DIGITAL HEALTH

Effectiveness of the "Essential Coaching for Every Mother" postpartum text message program on maternal psychosocial outcomes: A randomized controlled trial

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Abstract

Objective: To determine the effectiveness of the *Essential Coaching for Every Mother* program on maternal self-efficacy, perceived social support, postpartum anxiety, and postpartum depression at six-weeks postpartum.

Methods: Participants from Nova Scotia were randomized, stratified by parity, to receive either the *Essential Coaching for Every Mother* postpartum text-message program or usual care, from birth to six-weeks postpartum. Participants completed surveys at enrollment (after birth) and at 6 weeks. Differences between groups were analyzed using analysis of covariance, considering parity and group allocation.

Results: Of the 171 participants recruited (53% primiparous), 150 completed the baseline survey (intervention $n = 78$, control $n = 72$). At baseline, newborns were on average 4.4 days old (SD: 3.9) and mothers 31.4 years old (SD: 4.5). Controlling for maternal age, primiparous women in the intervention group had a greater increase in maternal self-efficacy than primiparous women in the control group (mean difference [MD] = 4.84 (standard error [SE] = 0.75) vs. MD = 2.13 (SE = 0.81), $p = 0.034$). Women allocated to the intervention group had a greater reduction in postpartum anxiety symptoms than women in the control group for both multiparous and primiparous women (MD = −3.91 (SE = 1.82) vs. 2.81 (SE = 1.86), $p = 0.011$). There was no significant change in postpartum depression scores or perceived social support for either group.

Discussion: This study presents the results of the first Canadian postpartum text message program, which found improved psychosocial outcomes for postpartum women. Given the potential to reach numerous women at a low cost across geographical locations, the scalability of this intervention can improve maternal self-efficacy and reduce postpartum anxiety.

Introduction

Despite significant physical and psychological changes that occur during the postpartum period, women often receive considerably less attention and support than during the prenatal or intrapartum period.[1,2] During pregnancy, women are regularly monitored and meet with healthcare providers, weekly or monthly based on gestation. Yet in the postpartum period, monitoring tends to occur only once or twice in the first year, typically around six weeks

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postpartum for most women.[3,4] In Canada, recommendations for postpartum care are importantly family centered, with an emphasis on planning the timing and purpose of postpartum visits based on individual needs.[5] However, previous work has shown that across Canada, women experience significant variations in care, depending on where they live and who their providers are.[6,7]

This lack of consistent care can leave women feeling under-supported and lacking information in their transition to motherhood.[8,9] Even in uncomplicated pregnancies and births, women may struggle with developing their parenting self-efficacy[10] and may feel unsupported by both informal and formal sources of support.[10,11] Additionally, 17% of women report postpartum depression symptoms[12] and 15% report postpartum anxiety symptoms.[13] Previous work has shown that primiparous women are more at risk, being more likely to have lower maternal self-efficacy and higher postpartum anxiety than multiparous women.[14,15]

Mobile health (mHealth) interventions have been developed to address some of these psychosocial outcomes but have shown mixed effectiveness depending on intervention type and focus.[16,17] mHealth has been defined as the use of mobile devices to transmit health content and services.[18] One mHealth tool which is often underutilized but shows promise is the use of text messaging to enhance maternal and newborn outcomes and engage mothers during the postnatal period.[19–21] To date, no mHealth interventions are available in Canada that have focused on enhancing maternal self-efficacy and perceived social support while decreasing postpartum anxiety and depression.

Essential Coaching for Every Mother was developed through iterative testing with mothers and postpartum healthcare providers as an evidence-based postpartum text message program which has the goal of improving mothers' access to information about caring for themselves and their newborns during the immediate six-week postnatal period.[22] Feasibility work showed preliminary effectiveness and uptake during a pilot pre–post intervention study offered during the COVID-19 pandemic.[23]

Aims

The primary objective of this study was to examine the effectiveness of the *Essential Coaching for Every Mother* program on maternal self-efficacy compared to a control group of usual care, measured immediately after the intervention. The secondary objective was to compare the effectiveness of the *Essential Coaching for Every Mother* program to usual care on perceived social support, postpartum anxiety symptoms, and postpartum depression symptoms immediately after the intervention.

Hypotheses

The primary hypothesis was that the *Essential Coaching for Every Mother* program would result in higher maternal self-efficacy for participants who received the intervention, regardless of parity, compared to the control group. The secondary hypotheses were that the *Essential Coaching for Every Mother* program would result in higher perceived social support, lower postpartum anxiety symptoms, and lower postpartum depression symptoms for those who received the intervention compared to the control group, regardless of parity.

Methods

Participants

Participants were recruited from Nova Scotia, Canada via social media advertisements (e.g. Facebook, Twitter) and research study posters (e.g. in the perinatal and postpartum units at IWK Health, family doctor offices) between 5 January 2021 and 1 August 2021. Participants were eligible if they were: between $37 + 0$ weeks pregnant and 10 days postpartum, had daily access to a mobile phone with text message capabilities, were over 18 years of age, lived and gave birth in Nova Scotia, and spoke and could read English. Participants were excluded if: their newborn died or was expected to die prior to leaving the hospital, they did not have access to a mobile phone (either personal or shared), were unwilling to receive text messages, declined or withdrew by not completing the baseline survey, or previously participated in the development or feasibility phase of this project.

Interested participants initiated contact by texting a study phone number to complete a pre-programmed eligibility screening process. All potential participants received a welcome message and details about the study, completed a brief eligibility screening, and provided preliminary consent via text message. If a woman completed initial screening and indicated interest while still pregnant, she was informed that she needed to text the study number within 10 days after giving birth to be enrolled in the study. Reminder text messages were sent at 39, 40, 41, and 42 weeks or until enrolled or withdrawn. Once a woman indicated she had given birth or completed the initial screening after giving birth, she completed further screening questions to ensure eligibility and determine parity for stratification. Once stratified, participants were randomized and informed of their group allocation, and asked to complete the electronic consent form and baseline survey. Participants who did not complete the baseline after randomization were withdrawn from the study. All participants were sent a follow-up survey at six-weeks postpartum. Participants were followed up via text message and/or email for 14 days (six messages max) or until the

survey was completed. Participants received a $15CAD electronic gift card for each survey completed.

This study was approved by the IWK Health Research Ethics Board (#1024984) and Nova Scotia Health Research Ethics Board (#1026534) and is registered with the clinicaltrials.gov Protocol Registration System (NCT04730570).

Randomization and design

This was a 2-group, stratified, parallel-arm randomized controlled trial (RCT) following a predefined protocol.[24] Participants were stratified into two groups based on parity (primiparous and multiparous), prior to randomization. Using a 1:1 allocation, participants were then randomized into either the intervention or control group using the TextIt platform using the "Split Randomly" function.[25] This function randomly passes contacts through approximately equally distributed pathways in the flow and allocates them to receive either the intervention or control condition. This results in unequal group size but was the most feasible option to ensure participants received as much of the intervention as possible.

Due to the nature of the intervention, blinding was not possible, and thus participants were informed of their group allocation. To minimize personnel blinding related to data collection, hospital staff were not informed of a patients' involvement in the study. While researchers were aware of participants' allocation, research staff were not involved in the randomization procedure which occurred directly on the TextIt platform. This reduced any risk of personnel or outcome assessor bias as the TextIt platform was remote and was not used to interact with participants directly.

Intervention

The *Essential Coaching for Every Mother* program includes 53 standardized evidence-based text messages that provides information related to newborn care and maternal mental health in the first six-weeks postpartum.[22] Participants allocated to the intervention were sent messages from birth to six-weeks postpartum, with two messages sent per day in the first two weeks (one at 10 a.m. and one at 5 p.m.) and a daily message (at 10 am) for weeks 3 through 6. The messages were sent automatically based on newborn age, and the total number of messages received varied depending on when the participant enrolled. Participants were able to self-select breastfeeding or formula feeding messages and if needed, they could indicate their choice to switch during the program, which modified the breastfeeding/formula feeding content of their subsequent messages. No change in the provision of health care was required when enrolled in the program and participants communicated with health care professionals as they wished. Participants

allocated to the control group did not receive any text messages aside from recruitment and survey requests. All participants, both intervention and control, were able to seek additional postpartum support outside of the study as needed/wanted.

Outcome measures

Upon enrollment and at six-weeks postpartum, all participants were sent a text message with a link to a REDCap[26] survey, hosted at IWK Health. Background demographics were collected at baseline on outcomes such as maternal age, occupation, marital status, and education level. At 6 weeks, data were collected with respect to whether mothers had any postnatal contact for themselves or their infant, health concerns, infant outcomes, birth journey (including any intensive care stays), and feeding behavior.

The primary outcome was maternal self-efficacy measured using the Karitane Parenting Confidence Scale (KPCS).[27] This 15-item scale assesses perceived self-efficacy of mothers with newborns from birth to 12 months of age. While scores can range between 0 and 45, a score of 39 or less (out of a possible 45) is considered to be clinically low perceived maternal self-efficacy.[27] A reliable change index of 6 or more is considered a clinically significant difference in maternal self-efficacy.[27]

Secondary outcomes included perceived social support, postpartum anxiety, and postpartum depression. Social support was measured through the Multidimensional Scale of Perceived Social Support (MSPSS), using a total score as well as family, friends, and significant other subscales. Scores can range between 1 and 7, with scores between 1 and 2.9 considered "low support," 3 to 4.9 as "moderate support," and 5 to 7 considered "high support."[28] Postpartum anxiety was measured using the Postpartum Specific Anxiety Scale (PSAS), with scores above 112 (out of 204) indicating clinical levels of postpartum anxiety.[29] Postpartum depression was measured using the 10-item Edinburgh Postnatal Depression Scale (EPDS), with scores above 14 (out of 30) indicating a likelihood of having or developing postpartum depression.[30]

Sample size

The sample size was determined based on the primary outcome of maternal self-efficacy using the findings from our feasibility study,[23] which had a mean difference for maternal self-efficacy between baseline and the six-week follow-up of 3.78 and a standard deviation of 4.5. This feasibility data and a moderate intraclass correlation of rho .2 resulted in a sample size calculation of 30 per cluster (with the cluster representing stratification by parity) and 60 per group (120 total) required. The estimated sample size was increased by 15%, to account for an expected incompletion rate of 15% which was encountered

in our feasibility study, thus a minimum of 70 participants per group was targeted for recruitment.

Data analysis

Data were analyzed on an intention-to-treat basis, excluding women who requested to stop receiving the messages and/ or did not return the six-week follow-up survey. Differences in baseline characteristics were examined through chi-square tests (categorical) or *t*-tests (continuous), with any significant differences between groups controlled for in the analysis. A *p*-value of 0.05 was considered significant for all outcomes. For the primary and secondary outcomes, total scores were reported separately using means, standard deviations, and percentages. A two-way (parity × group allocation) analysis of covariance (ANCOVA) was carried out to examine difference scores between the groups and adjusted for maternal age as a covariate which was significantly correlated with baseline outcomes.

Results

Baseline characteristics and attrition

A total of 295 participants initiated contact during the recruitment period. Of the 171 participants that were eligible, 83 were randomized to the intervention ($n = 44$ primiparous, $n = 39$ multiparous) and 88 were randomized to control ($n = 47$ primiparous, $n = 41$ multiparous). A total of 12% did not complete a baseline survey ($n = 5$ intervention, $n = 16$ control) (Figure 1). Due to incomplete baseline surveys, demographic comparison on those that withdrew was not possible, but 52% were primiparous and 76% were from the control allocation. For the enrolled participants, the mean age of the newborn at enrollment was 4.4 days (standard deviation [SD]: 3.9) and mothers were a mean age of 31.4 years (SD: 4.5). Most participants were followed by an obstetrician-gynecological doctor (71.3%) and/or a family doctor (34.7%). All participants identified as female and women, thus the term women/ mother will be used in describing the sample. There were no differences between trial arms on baseline variables (Table 1).

Of the 150 participants who completed the baseline survey, 144 fully completed the six-week follow-up survey (96.0% completion rate) and 146 completed the primary outcome (self-efficacy) at 6 weeks (97.3% completion). Participants completed the baseline survey at a mean of 2.3 days (SD:3.4, range: 0–17 days) after enrollment and the six-week follow-up survey at a mean of 44.1 days (SD:3.5, range: 42–77 days) postpartum, with a mean difference of 40.1 days (SD:5.6, range: 27–77 days) between surveys. There were no differences between participants with incomplete or fully complete surveys on any of the baseline characteristics or baseline outcomes except for

race (equal number of Whites and non-Whites in withdrawal group [$n = 3$ each]) and time living in Nova Scotia (withdrawals more likely for those always living in Nova Scotia [$n = 3$] or moved <5 years ago [n = 3]).

Table 2 summarizes the means and standard deviations of groups (parity by allocation) as well as the mean difference for each outcome. In terms of baseline outcomes, there were no significant differences between primiparous and multiparous women within the control group for baseline maternal self-efficacy scores ($p = 0.077$), however, for *Essential Coaching for Every Mother* participants, primiparous women had lower baseline maternal self-efficacy scores than multiparous women ($p = 0.003$). Almost three-quarters of participants (72.7%) reported clinically low levels of maternal self-efficacy at baseline, which dropped to just under half at six-weeks postpartum (48.6%).

For postpartum anxiety, there was no significant difference by parity in the control group for baseline anxiety scores ($p = 0.372$), however, for *Essential Coaching for Every Mother* participants, primiparous women had higher baseline postpartum anxiety scores than multiparous women ($p = 0.003$). Just over a third of participants (34.7%) reported clinical levels of postpartum anxiety symptoms at baseline and 32.6% reach clinical levels at six-weeks postpartum.

For postpartum depression symptoms, there was no significant difference by parity in the control group for baseline depression scores ($p = 0.731$) or *Essential Coaching for Every Mother* group ($p = 0.449$). Overall, a quarter of participants (24.7%) scored within the high probability of depression range at baseline, and 22.2% scored in the high probability range at six-weeks.

For overall perceived social support, there was no significant difference by parity in the control group for baseline perceived social support scores ($p = 0.319$) or *Essential Coaching for Every Mother* group ($p = 0.085$). At baseline, 90.0% of participants had high overall perceived social support which was maintained at six-weeks (89.7%).

Primary outcome (maternal self-efficacy)

Table 3 summarizes the ANCOVA results for all the outcomes. Comparing difference scores over time, controlling for maternal age, there was a statistically significant interaction between parity and group allocation on maternal self-efficacy, $F(1, 141) = 4.60$, $p = 0.03$, partial $\eta^2 = 0.03$. That is, primiparous women who received *Essential Coaching for Every Mother* had a greater increase in maternal self-efficacy scores than primiparous women in the control group ($F(1141) = 5.93$, $p < 0.05$). For multiparous women, group allocation had no effect ($F(1141) = 0.413$, $p = n.s.$). This is also illustrated in Figure 2.
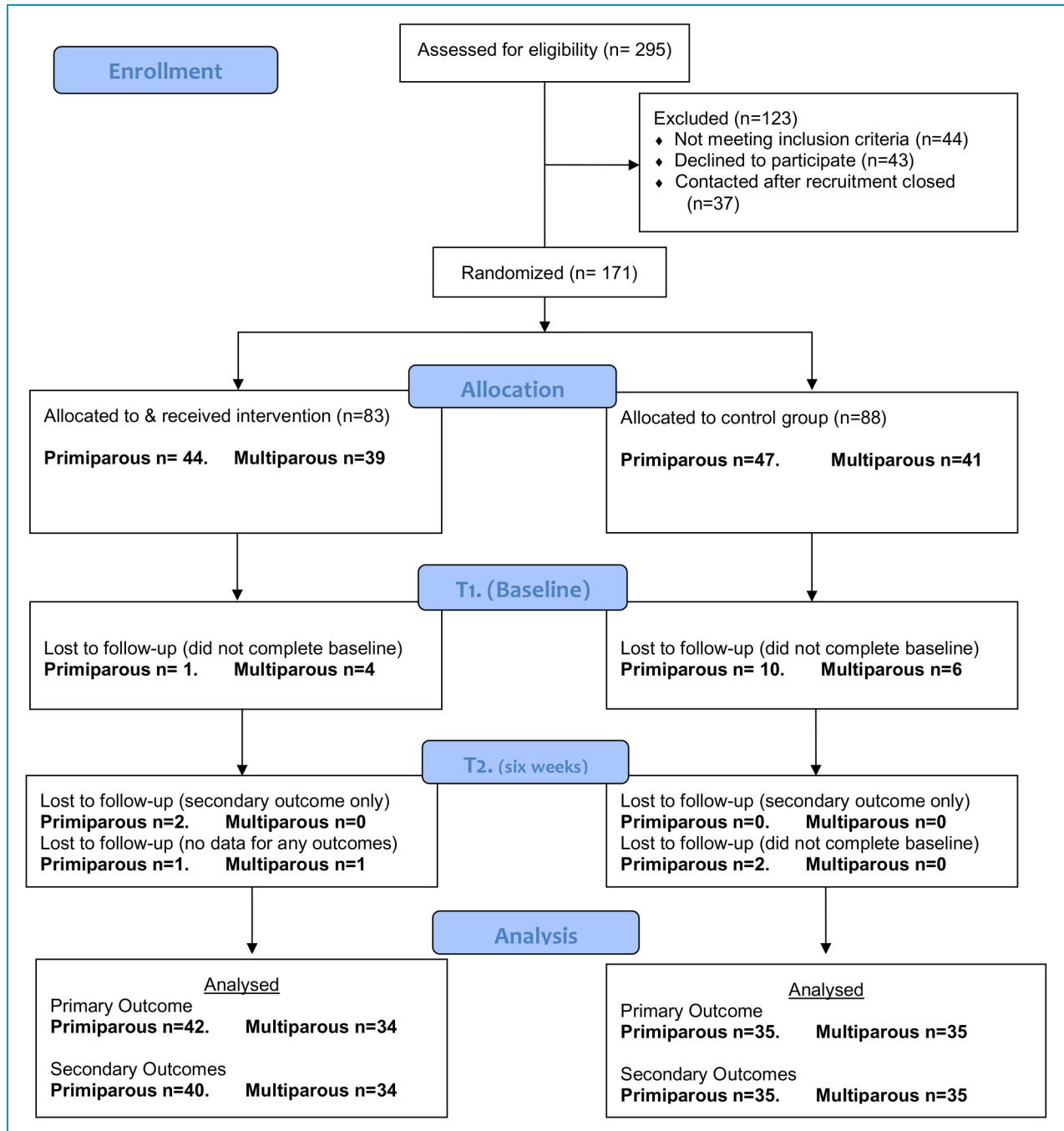
Figure 1. Recruitment flowchart.

Secondary outcomes

There was no statistically significant interaction in difference scores on postpartum anxiety symptoms between parity and group allocation, controlling for maternal age, $F(1, 139) = 1.19$, $p = 0.278$, partial $\eta^2 = 0.008$. There was, however, a significant main effect for allocation $F(1, 139) = 6.62$, $p = 0.011$, partial $\eta^2 = 0.045$, but not for parity $F(1, 139) = 0.26$, $p = 0.609$, partial $\eta^2 = 0.002$. That is,

women allocated to the *Essential Coaching for Every Mother* group had an overall decline in postpartum anxiety score (mean difference (MD) $= -3.91$, standard error (SE) $= 1.86$) while women allocated to the control group had a slight increase in postpartum anxiety scores (MD $= 2.81$, SE $= 1.82$).

There was no statistically significant interaction in difference scores in the postpartum depression between parity and group allocation, controlling for maternal age,

Table 1. Baseline characteristics for the intervention and control groups.

Demographics	Intervention n = 78 n (%) or M (SD)	Control n = 72 n (%) or M (SD)	p-value
Maternal age	30.71 (4.79)	32.14 (4.14)	0.053[a]
Newborn age at enrollment (days)	1.68 (2.10)	2.44 (2.94)	0.067[a]
History of depression/anxiety	28 (35.9)	18 (25.0)	0.307[b]
Marital status			0.907[b]
Single/not living with partner	4 (5.2)	4 (5.6)	
Married/common-law/living with partner	74 (94.8)	68 (94.4)	
Household income (CAN)			0.101[b]
< $74,999	28 (35.9)	18 (25.0)	
$75,000−$149,999	37 (47.4)	34 (47.2)	
Over $150,000	9 (11.5)	17 (23.6)	
Prefer not to answer	4 (5.1)	4 (5.5)	
Education			0.557[b]
High school/incomplete college/university	6 (7.7)	9 (12.5)	
College diploma	16 (20.5)	10 (13.9)	
Undergraduate degree (BA, BSc)	35 (44.9)	36 (50.0)	
Graduate degree (MSc, PhD)	20 (25.6)	17 (23.6)	
Prefer not to answer	1 (1.3)	-	
Race			0.067[b]
White	65 (83.3)	67 (93.1)	
Non-White (included Black, Chinese, Filipino, Latin American, Greek, and Indigenous)	13 (16.7)	5 (6.9)	
Landed Immigrant	12 (15.4)	6 (8.3)	0.349[b]
Time in Nova Scotia			0.933[b]
Always lived in Nova Scotia	43 (55.1)	39 (54.2)	
Moved > 10 years ago	10 (12.8)	9 (12.5)	
Moved 5−10 years ago	7 (9.0)	7 (9.7)	
Moved 1−5 years ago	15 (19.2)	12 (16.7)	

(continued)

Table 1. Continued.

Demographics	Intervention n = 78 n (%) or M (SD)	Control n = 72 n (%) or M (SD)	p-value
Moved within the past 12 months	3 (3.9)	5 (6.9)	
Primary outcomes (baseline)			
Self-efficacy	35.81 (6.0)	36.07 (5.3)	0.776[a]
Postpartum anxiety	107.19 (22.5)	101.47 (20.6)	0.106[a]
Postpartum depression	9.14 (5.9)	7.92 (4.8)	0.165[a]
Social support (overall)	6.07 (1.1)	6.14 (1.1)	0.691[a]

[a]Conducted using an independent *t*-test.
[b]Conducted using Pearson chi-square.

Table 2. Primary and secondary outcomes baseline and six-weeks and mean difference.

Outcome	Essential coaching for every mother			Control		
	Baseline M (SD)	Six-weeks M (SD)	Mean difference (MD, (SD))	Baseline M (SD)	Six-weeks M (SD)	Mean difference (MD, (SD))
Self-efficacy						
Primiparous	34.05 (6.53)	38.56 (4.61)	4.47 (6.20)	35.00 (5.00)	37.14 (3.89)	2.26 (4.03)
Multiparous	38.09 (4.27)	39.45 (4.64)	1.33 (4.27)	37.20 (5.00)	39.20 (3.90)	2.00 (3.93)
Postpartum anxiety						
Primiparous	113.39 (20.99)	106.68 (22.09)	−6.05 (18.34)	103.59 (22.05)	108.20 (22.76)	3.57 (13.88)
Multiparous	99.18 (22.19)	97.30 (25.50)	−1.79 (15.18)	99.23 (18.92)	101.29 (19.01)	2.06 (13.17)
Postpartum depression						
Primiparous	9.59 (5.45)	7.68 (3.97)	−1.51 (4.90)	8.11 (5.38)	8.66 (5.27)	0.34 (4.54)
Multiparous	8.56 (6.52)	8.91 (6.09)	0.42 (4.48)	7.71 (4.19)	8.00 (4.67)	0.29 (3.20)
Social support (total)						
Primiparous	6.26 (0.73)	6.15 (0.91)	−0.10 (0.60)	6.26 (1.07)	6.21 (0.64)	−0.01 (1.20)
Multiparous	5.83 (1.37)	5.99 (1.00)	0.15 (1.40)	6.01 (1.05)	5.77 (0.92)	−0.25 (0.76)
Social support (significant others)						
Primiparous	6.72 (0.65)	6.58 (0.76)	−0.14 (0.59)	6.66 (1.07)	6.52 (0.79)	−0.11 (1.29)
Multiparous	6.05 (1.42)	6.33 (0.99)	0.28 (1.40)	6.44 (1.09)	6.01 (1.50)	−0.43 (1.12)

Table 3. Two-way ANCOVA of difference score for primary and secondary outcomes, controlling for maternal age.

Outcome	df	Mean square	F	p	Effect size
Self-Efficacy					
Allocation	1	34.34	1.53	0.219	0.011
Parity	1	137.60	6.12	0.015*	0.042
Allocation × parity	1	103.49	4.61	0.034*	0.032
Error	141	22.49			
Postpartum anxiety					
Allocation	1	1584.17	6.62	0.011*	0.045
Parity	1	62.84	0.26	0.609	0.002
Allocation × parity	1	283.73	1.19	0.278	0.008
Error	139	239.45			
Postpartum depression					
Allocation	1	37.35	2.00	0.159	0.014
Parity	1	48.49	2.69	0.109	0.018
Allocation × parity	1	52.68	2.82	0.095	0.020
Error	139	18.66			
Social support (overall)					
Allocation	1	90.46	0.60	0.439	0.004
Parity	1	6.43	0.04	0.836	0.000
Allocation × parity	1	372.43	2.48	0.117	0.017
Error	140	149.92			
Social support (significant other)					
Allocation	1	3.61	2.90	0.091	0.020

(continued)

Table 3. Continued.

Outcome	df	Mean square	F	p	Effect size
Parity	1	0.22	0.18	0.667	0.001
Allocation × parity	1	5.32	4.28	0.041*	0.030
Error	139	1.25			

Effect size = partial η^2. *$p < .05$. †$p < .01$. ‡$p < .001$.

$F(1, 139) = 2.82$, $p = 0.095$, partial $\eta^2 = 0.02$. There were also no significant main effects for either parity or group allocation. Even though not statistically significant, the only group that showed a decrease in postpartum depression scores was primiparous women who received the intervention (MD = −1.51) while all other groups had a slight increase.

There was no statistically significant interaction in perceived social support difference scores between parity and group allocation, controlling for maternal age, $F(1, 140) = 2.586$, $p = 0.117$, partial $\eta^2 = 0.017$. There were also no significant main effects for either parity or group allocation for overall social support. Looking at the sub-scales, there were no interactions or main effects for family or friends (data not shown). However, for the significant other subscale, there was a statistically significant interaction between parity and group allocation, controlling for maternal age, $F(1, 139) = 4.28$, $p = 0.041$, partial $\eta^2 = 0.03$. That is, multiparous women who received *Essential Coaching for Every Mother* had a greater increase in social support from significant others than multiparous women in the control group ($F(1139) = 6.85$, $p < 0.01$). For primiparous women, group allocation had no effect on social support from significant others ($F(1139) = 0.073$, $p = n.s.$).

Discussion

This randomized controlled trial examined the effectiveness of *Essential Coaching for Every Mother*, a six-week postpartum text message program, on maternal self-efficacy, perceived social support, postpartum anxiety symptoms, and postpartum depression symptoms. The intervention had a positive effect on outcomes for primiparous women, shown by a greater increase in maternal self-efficacy scores than primiparous women in the control group. Additionally, women who received the intervention had a significant reduction in postpartum anxiety symptoms, regardless of parity, but did not shown a significant change in postpartum depression symptoms. While overall perceived social support was not impacted by the intervention, multiparous women who *received Essential Coaching for Every Mother* reported a greater increase in social support
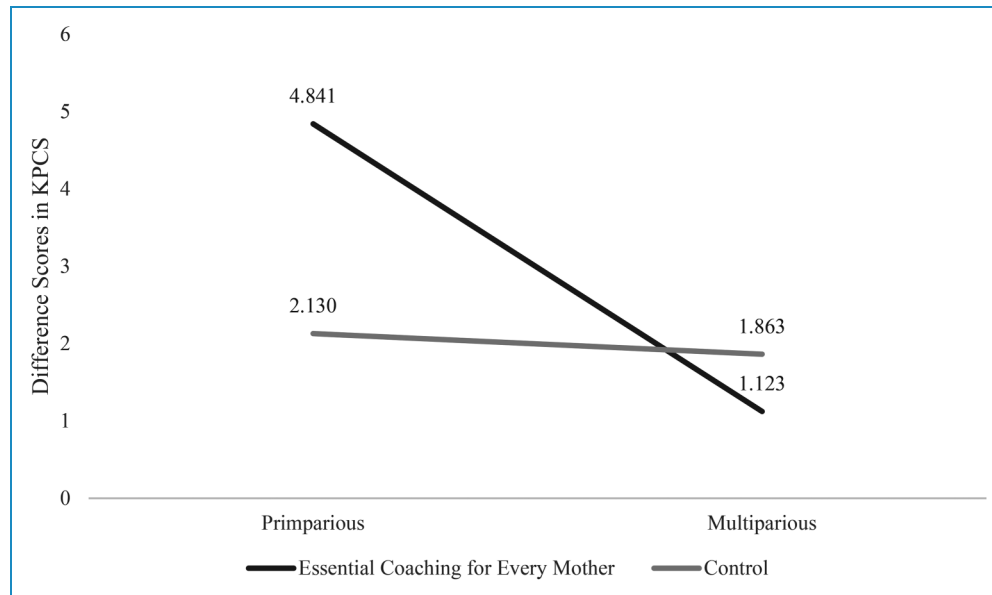
Figure 2. Self-efficacy difference scores following intervention between primiparous and multiparous women.

from significant others than multiparous women in the control group.

Previous literature has established that primiparous women often have lower maternal self-efficacy than multiparous women within the first six-months postpartum,[14,15] thus making this an important population to focus on to improve maternal self-efficacy. At baseline, primiparous women (regardless of allocation) had lower self-efficacy scores, scoring within the moderate clinical range (31–35) while multiparous women scored within the mild clinical range (36–39) with all groups having an average within the mild clinical range. In our study, the *Essential Coaching for Every Mother* program was effective at improving maternal self-efficacy scores in primiparous women. Previous research has found mixed effectiveness of mHealth interventions on parenting self-efficacy as shown through a recent systematic review,[31] with a systematic review on general educational interventions finding a positive effect on self-efficacy in primiparous parents.[32] Looking at specific parenting self-efficacy interventions, an in-person psychoeducational program targeting Iranian primiparous women found an increase in self-efficacy at six- and 12-weeks postpartum[33] as did an mHealth educational app when measured 4–6 weeks postpartum.[34] However, these studies focused on Iranian women; this current study is the first to date to evaluate a Canadian intervention focused on improving maternal self-efficacy. Overall, findings from this study suggest that providing a mHealth postpartum intervention targeted to first-time mothers may be an effective way to improve maternal self-efficacy during a critical time, however, further work is needed to understand whether maternal self-efficacy interventions should target also multiparous women.

Essential Coaching for Every Mother was also found to improve postpartum anxiety for all participants who received the intervention compared to usual care, with the control group seeing an increase in postpartum anxiety over time. With 15% of women experiencing postpartum anxiety symptoms in the postpartum period,[13] identifying interventions to reduce postpartum anxiety is extremely important. Previous work has suggested that parenting self-efficacy and postpartum anxiety are correlated in that higher parenting self-efficacy is associated with lower postpartum anxiety.[14,15,35,36] What is interesting is that postpartum anxiety was reduced in both primiparous and multiparous women who received the intervention, despite only significant improvement in maternal self-efficacy for primiparous women. Even though primiparous women in the *Essential Coaching for Every Mother* group had higher postpartum anxiety at baseline than multiparous women, both groups showed a decrease in postpartum anxiety scores compared to the control group where both multiparous and primiparous women experienced an increase in postpartum anxiety. This suggests that *Essential Coaching for Every Mother* may play a positive role in reducing postpartum anxiety symptoms.

There were no significant changes in postpartum depression scores between the intervention and control, regardless of parity. Given that *Essential Coaching for Every Mother* was not targeting depression as a primary outcome, this finding is in line with a recent systematic review on mHealth interventions targeting the perinatal period which found that mHealth interventions which specifically targeted postpartum depression saw a decrease in postpartum depression scores.[31] Additionally, a mHealth intervention for Iranian primiparous women similarly found no significant

difference in postpartum depression scores.[34] Despite post-partum anxiety having significant comorbidity with post-partum depression, the underlying feelings associated with each mental health condition differ, and thus, an intervention targeted at self-efficacy is unlikely to address the thoughts and feelings that emerge with postpartum depression. It is important to note that between 15% and 25% of participants had a high probability of depression at either baseline or six-weeks postpartum, consistent with population norms.[12] This suggests that postpartum depression is a concern in this population and additional supports may be needed to specif-ically target postpartum depression.

While overall perceived social support was not impacted by the intervention, multiparous women who received *Essential Coaching for Every Mother* had a greater increase in social support from significant others than multiparous women in the control group. Interestingly, all groups had high levels of social support at all measurement time points, suggesting that this group felt well-supported by their family, friends, and significant others at birth and six-weeks postpartum. Despite this, all groups experienced a slight decline in feelings of social support overall and by their significant other, except for multiparous women who received the *Essential Coaching for Every Mother* program. This differs from previous work which did not find differences in social support based on parity[14] or if they did, primiparous women reported more social support in the early postpartum period.[37] Further work is needed to understand why multiparous women experienced an increase in social support from significant others, but not overall or from family and friends. Perhaps couples with at least one other child felt more comfortable asking for support from their significant other[38] when provided with the information provided through *Essential Coaching for Every Mother*.

Strengths and limitations

This study has several strengths. First, the *Essential Coaching for Every Mother* program was developed using the social cognitive theory of behavioral change[39] and was focused on ensuring mothers felt supported and were provided information relevant to their current needs. Second, we were able to design the recruitment, enrollment, and evaluation process to occur completely remotely,[40] which minimized the likelihood of selection, detection, and contamination bias. We also had low attrition, with only a 4% loss to follow-up at the six-week follow-up time point.

Nevertheless, there were some limitations to be acknowledged. First, due to the hands-off nature of recruit-ment, enrollment, and intervention, participants were pro-vided their group allocation prior to completing the consent and baseline survey. This resulted in more with-drawal/incomplete baseline surveys from the control

group, and we were unable to determine whether there were any differences in the groups lost to follow-up aside from parity and allocation. Nevertheless, this process was required to ensure that participants received as much of the intervention as possible instead of delaying on average 2.4 days after the participant completed the base-line, which would be about five messages (~10% of overall messages). Furthermore, due to physical distancing limitations due to the COVID-19 pandemic, in-person recruitment strategies previously planned (e.g. involvement of public health nurses who did postpartum checks after birth, research assistant in hospital on the postpartum unit) were not possible. Despite attempts to reach diverse populations, most participants were married, White women with moderate to high income. Additionally, recruitment was limited to birthing individuals living in Nova Scotia, thus, the generalizability of findings beyond this sample population may be a challenge. Further work should evaluate the effects of *Essential Coaching for Every Mother* on a more diverse population and elsewhere in Canada.

Conclusion

Essential Coaching for Every Mother is an effective post-partum text message intervention that can improve maternal self-efficacy in primiparous women and reduce postpartum anxiety symptoms in women who received the intervention, regardless of parity. This study adds value as the first Canadian postpartum text message program shown to improve psychosocial outcomes for postpartum women. Further work to evaluate the long-term impacts of the program is needed. Given the potential for mHealth to reach many women with support information and resources tailored to different geographical locations, at a low cost, the potential scalability of this intervention to improve par-enting self-efficacy and reduce postpartum anxiety cannot be understated.

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