Original Article

Adherence and self-efficacy of pregnant women to perform pelvic floor muscle training through a health education application: a feasibility study

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Background: Pelvic floor muscle training (PFMT) is a treatment that can be used during pregnancy. The main aim of this study was to evaluate adherence to PFMT and self-efficacy using a mobile application (app) named GoMAP. The secondary objective was to evaluate the correlation between self-efficacy and adherence of participants who used the GoMAP app.

Methods: This is a feasibility study. The participants were pregnant women who underwent an 8-week PFMT protocol, provided through a previously validated GoMAP app. To assess self-efficacy, the Self-Efficacy Scale for practicing Pelvic Floor Exercises was applied four times—every two weeks after starting the PFMT program on the GoMAP app. Adherence was evaluated daily by a frequency questionnaire that was completed as the participant performed the exercise program. The data are expressed as mean ± standard deviation and percentage, and the Pearson correlation test was performed between quantitative variables. A 5% significance level was adopted.

Results: Eighteen pregnant women completed the 8-week exercise protocol. The mean Self-Efficacy Scale after eight weeks of PFMT was 75.8±14.8 and the average adherence of pregnant women to the protocol was 30.4±14.0 days. The adherence and self-efficacy variables showed a strong correlation after eight weeks of PFMT ($r=0.79$, $P<0.001$).

Conclusions: Women who used the GoMAP app demonstrated good adherence and self-confidence when performing the PFMT exercises. The app could be an important therapeutic resource when conducting a PFMT program for pregnant women.

Keywords: Health education; pelvic floor; physical therapy; women's health

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Introduction

The pelvic floor comprises muscles, fascia, and ligaments, among other structures, whose primary functions are to support the pelvic organs, urinary and fecal continence, and sexual functions (1). Pregnancy is considered a risk factor for pelvic floor dysfunction (PFD), such as urinary incontinence (UI) and fecal incontinence, pelvic organ prolapse, and sexual dysfunction (2).

Pelvic floor muscle training (PFMT) is a first-line, non-invasive therapeutic resource for the treatment and prevention of UI (3-5) and it can be used before pregnancy, during pregnancy, and postpartum (3), reducing the risk of urinary loss at the end of pregnancy by up to 62% (5). Furthermore, health education is fundamental in PFD care, it is known that women who receive information about the pelvic floor muscles (PFM), when compared to those who do not have access to this content, demonstrate the behavior of seeking treatment and the prevention of PFD (6), and greater satisfaction with their birth experience (6,7).

However, some adherence-related barriers may influence the effectiveness of performing PFMT, such as difficulty finding time to perform PFMT and difficulty remembering to perform the exercises (2,4,8). On the other hand, knowledge about the pelvic floor can improve adherence to and the performance of PFMT (9). Furthermore, self-efficacy with respect to PFMT, which is the personal belief regarding the ability to carry out the training, can also influence adherence, positively or negatively (10). A woman's lack of confidence when performing PFMT may raise doubts about the possible benefits of the exercises (11). In contrast, a good perception of self-efficacy can result in treatment progression (10).

The creation of technological tools can increase the adherence of pregnant women to PFMT (9,12,13) by reducing medical and travel expenses and increasing independence in choosing how often and at what time of day they carry out the training (14). Research involving app has shown that these technological tools for the treatment and prevention of UI is effective and can enhance both access to and adherence to PFMT (15-17). For the implementation of this study, we used the GoMAP app that was developed and validated in Brazil with the intention that pregnant and puerperal women have direct access to information about PFM and PFMT (18).

In this way, the main objective of the present study was to evaluate the adherence and self-efficacy of pregnant women to perform PFMT using an app. The secondary objective of this study is to evaluate the correlation between self-efficacy and adherence of participants who used the GoMAP app.

Highlight box

Key findings

- The GoMAP app is an important therapeutic resource to perform a pelvic floor muscle training (PFMT) program for pregnant women.

What is known and what is new?

- Adherence and self-efficacy may influence the effectiveness of performing PFMT.
- The GoMAP app has good adherence and self-efficacy when performing the PFMT exercises.

What is the implication, and what should change now?

- The GoMAP app for pregnant and postpartum women can promote self-efficacy to perform PFMT and improve their quality of life.

Methods

This feasibility research was developed at the Women's Health Research Laboratory (LAMU) of the Physical Therapy Department of the Federal University of São Carlos. The project was approved by the Ethics Committee of the Federal University of São Carlos, according to approval ID: 40121820.3.0000.5504. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). Informed consent was taken from all the participants.

Educational material, in the format of an app was used in this research (18), containing information about the PFM, their functions and dysfunctions, and an 8-week PFMT program to be performed at home. The GoMAP app was previously validated with health and technology professionals and with pregnant and postpartum women, presenting a global Content Validity Index (CVI) of 0.91 and an agreement level of 94.8% (18). Besides that, the app was developed and hosted on a Wix platform (https://pt.wix.com) and could be accessed on any operating system.

Study participants

The invitation to participate in the research was publicized through social media and an interest form. Participants

who met the eligibility criteria received information about the study and the Informed Consent Form online (Google Forms Questionnaire).

The inclusion criteria were: pregnant women over 18 years old, between 20 and 30 weeks of gestation (2,19), literate, with preserved cognitive capacity that would enable them to understand the application's content, and with internet access. The exclusion criteria for discontinuity were; risk of premature birth and/or complications during pregnancy, such as hypertensive or hemorrhagic syndromes and changes in the volume of amniotic fluid (19), and not answering the satisfaction questionnaires.

PFMT program

To develop the PFMT program contained in the GoMAP app, protocols from previous studies were considered that aimed to evaluate the effects of PFMT during pregnancy for the prevention and treatment of UI (20-22), and the general principles of strength training, with an emphasis on maximum/sustained contractions (2).

The protocol consisted of a daily PFMT program, with three series of repetitions of 6 to 12 maximal sustained contractions (duration of 6 to 10 seconds per contraction), with an interval of 12 seconds between them, and the addition of 4 to 5 quick contractions at the end of each repetition. The interval between each series was two minutes.

The GoMAP app also instructed participants on how to perform the exercises in 4 different positions: lying down, on four-point support, sitting, and standing. In addition, the women were guided to contract the PFM when coughing, sneezing, jumping, or making any strong effort (20).

Pregnant women participating in this study were instructed to contact the responsible researchers if they felt pain when performing the exercises or presented any possible complications that could interfere with their participation.

Adherence evaluation

Adherence was assessed using an online frequency questionnaire developed by the researchers in the format of an attendance control (21), which was sent daily via telephone message, along with the reminder to perform the exercises. Participants were able to choose the time of the day when this message and reminder would be sent. The participants were required to fill in the fields on the questionnaire related to personal data, date, time, position, and the series completed.

The analysis of the questionnaire was divided into two parts, obtaining the average adherence of participants after 28 days of training and this same average after 56 days (i.e., after the entire PFMT period). This division assessed whether pregnant women would maintain, decrease, or increase adherence over time.

Self-efficacy verification

Self-efficacy was assessed using the Self-Efficacy Scale for Pelvic Floor Exercises, an instrument validated for the Brazilian public. The questionnaire contains 17 questions: 13 related to self-efficacy, and four on expectations regarding the PFMT. The questions were answered using the visual analog scale ranging from 0 to 100 (22).

The average of the items on the questionnaire was calculated for each participant, and the final score can vary from 0 to 100; the higher the score, the greater the self-efficacy and expectations regarding PFMT. The self-efficacy questionnaire was answered four times—every two weeks after the start of the protocol. Participants received a telephone message with the online questionnaire.

Level of satisfaction

To assess the level of satisfaction of pregnant women with the app, a satisfaction questionnaire was administered using the Likert scale [1932] (23) the end of the 8-week exercise protocol. The percentage of absolute agreement was calculated by summing the positive responses from participants and then dividing that result by the total number of responses collected. The minimum level of agreement required by the literature is 75% (24).

Statistical analysis

The data collected were exported from Google Forms to Excel spreadsheets and analyzed using the SPSS program, version 22.0. A descriptive analysis was carried out before presenting the data obtained from the sociodemographic responses. Data regarding adherence and self-efficacy are expressed as percentages, means, and standard deviations. The correlation between the adherence and self-efficacy variables was performed using the Pearson test (25). A significance level of 5% was adopted.

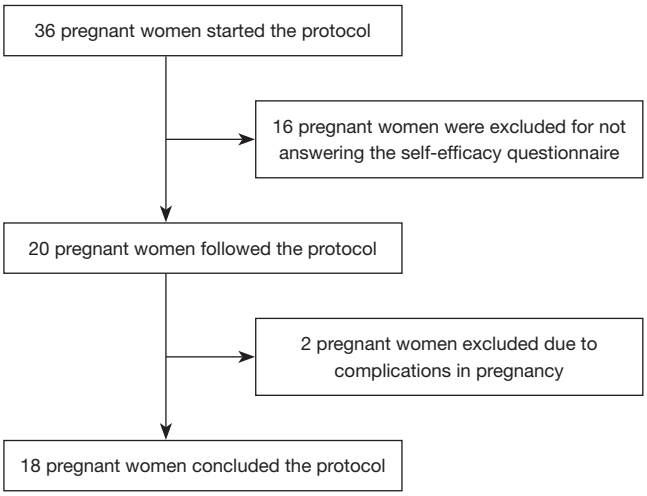

Figure 1 Flowchart of study participants.

Table 1 Description of sociodemographic data of the participants

Variables	Results
Education level	
High school	2 (11.1)
College	16 (88.9)
Marital status	
With stable union	15 (83.3)
Without stable union	3 (16.7)
Age (years)	30.8±3.7
Gestational age (weeks)	22.2±2.7
Adherence to the exercise protocol (days)	30.4±14.0

Data are presented as N (%) or mean ± SD. %, sample frequency in percentage; N, absolute frequency of the sample; SD, standard deviation.

Results

After publicity on social media, 67 women expressed interest in participating in the project, and 36 women began the exercise protocol.

Over the eight weeks of the PFMT protocol, 18 pregnant women were excluded from the research, for not answering the self-efficacy questionnaire (n=16) or for pregnancy complications unrelated to the training (n=2) (*Figure 1*), including intrauterine premature contractions, and reduction in amniotic fluid. None of the participants reported pain or any other complications when performing the exercises.

Table 2 Description of adherence data

Variables	Results
Position	
Sitting	11 (61.1)
Lying	7 (38.9)
Exercises	
Number of series per day	3.4±2.0
Number of sustained contractions	6.6±1.2
Number of fast contractions	6.1±2.0
Maximum contraction sustaining time (seconds)	7.7±1.9
Adherence	
First four weeks (days)	17.2±6.6
Last four weeks (days)	13.3±7.6
Total eight weeks (days)	30.4±14.4

Data are presented as N (%) or mean ± SD. %, sample frequency in percentage; N, absolute frequency of the sample; SD, standard deviation.

The mean age of the participants was 30.8±3.7 years, and the mean gestational age at the beginning of training was 22.2±2.7 weeks. The remaining sociodemographic data are found presented in *Table 1*.

The average adherence of the pregnant women to the protocol was 30.4±14.0 days, and 50% of participants performed a minimum of 28 days of exercise, in a total of 56 days of PFMT.

The majority of the pregnant women (61.1%) performed the exercises mainly in a sitting position. The mean number of series performed per day was 3.4±2.0, with the number of series being, ideally, three per day. Women achieved an average of 6.6±1.2 sustained contractions (also called slow or maximal contractions) and 6.1±2.0 fast contractions daily. The average duration of the maximum contractions was 7.7±1.9 seconds (*Table 2*).

Mean adherence decreased in the second half of the PFMT program, going from 17.2±6.6 to 13.3±7.6 days.

The Self-Efficacy Scale for practicing Pelvic Floor Exercises questionnaire was applied four times—every two weeks; the closer the final score to 100, the greater the self-confidence about PFMT. *Table 3* presents the average of the self-efficacy questionnaire over eight weeks of exercises and the average responses, according to each of the questions

Table 3 Averages for each question on the Self-Efficacy Scale (22)

Questions	2 weeks	4 weeks	6 weeks	8 weeks
How confident do you feel that you can				
Perform PFEs on your own	74.4±19.8	80.0±22.6	79.4±18.0	81.1±21.8
Remember to perform the exercises every day	57.8±25.1	54.4±24.1	58.3±24.3	62.2±28.4
Perform the exercises at least three times a week	86.7±17.6	77.8±20.4	82.2±17.3	83.9±14.6
Include PFEs in your daily routine	69.4±24.4	73.3±21.3	78.3±17.2	73.9±20.0
Continue performing the exercises even when they do not show any noticeable results	81.1±18.2	77.8±18.4	80.0±17.1	86.1±12.1
Perform the exercises during vacations and while traveling	69.4±26.1	56.1±30.9	57.2±28.0	56.7±30.6
Perform the exercises in the sitting position	77.8±26.6	85.0±19.2	85.0±15.8	87.8±13.1
Perform the exercises in the standing position	51.7±30.2	60.6±19.6	70.0±21.7	70.0±24.3
Contract PF before coughing, sneezing, or strongly laughing to prevent leakage	62.2±22.2	68.3±21.4	70.6±24.1	75.0±20.6
Continue performing the exercises even when your personal and familial responsibilities are more demanding than usual	55.6±25.2	51.1±28.7	53.9±29.5	56.1±30.2
Continue performing the exercises even when you have more activities to do than usual	56.7±26.2	58.3±25.4	56.1±29.3	55.0±29.7
Continue performing the exercises even when you have another health problem that is more severe	50.6±28.2	47.2±27.2	48.9±28.3	52.8±29.0
Perform the exercises even when other people say they are unnecessary (e.g., family and friends)	90.6±10.3	92.2±10.3	91.7±11.0	91.7±9.6
Now we would like to know how confident you are that				
PFEs will prevent or ameliorate problems such as leakage or prolapsed bladder/uterus	91.1±12.4	92.8±9.3	91.7±11.5	92.2±9.7
PFEs will improve your sex life	78.9±23.1	84.4±18.3	85.0±16.5	81.1±20.0
PFEs will improve your bodily perceptions	81.1±19.7	87.2±12.8	90.0±11.4	90.6±8.5
PFEs will benefit your health and well-being	91.1±11.0	93.3±9.4	92.2±10.6	91.7±9.0
Self-efficacy scale means	72.1±13.9	72.9±13.8	74.7±13.2	75.8±14.8

Data are presented as mean ± SD. PF, pelvic floor; PFEs, pelvic floor exercises; SD, standard deviation.

Table 4 Pearson correlation for adherence and self-efficacy

Self-efficacy	Adherence	
	r	P value
4 weeks of PFEs	0.64	0.004
8 weeks of PFEs	0.79	<0.001

PFEs, pelvic floor exercises.

after two, four, six, and eight weeks of PFMT.

The results for the Pearson Correlation between the adherence and self-efficacy variables are described in *Table 4*. The correlation was performed at the two moments in which self-efficacy and adherence were assessed in pregnant women, four and eight weeks after starting the exercises.

Pregnant women also responded about their satisfaction with the app, approximately 81.25% agreed that they were totally or partially satisfied with the GoMAP app.

Discussion

This is an innovative study that analyzed the relationship between adherence and self-efficacy through an online PFMT program, evaluating participants' self-confidence

when performing PFMT using the information and guidance contained in the GoMap app (18).

The average adherence of the women was more than 28 days out of a total of 56 days and studies indicate an increase in the strength of the PFM after one month of PFMT (26,27). A previous study by Reilly *et al.* [2014] compared the presence of UI in the postpartum period between participants who performed supervised PFMT during pregnancy, and participants who only received verbal commands on how to perform the exercises (control group) (27). Reilly *et al.* [2014] reported adherence to treatment for more than 28 days in 46% of participants, corresponding to the results in the current study. Furthermore, it was found that pregnant women who performed a minimum of 28 days of exercise were less likely to experience stress urinary incontinence (SUI) postpartum when compared to the control group and participants who performed less than 28 days of PFMT (27).

Studies conducted with applications found that using these technological tools for the treatment and prevention of UI is effective and can increase access and adherence to PFMT (15-17). In addition, Nyström *et al.* [2018] found that PFMT protocols, provided through an app, present better results in women interested in the subject and with high expectations regarding the treatment (28). Additionally, the study by Vilela *et al.* [2024] found that the use of an app with a PFMT protocol for women with SUI was able to reduce UI and its impact on quality of life (29).

In the current study, pregnant women mainly opted for the sitting position, a position frequently adopted in everyday life that brings good results for PFM, as reported by Liu *et al.* [2018] (30). On average, pregnant women performed the exercises with several repetitions of the series and sustained contraction times greater than what was suggested by the PFMT program contained in the app, indicating that the participants, in some cases, progressed in the execution and intensity of the PFMT training (31).

It is also possible to observe that training adherence decreased in the last 28 days compared to the first half of the protocol. This decrease in adherence over time was also found in previous research (32). Other study demonstrated the importance of physiotherapist supervision for maintaining adherence and effectiveness of PFMT (2). It is important to highlight that the literature indicates that physiotherapist supervision is essential to ensure that women perform the exercises correctly, with the recommended number of repetitions, and regularly (33,34). Additionally, other research demonstrated better results in reducing the severity of urine loss in supervised treatments compared to unsupervised treatments (35).

The overall mean for the Pelvic Floor Exercise Self-Efficacy Scale increased over the eight weeks of PFMT, which may indicate that participants gained confidence in performing the training as they saw the benefits of the exercises and accessed the educational material (36). However, this increase does not follow the findings of other studies that indicate decreases in self-efficacy over time (36,37). One hypothesis that can explain this finding is that using an app, as educational material, facilitates pregnant women's access to content, increasing their independence to carry out training according to their routine (14). Furthermore, it was observed that the women with high self-efficacy were those who adhered most to the treatment (31-33).

The items with the lowest confidence level on the Scale were doing the exercises in the presence of more urgent health problems or when responsibilities and daily activities are more demanding than normal, and remembering to do the exercises every day, including vacations and trips. These barriers, also highlighted in previous studies (36,38), show the difficulty of including PFMT in the daily routine, contributing to reduced adherence to training, especially in the long term (39). Other research also showed that some women find the training tedious and have difficulty adhering to PFMT when they do not understand the benefits of this training (39,40). The app is an easily accessible resource (13), expanding access to information about the importance of PFMT and the benefits of these exercises. Other than that, the app can help in the inclusion of training in the daily routine, as it is a resource that can be taken when traveling, with visual resources that make PFMT less boring and with details on the effectiveness and results that training can generate (15-17).

Participants were generally very satisfied with the app's content, functionality, and the PFMT protocol (18). Suggestions for improvement mainly focused on making the app easier to install and expanding the content. Some also mentioned challenges in integrating the PFMT protocol into their routine, emphasizing the need for personalized training plans.

The current study presents some limitations, including the sample size and low diversity of the pregnant women's educational level. More studies are needed, with larger and more diverse samples, to analyze the effect of technological tools on adherence and self-efficacy of PFMT for pregnant women. Furthermore, future studies

should evaluate the PFM before and after unsupervised training; and analyze the influence of motivational factors, considering that motivation is related to the individual's behavioral change.

Conclusions

The GoMAP app and training demonstrated good applicability for promoting health education for pregnant women and can contribute to high expectations, adherence, and self-confidence about PFMT. The high level of satisfaction of users demonstrates that the app can be used as a great tool to aid physical therapists, increase patients' co-participation during training and dissemination of knowledge about PFM, and promote greater autonomy for women regarding their choices about the prevention and treatment of PFD, childbirth, and the postpartum period.

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This project was the first author's final undergraduate monographs, and the final version of the monographs was included in the directory of the Federal University of São Carlos in Portuguese.

Footnote

Data Sharing Statement: Available at https://mhealth.amegroups.com/article/view/10.21037/mhealth-24-40/dss

Peer Review File: Available at https://mhealth.amegroups.com/article/view/10.21037/mhealth-24-40/prf

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://mhealth.amegroups.com/article/view/10.21037/mhealth-24-40/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013) and was approved by the Ethics Committee of the Federal University of São Carlos (approval ID: 40121820.3.0000.5504). Informed consent was taken from all the participants.

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