ribbers & Waringa, 2015) to provide tailored guidance for mothers. These interventions have shown promise in enhancing maternal self-efficacy, reducing stress, and improving newborn care practices. By leveraging technology, e-coaching addresses geographical and logistical barriers, enabling mothers to access reliable information and support regardless of their location.

In Indonesia, e-coaching programs can be effectively integrated into maternal health services by utilizing local languages and culturally relevant content (Sparrow & Clarke, 2017; Rosyidah, Koning, & Ormel, 2019; Sayaka Koseki *et al.*, 2022). Research suggests that structured educational sessions can improve postpartum outcomes, primarily through the lens of self-efficacy theory. Programs that focus on skill-building, emotional support, and community engagement have proven effective in fostering confidence and alleviating maternal stress. Evidence from similar initiatives in other countries suggests that e-coaching can significantly improve

maternal outcomes (Chatterjee *et al.*, 2021; Abbaspoor *et al.*, 2023; Bezerra *et al.*, 2024; Karaçay Yıkar & Nazik, 2024; Karimi Maleki & Rastegari, 2024). Empowering first-time mothers through e-coaching represents a promising approach to postpartum care. Addressing knowledge and resource gaps can enhance maternal self-efficacy, improve newborn care practices, and ultimately lead to better health outcomes for mothers and their infants. The research question is: Can e-coaching enhance postpartum self-efficacy in primiparous mothers in Indonesia? This mixed-methods study aims to investigate the effectiveness of e-coaching within the Indonesian context, providing valuable insights into its potential integration into maternal health systems.

This research has a significant impact on nursing science and practice by emphasizing the integration of digital tools, such as e-coaching, into maternal care frameworks, promoting evidence-based strategies for enhancing self-efficacy, and improving maternal and neonatal outcomes.

Materials and Methods

Research design

The study employed an explanatory sequential mixed-methods design (Quan-Qual) grounded in a pragmatist paradigm and was conducted in two phases. The first phase was a quantitative quasi-experimental study to identify differences in mean self-efficacy scores among primiparous mothers in the intervention and control groups. The goal was to determine the influence of e-coaching on first-time postpartum mothers. Data collected during this phase were analyzed using SPSS version 22, employing both descriptive and analytical statistical methods.

The second phase involved a qualitative study. The findings were analyzed using directed content analysis to identify the benefits of e-coaching, the barriers faced, and recommendations for primiparous mothers regarding self-efficacy in self-care and newborn care. Perspectives were gathered from first-time mothers through semi-structured, in-depth individual interviews and field note-taking. Participants who met the eligibility criteria were selected using a purposive sampling approach.

Phase I (Quantitative Study)

This quantitative study employs a quasi-experimental research design with a pre-test and post-test approach, including a control group. The objective was to identify differences in mean self-efficacy scores among postpartum mothers participating in the intervention (e-coaching) compared to those in the control group. The target population comprises all primiparous mothers at the Public General Hospital in Bandung, Indonesia.

Population and Sample

The target population comprises all primiparous mothers at the Public Hospital in Bandung, Indonesia. Participants were selected through purposive sampling, with inclusion criteria set for primiparous mothers who own Android phones. Exclusion criteria included primiparous mothers with complications and those who declined to participate in the study. The sample size was determined using G*Power software, with an effect size of 0.8, an α value of 0.05, and a power of 80%. This calculation resulted in a requirement of 27 participants for each group. The total sample size was increased by 10% to mitigate the dropout risk, resulting in a final sample of 60 participants, with 30 participants in each of the two groups. Group division is done randomly based on the availability of respondents. In the intervention group, coaching was administered in two sessions for each respondent. Questionnaires were distributed both prior to and following the coaching sessions to assess pre-test and post-test outcomes. In contrast, the control group received education without coaching, which was conducted in a single session.

Data Collection

Data collection utilized a research instrument developed by Barnes & Adamson-Macedo (2007) called the Perceived Maternal Parenting Self-Efficacy (PMP S-E) scale. This tool is considered psychometrically robust, with high internal consistency (Cronbach's $\alpha = 0.91$) and test-retest reliability ($r_s = 0.96$, $p < 0.01$). The instrument was professionally translated into Indonesian and then back-translated into English by a different translator to ensure consistency in the questionnaire items. A construct validity test on 30 primiparous mothers yielded a Cronbach's α value of 0.85. It has potential applications for maternal self-efficacy during the neonatal period.

The PMP S-E tool comprises four interrelated subdomains that collectively capture the essential dimensions of parenting competence. The first subdomain, *care-taking procedures*, evaluates maternal ability to meet the infant's fundamental needs, including feeding, bathing, and diaper changing. The second subdomain, *evoking behaviors*, reflects the mother's capacity to respond to and regulate changes in the infant's behavior, such as through soothing strategies. The third, *reading behaviors* (or signaling), focuses on maternal sensitivity in interpreting infant cues, for example, identifying signs of fatigue or illness. The final subdomain, *situational beliefs*, assesses maternal confidence in engaging with and forming an emotional bond with the infant, encompassing expressions of affection and relational closeness.

Each item is scored on a 4-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. Total scores range from 20 to 80, with

higher scores indicating higher maternal self-efficacy. Subscale scores are calculated by summing the respective items within each domain. High self-efficacy is indicated by scores equal to or above 40, while scores below 40 indicate low self-efficacy.

The intervention procedure was implemented through e-coaching on postpartum maternal and newborn care, delivered via six e-modules. These e-modules, which contain relevant materials and videos for each topic, as well as pre-test links, were shared with participants via WhatsApp. Those assigned to the intervention group were added to a WhatsApp group, which enabled the research team to monitor their progress in completing the study materials and e-coaching videos. Over the course of one week, participants engaged in e-coaching by independently studying the provided materials. Upon completing each e-module, they were required to submit videos demonstrating their newborn care practices to the research team. Finally, at the end of the week, all participants—both from the intervention and control groups—received a post-test link through the private network.

The modules cover five key topics: Postpartum physical adaptation, postpartum psychological adaptation, postpartum maternal care, newborn care, and lactation and breast milk management.

The control group was placed in a different WhatsApp group from the intervention group. They received an intervention with a printed brochure on postpartum care for mothers and newborns. A pre-test was administered before they received the brochure, and a post-test was given one week later.

Data Analysis

Data analysis was conducted using a paired sample T-test to assess the difference in mean self-efficacy scores within the intervention group. In the control group, the Wilcoxon test was used based on the outcomes of the normality tests conducted for both groups (see Table 2). The Mann-Whitney test was applied to compare the means between the intervention and control groups.

Phase II (Qualitative Study)

This qualitative study employed an explanatory descriptive design to examine the benefits, ease of use, and barriers associated with e-coaching in enhancing self-efficacy among first-time mothers (primiparous mothers). The explanatory descriptive approach is designed to build upon and clarify the quantitative results. Specifically, it aimed to explain how and why e-coaching affects self-efficacy by examining the perceived benefits, ease of use, and barriers among primiparous mothers.

Sample

Participants were selected from the intervention group using simple random sampling based on odd-numbered identification, resulting in a total of 15 participants. This method ensured objectivity and minimized researcher bias, thereby enhancing the credibility of the qualitative sampling process.

Data Collection

Data collection through focus group discussions (FGD). FGD was conducted with three separate groups, each consisting of five participants selected from the intervention group. The FGDs were held in a private, quiet setting to ensure comfort and confidentiality. Each session was facilitated by a trained moderator from the research team, accompanied by a note-taker. The moderator guided the discussion using a semi-structured FGD guide, ensuring all key topics were covered while allowing flexibility for participants to share freely. Sessions were audio-recorded with participants' consent and lasted approximately 60–90 minutes. Field notes were also taken to capture non-verbal cues and contextual information, enhancing the depth of qualitative analysis. The discussions were recorded with the participants' consent. The questions for FGD are displayed in Table 6.

Data Analysis

The researchers used thematic analysis to qualitatively analyze interview notes in line with the study's objectives. The process of data analysis begins with transcribing the interview data. Then, small units of meaning, known as "codes," are identified. These codes are further categorized into primary categories. Those primary categories are then grouped into secondary categories based on their relationships. Next, any emerging themes are noted. Finally, the themes are analyzed to extract meaningful insights from the data (Johnson, 2019; Naeem *et al.*, 2023).

The validity of qualitative research data is based on credibility, trustworthiness, suitability, and transferability (Moser and Korstjens, 2018). The research maintained its credibility by using semi-structured interview guides to ensure consistency, thoroughly reviewing the transcripts, and analyzing any contradictory cases. The research team independently analyzed the data and achieved 90% agreement in coding and themes compared to expert coders. A detailed guide was used to ensure reliability by linking the raw data to the identified themes. The suitability of the sample size was assessed through theme saturation, established criteria, and participant dropouts. Transferability was supported by presenting the raw data to emphasize broader applicability. While informants were made aware of the member-checking process, only 15 women consented to participate in the focus group discussion

(FGD), concluding that member-checking was unnecessary.

Ethical Consideration

Ethical principles in research emphasize autonomy, which includes obtaining informed consent, ensuring voluntary participation, and respecting participants' decisions. Justice promotes fairness and equality in participant selection, while beneficence maximizes benefits and reduces potential harm. Non-maleficence emphasizes the avoidance of harm through ethical sensitivity, and veracity requires honesty, transparency, and accuracy in reporting to ensure credible research findings.

The Research Ethics Committee of Universitas Aisyiyah Bandung, Indonesia, reviewed and approved this study under reference number 902/KEP.01/UNISA/VI/2024.

Results

Quantitative Results

Participants in both groups had comparable age distributions and educational backgrounds. The majority had completed either Senior High School or College, while fewer participants had only completed Elementary or Junior High School. Additionally, a larger percentage of participants in both groups were unemployed than those employed (see Table 1).

The intervention group showed normally distributed data for both pre-test and post-test scores, while the control group did not display this distribution. This difference in distribution necessitated the use of different statistical methods for analyzing each group (Table 2).

The analysis using a Paired T-Test revealed a significant difference in the mean Self-Efficacy score for the intervention group. At the same time, the Wilcoxon Signed Rank test showed no significant difference in the control group (Table 3). This suggests that the e-coaching intervention had a positive impact on the self-efficacy of primiparous mothers in the intervention group. In contrast, providing education through brochures did not improve the self-efficacy of primiparous mothers in the control group.

Table 1. Characteristics of participants

Characteristics	Intervention group		Control group	
Mean age (year)	25		24	
Minimum age (year)	19		18	
Maximum age (year)	31		33	
	n	f	n	f
Education History				
Elementary school	1	3,33%	0	0%
Junior High School	9	30,00%	6	20,00%
Senior High School	10	33,33%	14	46,70%
College	10	33,33%	10	33,30%
Work experience				
Employed	12	40,00%	11	36,70%
Unemployed	18	60,00%	19	63,30%

f = frequencies

Table 2. Normality Test

Data	Intervention Group		Control Group	
	Pre-Test	Post-Test	Pre-Test	Post-Test
Normality test	0,598	0,074	0,024	0,015

Table 4 presents a statistically significant disparity between the intervention and control groups, as determined by the Mann-Whitney test. The intervention group achieved a mean score of 65, considerably higher than the control group's mean score of 41.8. The Mann-Whitney test confirms that this difference is statistically significant ($p < 0.001$), with a considerable effect size (Cohen's $d = 5.15$). This suggests that the e-coaching intervention has a positive impact on the self-efficacy of first-time mothers.

Figure 1 shows that the intervention is highly effective, with an average improvement of 22.6 points. It is particularly beneficial for mid-range performers, specifically those scoring between 60 and 70. The results are consistent, demonstrating lower variance within the intervention group. This could be especially advantageous for primiparous mothers who score below 50.

Qualitative Results

The characteristics of the participants in this qualitative phase included an age range of 25 years, with a predominance of working mothers and those with a higher education background. Qualitative data findings from the FGD results identified five themes and 15 categories.

Theme 1: Perceived benefits of e-coaching

Categories identified:

1. Empowerment through knowledge

Mothers felt more confident in managing postpartum recovery, newborn care, and lactation due to the availability of accessible, real-time guidance. The interview findings indicate that e-coaching exerted a positive influence on postpartum mothers. Participants reported increased confidence in managing both self-care and infant care. Moreover, the program was perceived as having the potential to enhance the recovery process and overall maternal experience, particularly if it were made widely accessible. For several mothers, e-coaching was described as resembling the presence of a knowledgeable companion who could guide at any time. Notably, the provision of immediate support was shown to alleviate maternal anxiety—for example, in situations where infants experienced difficulties with latching—while simultaneously facilitating calmer and more effective problem-solving.

"I feel much more confident about caring for myself and my baby." (P1)

Table 4. The effect of the intervention on the group

Group	n	Median (minimum- maximum)	Mean±SD	p
Intervention Group	30	65 (60-72)	65 ± 3,3	<0,001
Control Group	30	40 (34-55)	40,8 ± 4,4	

Table 3. The effect of the intervention within the group

	Intervention Group*			
	n	median (minimum-maximum)	mean±SD	p
Pre-Test	30	38 (31 - 45)	37,6 ± 3,1	<0,0001
Post-Test	30	65 (60-72)	65 ± 3,3	
Control Group**				
	n	Median (minimum-maximum)	mean±SD	p
Pre-Test	30	40 (31-51)	41 ± 4,7	0,946
Post-Test	30	40 (34-55)	40,8 ± 4,4	

SD=Standard Deviation, *Paired T-Test, **Wilcoxon Signed Rank Test

"If every mom had access to this, it could make postpartum recovery and motherhood a much more positive experience." (P13)

"It is like having a knowledgeable friend on speed dial." (P5)

E-coaching helped bridge the gap between uncertainty and informed decision-making.

"When my baby was not latching properly, I started panicking. But getting instant support calmed me down and helped me find a solution." (P2)

2. Psychological reassurance

Continuous access to motivational content encouraged a positive mindset. The interpretation of these findings highlights the significance of accessible guidance for postpartum mothers. Such support is perceived not only as an empowering tool but also as a means of reducing stress during the transition to motherhood. Furthermore, motivational strategies—such as encouraging mothers to "take one step at a time"—were shown to foster self-efficacy and promote a positive mindset. These elements collectively contribute to a smoother adaptation process in early motherhood.

"This kind of accessible guidance should be standard for all new mothers. It is empowering and reduces so much stress." (P9)

'Take one step at a time' helped me believe in myself as a new mom. That mindset shift made all the difference." (P3)

3. Convenience and accessibility

The ability to attend coaching sessions from home reduced the logistical challenges of seeking support. The findings underscore the importance of accessibility and convenience as key factors in the effectiveness of e-coaching. Participants emphasized that the elimination of logistical barriers allowed them to focus entirely on receiving the support they required, underscoring e-coaching as a practical and sustainable solution. Moreover, the ability to participate from home was described as a simple yet impactful feature that substantially reduced stress and enhanced access to support. Convenience was further linked to increased consistency in attendance, suggesting that flexibility in delivery plays a critical role in promoting participant engagement and adherence to the program.

Table 5. Categorization and Themes Derived from FGD Results

Themes	Categories
Perceived benefits	Empowerment, psychological reassurance, and convenience
Ease of use	User-friendly design, flexible accessibility, and technical challenges
Barriers	Technology limitations, lack of interaction, and generic content
Application areas	Postpartum care, newborn care, lactation management
Recommendations	Hybrid models, technical infrastructure, tailored content, flexible scheduling

"E-coaching removed one huge hurdle, logistics, and let me focus on the support I needed. It's such a practical solution."(P4)

"It is amazing how something so simple, attending from home, can have such a big impact on reducing stress and making support accessible."(P7)

"The convenience made me more consistent with the sessions."(P1)

Theme 2: Ease of use of e-coaching

Categories identified:

1. User-friendly design

After a short learning curve, most participants found the platform intuitive and straightforward. The findings suggest that usability played an essential role in participants' engagement with the e-coaching platform. Several mothers noted that, once they became familiar with the system, it was perceived as user-friendly and accessible. Additionally, the clear layout and intuitive navigation were reported to facilitate ease of use, enabling participants to locate the information and resources they needed quickly. These features indicate that a well-structured and user-centered design is essential for enhancing the effectiveness and acceptability of digital health interventions.

"It is user-friendly once you get the hang of it." (P10)

"The layout made it easy to navigate and find exactly what I needed." (P6)

2. Flexible accessibility

Participants appreciated the ability to access sessions at their convenience, aligning with their schedules. The results highlight the importance of intuitive design in enhancing the usability of the e-coaching platform. Participants emphasized that the system felt natural to use, even during ongoing sessions, as it allowed for seamless navigation, such as switching tabs or accessing resources, without disruption. The simplicity of the interface was associated with a stress-free user experience, minimizing potential barriers to engagement. Furthermore, the integration of key features—including session schedules, learning resources, and communication tools—into a single, easily accessible platform was reported to improve efficiency and convenience. Collectively, these findings highlight that intuitive and well-integrated design features are crucial for enhancing user satisfaction and

Table 6. FGD Guide Questions

No	Questions
1	Can you share your experience with e-coaching during your pregnancy and postpartum journey?
2	How effective was the e-coaching program in supporting you after childbirth?
3	How useful was e-coaching in helping you care for your baby?
4	Was e-coaching effective in helping you with breastfeeding?
5	Was it easy to access and navigate?
6	What improvements would you suggest to make e-coaching more effective?
7	How did you feel about the emotional and psychological support provided by e-coaching?
8	Did you encounter any technical issues while using the platform?

fostering sustained participation in digital health interventions.

"What I appreciated most was how intuitive it was. Even during a session, it felt natural if I needed to switch tabs or look up a resource. Nothing was overly complicated, which made the experience stress-free." (P9)

"Whether it was the session schedule, resources, or messaging, it was all in one place and easy to find."(P11)

3. Technical support challenges

Technical issues, such as delayed support or connectivity problems. The findings reveal that while the e-coaching content was highly valued, technical difficulties and delayed support posed notable challenges to the overall user experience. Participants described feelings of frustration when encountering issues such as login failures, particularly when responses from technical support were significantly delayed. These interruptions not only created a sense of being "stuck" but also disrupted the continuity of engagement with the program. Several participants emphasized the need for more immediate and responsive support systems, such as live chat features, to address urgent problems effectively. Although the platform was perceived as having considerable potential, the limitations in technical support were identified as barriers that could undermine both user satisfaction and sustained participation.

"The coaching itself was great, but when technical issues came up, getting help was sometimes frustrating. I remember waiting hours for a response when I couldn't log in—it made me feel stuck." (P15)

"If there were a live chat or faster way to get help, it would have made a big difference. Delayed responses just did not cut it when the problem was urgent." (P3)

"The platform has so much potential, but the tech support could be improved." (P8)

Theme 3: Barriers in e-coaching

Categories Identified:

1. Technology limitations

Poor internet connectivity, especially in rural areas, and occasional issues with audio or video quality were common barriers. The findings indicate that technical

infrastructure, particularly internet connectivity, played a significant role in shaping participants' experiences with e-coaching. While the overall concept of the program was positively received, several mothers reported that unstable or slow internet connections hindered their ability to benefit from the sessions fully. These connectivity issues were perceived as reducing the effectiveness of the intervention at times, highlighting the dependence of digital health initiatives on reliable technological access. Such barriers underscore the importance of ensuring adequate digital infrastructure to optimize the delivery and impact of e-coaching programs.

"As much as I loved the concept of e-coaching, poor internet connectivity was a big issue for me." (P11)

"I am sure it was due to my internet speed, but it made the sessions less effective at times"(P12)

2. Lack of physical interaction

E-coaching fell short of delivering the tactile guidance necessary for post-partum exercises and breastfeeding assistance. The findings suggest that while e-coaching was perceived as highly beneficial, its limitations became apparent in areas requiring physical demonstration and correction. Participants reported challenges in performing postpartum exercises and breastfeeding techniques, noting uncertainty about whether they were executing the practices correctly without direct, in-person guidance. Although virtual advice was valued, mothers emphasized that specific skills—such as positioning the infant or adjusting the latch—were difficult to master solely through a screen. These perspectives highlight a key limitation of digital health interventions, underscoring the potential need for hybrid models that combine virtual coaching with opportunities for physical demonstration and real-time correction.

"E-coaching was helpful in many ways, but I missed the physical guidance for things like postpartum exercises. Sometimes, I was unsure if I was doing them right, and I wished someone was there to correct me." (P1)

"I felt the same way about breastfeeding support. The advice was great, but positioning the baby or fixing the latch was tricky without someone physically showing me. It is just not the same through a screen."(P5)

3. Generic nature of content

Some participants felt that the information was not personalized, which reduced its relevance to their unique circumstances. The findings reveal that although participants valued the guidance offered through e-coaching, some perceived the content as overly generalized and not sufficiently tailored to their individual circumstances. Mothers noted that specific concerns, such as unique feeding schedules or personalized postpartum recovery needs, were not always adequately addressed. In particular, the exercise recommendations were described as too broad, limiting participants' ability to implement them effectively. These insights suggest that personalization is a critical component in enhancing the relevance and effectiveness of digital health interventions, emphasizing the need for

content that is adaptable to the diverse needs and recovery trajectories of postpartum mothers.

"While I appreciated the tips and advice, I sometimes felt the content was too general. It didn't always address my specific challenges, like my baby's feeding schedule or my own postpartum recovery."(P9)

"For me, the postpartum exercise tips were too broad, so I could not follow all the suggestions. I wished there had been more personalized plans based on my recovery needs."(P3)

Theme 4: Application areas of e-coaching

Categories identified:

1. Postpartum Recovery

Structured guidance on postpartum care encouraged mothers to adopt healthier routines. The findings indicate that participants expressed a strong preference for visual learning tools, particularly video demonstrations, as these were perceived to be more effective than written instructions. Mothers reported that seeing exercises demonstrated would increase their confidence in performing them correctly. Furthermore, participants highlighted the need for more comprehensive guidance on balancing postpartum recovery with newborn care, suggesting that e-coaching could be strengthened by integrating practical, scenario-based resources. These insights underscore the value of incorporating multimedia and tailored instructional content to enhance both confidence and applicability in digital health interventions for postpartum mothers.

"I love the idea of videos! That is much better than just reading about exercises. Seeing someone demonstrate them would give me more confidence." (P13)

"When I had my baby, I did not know how to balance recovery with taking care of a newborn. E- coaching has used more guidance." (P6)

2. Newborn Care

Tutorials on basic newborn care (e.g., bathing, swaddling) were practical and easy to follow. The findings highlight the significant role of newborn care tutorials in supporting the confidence and skill development of first-time mothers. Participants described the step-by-step video demonstrations on essential practices, such as bathing and swaddling, as highly accessible and easy to follow. The ability to replay the tutorials as needed was valued as a flexible and reassuring feature, enabling mothers to revisit instructions during moments of uncertainty. Furthermore, the calm and empathetic delivery of the guidance was noted to reduce anxiety, suggesting that the tutorials not only provided technical knowledge but also addressed the emotional needs of new parents. Collectively, these insights underscore the effectiveness of structured, empathetically designed video resources in enhancing both competence and emotional well-being in postpartum care.

"The newborn care tutorials were such a lifesaver! The step-by-step videos on things like bathing and swaddling were super easy to follow, even for a first-time mom like me."(P7)

"I also liked how I could replay the tutorials whenever needed. Some nights, I'd watch the swaddling one again to make sure I was doing it correctly—it was such a great resource."(P14)

"The instructions were calm and reassuring, which helped ease my anxiety. It felt like they understood what new parents needed."(P15)

3. Lactation and Breastfeeding

Troubleshooting breastfeeding challenges with expert advice empowered mothers to manage lactation confidently. The findings highlight the crucial role of practical, step-by-step guidance in promoting successful breastfeeding practices. Participants reported that instructional support enabled them to make necessary adjustments, such as improving the infant's latch, which alleviated pain and enhanced maternal confidence to continue breastfeeding. Troubleshooting sessions were also described as particularly transformative, with targeted tips on positioning cited as pivotal in helping mothers overcome challenges and gain a sense of autonomy in managing lactation. These experiences suggest that structured, problem-solving approaches within e-coaching interventions can significantly improve breastfeeding outcomes by fostering maternal competence and resilience.

"I completely agree! I was struggling with pain during breastfeeding, and the step-by-step guidance helped me adjust my baby's latch. It gave me the confidence to keep going instead of giving up."(P3)

"The troubleshooting sessions were a game-changer. One specific tip about positioning finally made breastfeeding click for me. I finally felt like I could manage lactation on my own."(P9)

Theme 5: Recommendations for improvement

Categories identified:

1. Hybrid models

Combining e-coaching with in-person sessions could address the tactile and hands-on gaps. The findings illustrate that while virtual coaching was valued for its accessibility and continuity of support, participants identified a need for complementary in-person or enhanced interactive components. Mothers expressed that a limited number of face-to-face sessions, particularly for hands-on skills such as newborn care or postpartum exercises, would significantly improve confidence and technique, thereby strengthening the effectiveness of subsequent virtual sessions. In addition, some participants suggested integrating advanced technological tools, such as wearable devices or live-streaming features, to provide coaches with a more accurate perspective during online sessions. These insights highlight the potential benefits of hybrid models that combine virtual coaching with either in-person

interaction or advanced digital innovations to optimize learning and maternal support.

"Virtual coaching is great for ongoing guidance, but having even one or two in-person sessions for things like newborn care or physical recovery would make a big difference."(P1)

"For something like postpartum exercises, having a professional there to show you proper technique even once would make it easier to follow up on your own with virtual sessions."(P10)

"Maybe they could offer a virtual option with advanced tools, like wearable devices or live-streaming, to give coaches a better view during sessions."(P6)

2. Improved technical infrastructure

Enhancing internet connectivity and providing reliable technical support to avoid disruptions. The findings highlight that technical challenges continue to be a significant barrier to the effectiveness of virtual coaching. Participants emphasized the need for more immediate and responsive technical support, such as live chat functions, to efficiently address urgent issues. Additionally, suggestions were made for providing alternative resources, such as downloadable materials or pre-recorded videos, to ensure continuity of learning during periods when live sessions were disrupted. Poor internet connectivity was frequently cited as a significant obstacle, with reports of sessions freezing or disconnecting entirely, leading to frustration and reduced engagement. These insights underscore the importance of incorporating robust technical support systems and flexible resource delivery to enhance the reliability and accessibility of digital health interventions.

"I also think there needs to be a faster way to get technical support, like a live chat option."(P8)

"That is a great idea. Having downloadable resources or pre-recorded videos would help a lot during times when live sessions are not possible because of technical issues."(P13)

"One of the biggest challenges I faced was poor internet connectivity. There were times when the session would freeze or disconnect completely, which was really frustrating."(P5)

3. Enhanced scheduling options

Offering greater flexibility to accommodate busy or unpredictable schedules. The findings reveal that scheduling emerged as a key challenge affecting mothers' engagement with e-coaching sessions. Participants noted that the unpredictable routines of caring for a newborn made it difficult to consistently allocate time for participation, emphasizing the need for greater flexibility. Suggestions included offering evening or weekend slots to accommodate mothers balancing multiple responsibilities, such as employment or caring for older children. Furthermore, participants highlighted that providing alternative formats or more adaptable scheduling options could alleviate stress and enhance accessibility. These insights underscore the importance of flexible program design to ensure that digital health

interventions align with the complex demands of postpartum mothers' daily lives.

"One of the challenges I faced was trying to fit the sessions into my unpredictable schedule. With a newborn, you never really know when you'll have free time, so more flexibility would help."(P3)

"I also think having more evening or weekend slots would be helpful for moms who might have other responsibilities during the day, like older kids or work."(P7)

"More scheduling flexibility and access to alternative formats would reduce the stress of trying to fit coaching into an already overwhelming schedule."(P15)

Discussions

The findings of this mixed-methods study reveal that e-coaching significantly enhances self-efficacy in primiparous mothers, both statistically and experientially. The intervention group's mean self-efficacy score increased substantially after the intervention, whereas the control group, which received only brochures, showed no significant change. These findings underscore the importance of structured digital support in empowering new mothers.

Quantitatively, the e-coaching program yielded consistent improvements across multiple domains of the Postpartum Maternal Parenting Self-Efficacy (PMP S-E) scale. Participants notably showed gains in confidence related to postpartum self-care, newborn handling, breastfeeding, and psychological adjustment. The most significant improvements were observed among those with mid-range pre-test scores, suggesting the intervention effectively supported mothers who were uncertain but open to guidance. This aligns with Bandura's self-efficacy theory, which emphasizes mastery experience, verbal persuasion, and emotional regulation as central to increasing perceived efficacy (Albert Bandura, 1997).

These findings support the e-coaching intervention as a practical approach for improving self-efficacy in this population, aligning with previous research on digital health interventions (Sawyer *et al.*, 2017; Lin-Lewry *et al.*, 2024). The intervention group also showed lower variance, suggesting that the e-coaching program provided consistent benefits across participants, particularly those with mid-range baseline self-efficacy scores. This finding aligns with Bandura's self-efficacy theory, which posits that targeted interventions can enhance confidence by addressing specific barriers and providing structured guidance.

Qualitative data further contextualized these improvements. Participants reported that the e-coaching provided them with immediate, practical knowledge, which helped them feel more competent and less anxious. For example, one mother noted: "I feel much more confident about caring for myself and my baby."

(P1). Another shared: "When my baby was not latching properly, I started panicking. But getting instant support calmed me down and helped me find a solution." (P2). These testimonials align with the questionnaire subdomains that target emotional self-regulation and technical skills in newborn care. The platform's user-friendliness and flexibility were critical to engagement. "It's user-friendly once you get the hang of it" (P10) and "The convenience made me more consistent with the sessions" (P1) suggest that e-coaching removes logistical barriers that often prevent postpartum follow-up. However, challenges such as limited internet access and slow technical support were recurring concerns, indicating a need for infrastructure and service enhancements. "The coaching itself was great, but getting help was sometimes frustrating" (P15) illustrates how technical issues can undermine the intervention's full potential.

These insights highlight the complexities of digital health interventions and underscore the importance of content tailored to user needs (Ellis, Draheim, and Anderson, 2022; Nittas *et al.*, 2024). The thematic analysis emphasized the practical applications of e-coaching in areas such as labor support, postpartum care, newborn care, and lactation management. Participants suggested incorporating hybrid models that blend digital and in-person support, improving technical infrastructure, and developing culturally tailored content. These recommendations align with current best practices in maternal health interventions (Lunze *et al.*, 2015; WHO, 2015).

The findings are consistent with previous studies demonstrating the efficacy of digital interventions in maternal health. For instance, a meta-analysis by (Lin-Lewry *et al.*, 2024) reported that e-health programs significantly improved self-efficacy and reduced depression among new mothers. Similarly, Jiao *et al.* (2019) Research has shown that digital coaching can reduce anxiety, increase maternal confidence, and improve coping strategies. This study is particularly noteworthy because it focuses on first-time mothers, a group especially vulnerable to self-efficacy-related challenges. The findings add to the growing body of evidence that underscores the importance of targeted, scalable interventions in maternal healthcare (Sawyer *et al.*, 2017; Sparrow & Clarke, 2017b; Lin-Lewry *et al.*, 2024; Nittas *et al.*, 2024).

The study highlights the transformative potential of e-coaching interventions while identifying critical areas for refinement. The significant improvement in self-efficacy underscores the importance of accessible, evidence-based support for primiparous mothers. However, the qualitative findings indicate the need for more interactive and culturally sensitive content to maximize engagement and effectiveness. The mixed-methods approach proved invaluable in capturing the

complexity of participants' experiences. Quantitative data established the efficacy of the intervention, while qualitative insights contextualized these outcomes and provided practical recommendations. This underscores the importance of integrating diverse methodologies in health research (Bashir, 2017; Gogo & Musonda, 2022).

Integrating e-coaching interventions signifies a transformative advancement in nursing research, opening new opportunities to enhance maternal self-efficacy. This study highlights the potential of hybrid models that blend digital coaching with in-person support, effectively addressing the diverse needs of mothers. It underscores the importance of culturally tailored content to foster greater engagement and outcomes, calling for further research into culturally sensitive program designs. Longitudinal studies are crucial for evaluating the sustained impact of e-coaching on maternal well-being and infant care practices. Incorporating advanced technologies, such as artificial intelligence (AI) and personalized algorithms, holds promise for delivering more targeted and innovative maternal care solutions.

In digital health, the study highlights the increasing importance of interactive features, such as real-time chatbots and virtual consultations, which can enhance user engagement and address existing limitations in e-coaching models. Enhancing accessibility through offline functionality and simplified user interfaces is crucial, especially in low-resource settings. Expanding evaluation metrics to encompass maternal mental health, breastfeeding success, and infant development is recommended for creating robust frameworks for future interventions. Additionally, addressing the scalability of e-coaching across diverse populations and overcoming barriers such as language and cultural differences remain key focus areas.

Evidence-based practices are essential for advancing maternal healthcare. Combining quantitative rigor with qualitative insights, a mixed-methods approach can provide a comprehensive understanding of intervention efficacy. Cross-disciplinary collaborations among technologists, public health experts, and sociologists are crucial for developing comprehensive solutions.

Policy advocacy is crucial in integrating digital health programs into maternal health frameworks, complemented by professional training for healthcare providers. While the study's robust design, statistical analysis, and diverse participant background strengthen its findings, future research should address limitations such as response bias, homogeneity in age range, and cultural specificity to enhance generalizability and impact globally.

Conclusion

E-coaching effectively improves maternal self-efficacy in primiparous mothers, offering a promising

strategy to address postpartum challenges in resource-limited settings. This research has a significant impact on nursing science and practice by emphasizing the integration of digital tools, such as e-coaching, into maternal care frameworks and promoting evidence-based strategies to enhance self-efficacy and improve maternal and neonatal outcomes.

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Declaration of Interest

The authors declare that the research was conducted without any commercial or financial relationships that could be perceived as a potential conflict of interest.

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