BMC Pregnancy and Childbirth

RESEARCH

Open Access

Exploring user profiles and preferences for mobile apps promoting active lifestyles during pregnancy and postpartum: cross-sectional study

Laura Alves[1], Cátia Ferreira[1], Cristiana Mercê[1,2*] and Rita Santos-Rocha[1,2]

Abstract

Background The proliferation of mobile health applications (apps) presents promising opportunities for promoting maternal-fetal health outcomes. While numerous pregnancy-related apps exist, their alignment with user needs and evidence-based recommendations remains understudied. This study aimed to analyze the usage profile, characteristics, and preferences regarding mobile apps for promoting a healthy lifestyle during pregnancy and postpartum, with particular emphasis on physical activity.

Methods A cross-sectional retrospective study was conducted using a questionnaire titled "Active Pregnancy App–Promoting an active and healthy lifestyle during pregnancy and postpartum," consisting of 36 questions in digital format via the Google Forms platform. The participants included 235 pregnant or postpartum women, with a mean age of 36 ± 4.67 years, with babies born between 2021 and 2023.

Results Among the women surveyed, 80% engaged in physical activity during pregnancy (39% 1–2 times/week), and 63% in the postpartum period. Walking was the predominant activity (90% of health/wellness activities). Most participants (87%) had never used pregnancy-specific fitness apps, despite 53% using general fitness apps. The majority considered the existence of a specific application for physical activity during pregnancy and postpartum to be important or very important. The main preferences regarding the app were: access to recommendations on an active and healthy lifestyle during pregnancy and postpartum; direct interaction with health and exercise professionals; the ability to record health and clinical parameters, physical activity, and training logs; access to guidelines on postpartum preparation and recovery programs; and workouts to perform at home and outdoors.

Conclusions User perspective is an actual trend for focusing on end users' point of view and preferences, as they are the people for whom the software is designed. The results reinforce and highlight the relevance of building a specific app for physical activity and other lifestyle parameters during pregnancy and postpartum that includes reliable and updated information, allows interaction with health and exercise professionals for monitoring, and enables the

*Correspondence:
Cristiana Mercê
cristianamerce@esdrm.ipsantarem.pt

Full list of author information is available at the end of the article

recording of progress. These results will be used in the creation and development of the "Active Pregnancy App" which can thus better meet the needs and demands of pregnant and postpartum women.

Keywords Pregnancy, Postpartum, Lifestyle, Computer applications, Gadgets, Exercise, Health, Intervention, Technology, User

Background

Pregnancy represents a unique and transformative phase in a woman's life, characterized by profound physical, emotional, behavioral, and social changes [1]. This phase brings several challenges to the future mother, while all these changes are essential for maternal adaptation and the healthy development of the fetus. They simultaneously can increase vulnerability to health issues such as gestational diabetes, pre-eclampsia, and excessive weight gain [2]. These potential risks highlight how important it is for expectant mothers to maintain a healthy lifestyle with particular emphasis on physical activity.

Regular physical activity (PA) during pregnancy and postpartum has been widely recognized as beneficial, contributing to improved maternal and fetal health. Scientific literature has consistently highlighted its benefits, namely in enhancing cardiorespiratory fitness, reducing pregnancy-related complications, and supporting mental well-being [3, 4]. These benefits remain in postpartum, in which maintaining an active lifestyle aid recovery and reduce the risk of chronic complications [5]. Despite these evidence-based benefits, many women face several barriers to engaging in regular PA. In addition to the most common barriers, such as lack of motivation, financial resources, or time, these are further intensified by the need to prepare for the baby's arrival or care for them after birth-tasks that are very time-consuming. Pregnant and postpartum women also reveal a lack of access to specific programs for their characteristics and misinformation about the (un)safety of practicing PA [2, 6].

The rapid expansion of information and communication technologies (ICT), particularly mobile health (mHealth) applications, has created new opportunities for health promotion in all ages and conditions, including pregnant and postpartum women. These tools have proven to be effective in addressing barriers to PA by providing evidence-based recommendations, enabling self-monitoring of health metrics, and fostering interaction with healthcare and exercise professionals [7]. Additionally, the increasing massification of electronic gadgets such as smartphones and tablets, make such interventions accessible and scalable, particularly for populations with specific needs who look for specific guidance, like pregnant and postpartum women [8].

Recent systematic reviews highlight significant gaps in pregnancy-specific apps. Mazaheri Habibi et al. [9] identified limitations in app quality rating scales, while Nissen et al. [10], found inconsistencies in scientific guidance and commercialization approaches. International comparisons [11] reveal variations in app features between countries, suggesting the need for culturally-adapted solutions. For a safe and harmonious experience of pregnancy and the postpartum period, it is crucial that information and knowledge are up-to-date and reliable. The use of a specific app for monitoring pregnant women and/or mothers can be a practical, accessible and beneficial way of increasing women's confidence and peace of mind during these special and stressful stages in their lives. Nevertheless, existing mHealth applications often fail to meet the specific needs of these women. Many of these apps do not adhere to current evidence-based guidelines for physical activity during pregnancy, such as those outlined by organizations like the American College of Obstetricians and Gynecologists (ACOG), which emphasize the importance of at least 150 min of moderate-intensity physical activity per week [5]. Furthermore, most apps are based on the non-interactive presentation of information, failing to integrate behavior change techniques or considering cultural and individual user preferences, which are critical for enhancing engagement and adherence [12].

A review by Tinius et al. [13] assessed the quality and perceived impact of free mobile apps directed to pregnant women, and identified lacked features for customizing physical activity plans based on individual health conditions, fitness levels, or contraindications, making them less effective and potentially unsafe. According to this study, the existing apps appear to have a low quality, with none of them affording a specific goal setting based on current recommendations during pregnancy. Additionally, apps rarely include interaction with qualified exercise or health professionals, an omission that can undermine user confidence and the quality of guidance provided [14].

Pregnancy is a unique window of increased health awareness, where many women become more motivated to adopt healthier lifestyle changes that benefit both them and their babies, such as being more physically active, taking better care of their diet and sleep. When digital apps don't adequately address the needs of this phase, they miss the opportunity to capitalize on this time of increased predisposition for change. Pregnant women often seek support to improve their diet, physical activity and emotional wellbeing. Nevertheless, existing mHealth applications often fall short of expectations. Many fail to align with current evidence-based PA guidelines, neglect

cultural and individual user preferences, or underestimate the importance of interaction with qualified exercise and health professionals [12]. The lack of good quality pregnancy-specific apps further emphasizes the need for innovative and culturally relevant solutions to support pregnant and postpartum women in adopting and maintaining active lifestyles [15].

This study aims to bridge existing gaps by exploring the usage profiles, preferences, and needs of pregnant and postpartum women regarding the features of a mobile application designed to promote active and healthy lifestyles. By understanding these perspectives, it will be possible to contribute to the development of effective digital tools tailored to the real needs of future and new mothers during this unique life phase. The future creation of the *Active Pregnancy* app, considering the results of this study, has the potential to empower women, not only by providing valuable knowledge but also by facilitating self-monitoring and fostering meaningful interaction with a multidisciplinary team of exercise and health professionals.

Methods

Study design and participants

A cross-sectional study was carried out with pregnant or postpartum women by completing a retrospective and cross-sectional questionnaire.

The participants' inclusion criteria were the following: Portuguese women, who understood Portuguese, pregnant or in the postpartum period (up to one year after giving birth) [6]. In turn, the exclusion criteria consisted of the following: women of non-Portuguese nationality, women who are not pregnant, or women who had their last child more than one year ago.

Questionnaire

The "Active Pregnancy App–Active and Healthy Lifestyle Promotion During Pregnancy and Postpartum Period" questionnaire, previously tested and validated in a preceding study [6], was administered with minor adaptations. These adaptations aimed to: (i) enhance the comprehensibility of the questions, for example, the previous question on 'Recording health parameters' was reworded with an example to make it more explicit 'Recording health and fitness parameters (such as blood pressure, heart rate, weight, glycaemia, etc.)'; (ii) specify some answers, previously, when asked 'How much time do you usually engage in moderate to vigorous physical activity per day during pregnancy,' participants could only choose 30, 45, or 60 minutes; in this new version, participants can now type in the number; (iii) explore more reasons for using the app by adding questions about knowledge of specific recommendations for exercise during pregnancy and postpartum, as well as the desire to contact professionals; (iv) investigate sleep and rest patterns, as well as emotional state. The adapted questionnaire is listed in Appendix 1.

Ethical considerations

This study was approved by the Ethical Board of the Research Unit of the Santarém Polytechnic University (nr. 6 A-2025ESDRM). All the procedures applied to the participants were in accordance with the ethical standards of the 1964 Declaration of Helsinki. As far as the participants are concerned, their identity was kept confidential and they were informed about the nature and objectives of the study, as well as their right to withdraw from it at any time.

The participants' informed consent was obtained through the following text in the initial tab of the Google Forms form: 'I declare that I have understood the written information provided to me about the objectives of the study by those responsible, as well as the guarantee of the possibility to refuse participation at any time without any consequence. I give my consent and agree to take part in this study. By choosing the 'Next' option, I have expressed my agreement and intend to continue and participate in the study.'

Data collection and analysis

The questionnaire was publicized through different online platforms such as social networks (e.g., WhatsApp, Facebook, Instagram), as well as by sharing it in groups of pregnant women and new mothers to reach a wider and more diverse sample. The questionnaire period lasted 50 days and was implemented between 28 November 2023 and 16 January 2024. During the analysis, all the answers on the forms were checked to ensure that they were complete and duly filled in, to guarantee the correct analysis and processing of the data.

The statistical analysis was performed using IBM SPSS Statistics (Version 29). After downloading the data to the software, a thorough review of the collected data was conducted to ensure completeness and accuracy. This included manual checks and the use of software to detect any inconsistencies. After this data quality check, a descriptive analysis was performed regarding the frequency in percentage by each question. Pie charts and bar graphs were created for questions related to the frequency of physical activity and minutes of practice, respectively. For the data analysis of the questions regarding the time (in minutes) spent on physical activity (questions 6 and 9), categories of time intervals were defined based on the responses. In the questions aimed at identifying the various types of physical activities practiced during pregnancy and the puerperium (questions 7 and 10), open-ended questions were used to collect detailed information. To analyze and systematize these data more

comprehensively, the described activities were classified according to the categories outlined in the ACSM based survey "Fitness Trends 2023 in Portugal" [16].

To identify the needs and preferences of pregnant and postpartum women in relation to the future "Active Pregnancy" APP, participants were asked: *"What are the reasons why you consider it is important to use a mobile fitness app specific for pregnancy or postpartum?"* (question 18). To answer this question, they were asked to express their level of agreement with 18 statements, with a Likert scale from 1 to 5 according to the following classification: 1 - *"I completely disagree"*; 2– *"I disagree"*; 3– *"I neither disagree nor agree"*; 4– *"I agree"*; 5 - *"I totally agree"*.

To treat the results of the open-ended question which addressed suggestions to make the mobile app function and useful (question 19), it was employed the technique of content analysis [17], which followed several steps: (i) reading all the responses to familiarize ourselves with the content and gain an overall understanding of the data, (ii) identifying recurring patterns within the responses, (iii) grouping responses with similar content into thematic categories, and (iv) quantifying the frequency of each thematic category to measure their prevalence. These steps allowed for a clear and concise presentation of the data.

Results

Participants' characteristics

The total study sample consisted of 235 women aged between 24 and 52, with an average age of 36 ± 4.67 years. In terms of geographical distribution, around 80% of the sample lived in the Lisbon and Tagus Valley region, around 6% in the Azores archipelago, 4.7% in the North of Portugal, 4.3% lived outside the country, 2.6% lived in the Center region, 2.6% in the South (Algarve), and 0.43% in the Madeira archipelago. Regarding the level of education of the participants, the majority have completed higher education (63.8%), followed by 23% who have advanced academic training (i.e., a master's degree or doctorate). The remainder have secondary education (11.5%) and only 1.7% have basic education. All the women who answered the questionnaire were already mothers or pregnant. Between 2021 and 2023, 83% had one pregnancy, 16% had two pregnancies, and 1% had three pregnancies. The main characteristics of the sample are shown below in Table 1.

Table 1 Presentation of the main characteristics of the participants (i.e., demographics, geographical distribution, education level and pregnancy status) *N* = 235

Topic	Characteristic	Value
Demographics		
	Age range (years)	24–52
	Average age (years)	36 ± 4.67
Geographical Distribution	Lisbon and Tagus Valley region	80%
	Azores archipelago	6%
	North of Portugal	4.7%
	Outside the country	4.3%
	Center region	2.6%
	South (Algarve)	2.6%
	Madeira archipelago	0.43%
Education Level	Higher education	63.8%
	Advanced academic training (master's or doctorate)	23%
	Secondary education	11.5%
	Basic education	1.7%
Pregnancy Status	One pregnancy	83%
	Two pregnancies	16%
	Three pregnancies	1%

Physical activity practice during pregnancy

According to the collected data, we found that 20% of the women did not practice physical activity (PA) during their pregnancy. The majority of the participants, around 39%, only practiced it 1–2 times a week, and only 2% said they did it every day, see Graph 1A. Regarding the time spent practicing PA in minutes, around 28% of the participants practiced between 60 and 90 min per day, 26.4% practiced between 30 and 44 min per day and around 19% practiced between 45 and 59 min, see Graph 1B.

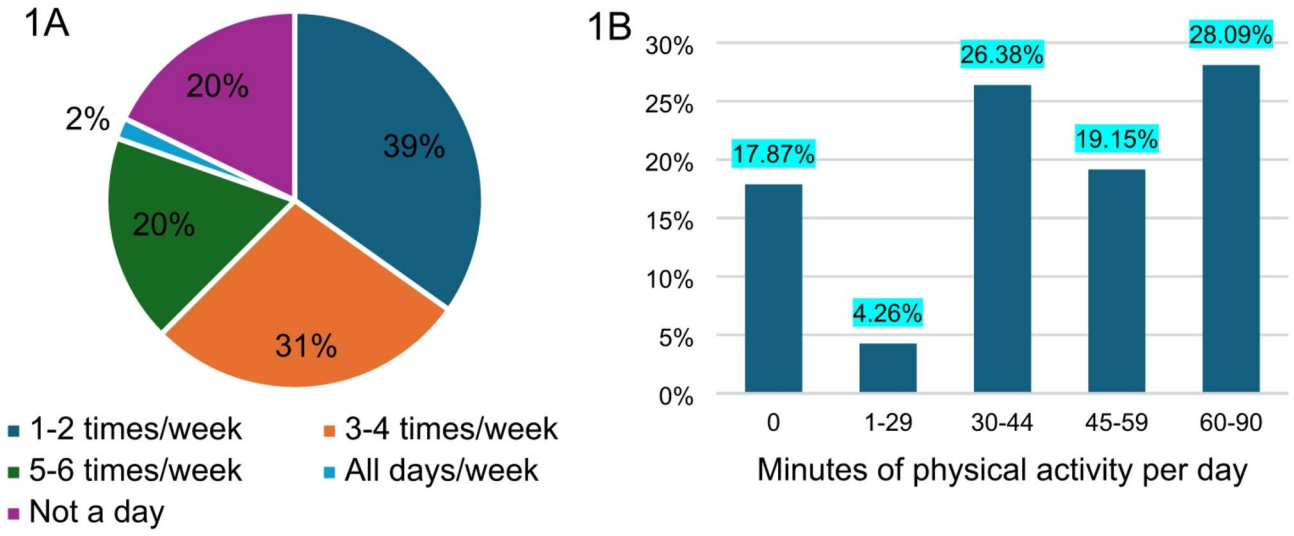
Among the 13 categories of PA practices defined to include the activities listed by the participants [16], the five most representative were: (1) Health and Wellness Training, practiced by 48% of the participants; (2) Fitness programs for pregnant and postpartum women, with a frequency of 16.7%; (3) Pilates, practiced by 14.5% of the participants; (4) Group classes; and (5) No activity, reported by 13% of the participants.

Within the 'Health and Wellness Training' category, during pregnancy, participants identified that 95% of the activities practiced consisted of walking, with the remaining 5% involving cardiovascular activities such as gym workouts, cycling, or treadmill exercises.

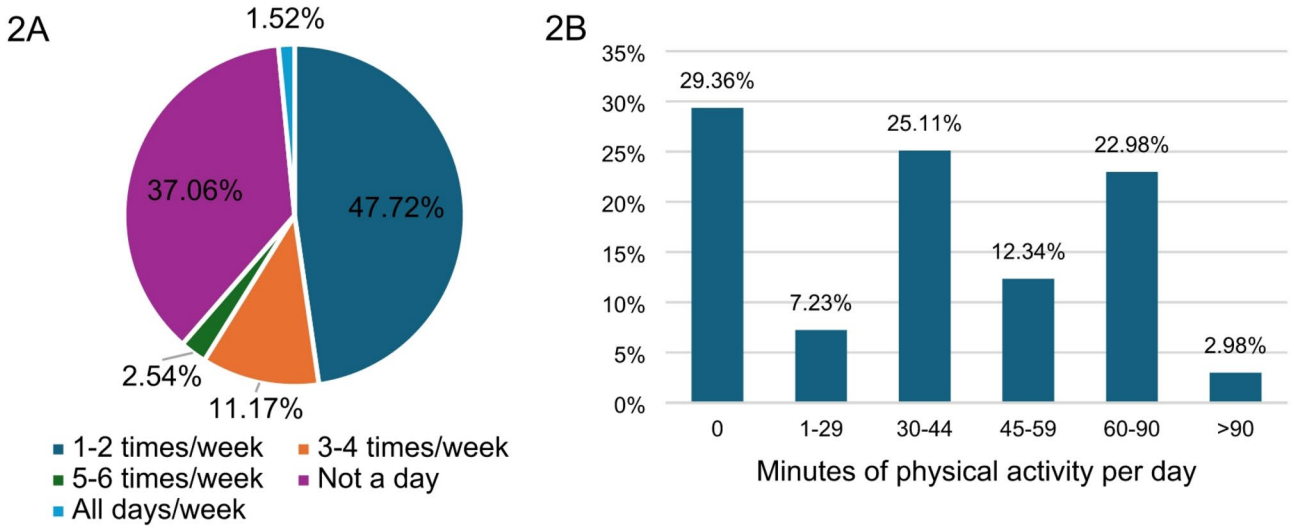
In the 'Group Classes' category, swimming accounts for approximately 39.5% of the activities identified. Other activities include dancing, practiced by 14% of the participants; aqua aerobics, practiced by 12%; body balance, practiced by 7%; and gymnastics and aerobics, practiced by 4.5%, among others with smaller percentages.

Physical activity practice during the postpartum period

During the puerperium, it was observed that 37% of the women did not practice any PA, and only 4% engaged in PA more than five times a week, as shown in Graph 2A. Most of the participants, approximately 47.7%, practiced PA one to two times per week, while around 11% practiced three to four times per week.



Graph 1 Illustration of the participants' weekly frequency of physical activity (**1A**) and duration of physical activity per day (**1B**) during pregnancy



Graph 2 Illustration of the participants' weekly frequency of physical activity (**2A**) and duration of physical activity per day (**2B**) during postpartum period

Regarding the time spent practicing PA in minutes, approximately 29% of the sample reported not engaging in any type of activity, i.e., 0 min, as shown in Graph 2B. Around 25% practiced between 30 and 44 min per day, 23% practiced between 60 and 90 min per day, and approximately 12% practiced between 45 and 59 min. Less than 30 min of PA was practiced by 7%, with a minority of 3% practicing PA for more than 90 min.

Among the 13 categories of physical activity practices defined [16], in the postpartum phase, the five more representative were: Health and Wellness Training, practiced by 48% of the participants; Fitness programs for pregnant and postpartum women, practiced by 21%; Group classes, practiced by 7%; Pilates, practiced by 6%; and No activity, reported by 17% of the participants.

In the 'Health and Wellness Training' category, similar to the pregnancy period, in postpartum, participants identified their main activity as walking, which accounted for 90% of the activities practiced. The remaining 10% consisted of cardiovascular activities such as gym workouts, cycling, and running.

In the 'Group Classes' category, dance accounted for approximately 26% of the most practiced activities. Swimming and gymnastics each accounted for around 16%, cycling and HIIT (high intensity interval training) each accounted for around 10.5%, with the remainder associated with activities such as stretching, gymnastics, and aqua aerobics, among others, having smaller percentages.

App usage

Concerning the engagement in PA under the supervision of an exercise professional during pregnancy, 52% of women reported participating in supervised PA. This percentage slightly decreases to 47% in the postpartum period.

Regarding the preferred location for engaging in physical activity, 36% of the participants prefer outdoor training, 30% prefer practicing in a fitness club, 29% at home, and only 2% conducted their activities in centers or clinics specialized in pre- and post-natal care. A minority of 2% did not use any specific location or used their workplace.

Regarding the use of computer applications, it was found that 53% already used a general fitness mobile application, while 87% had never used a mobile app specifically for fitness during pregnancy and postpartum. In terms of application usage frequency, the majority, 60%, did not use it on any day of the week, 26% used it 1 to 2 times per week, 8% used it 3 to 4 times per week, and only 6% used it between 5 and 7 days per week.

Preferences regarding the future "active pregnancy app"

The attribution of value and recognition of sharing valuable information through the app was highly recognized by most participants. Practically three quarters of the participants, 73%, agreed or strongly agreed that the app could improve knowledge about recommendations for an active lifestyle, including physical activity, exercise, and sports. Equally, 78% believed the app would provide updated recommendations in specific areas of PA and physical exercise during pregnancy and postpartum. This attribution of value also extends to the healthy lifestyle, in which statement 77% agreed or strongly agreed that the app would offer valuable information on health, sleep, nutrition, and stress management.

Regarding exercise sessions, 80% agree or strongly agree that the app will allow pregnant or postpartum women to practice exercise at home and outdoors, and 71% maintain this opinion regarding the outdoor environment. On the other hand, only 54% agreed or strongly agreed that the app could help the user to realize exercise in the gym context, with 23% remaining neutral. Direct contact with professionals was extremely valued by participants. Direct contact with health professionals (e.g., doctors, nutritionists, psychologists, nurses, physiotherapists) was considered important by 73% of the respondents, and 72% valued direct contact with exercise professionals (e.g., personal trainers, exercise physiologists, sport coaches).

Guidance on childbirth and parenting preparation programs was deemed important by 72% of the women, and 79% agreed or strongly agreed on the importance of postpartum recovery programs. Recording health and fitness parameters (e.g., blood pressure, heart rate, weight, blood glucose) was supported by 75% of the participants, and the same percentage agreed on recording physical activity parameters or training plans.

Regarding food diary records, 54% agreed or strongly agreed, although 28% were neutral. Similarly, 56% supported recording sleep and rest patterns, with 30% remaining neutral. Emotional state tracking was agreed upon by 50%, with 32% neither agreeing nor disagreeing. The app's ability to record daily step counts, distance traveled, walking speed, and effort intensity through heart rate was important to 73% of the women.

Interoperability with other applications for tracking daily steps, distance, and heart rate was supported by 68% of the respondents. Finally, 47% agreed or strongly agreed on the importance of interoperability with social networks and contact with other pregnant and postpartum women, while 35% were neutral on this aspect.

To gather more personalized information regarding women's preferences about the app, we posed an open-ended question: *"What suggestions would you like to make regarding the functionality and usefulness of a fitness app specifically for pregnancy or postpartum?".* Most participants responded to this question (75.55%), adding value and depth to the questionnaire. To summarize and illustrate the responses obtained, we provide some examples below:

- Usability-related questions: *"be simple"*, *"be easily accessible"*, *"be flexible"*, *"be user-friendly"*, *"be versatile"*, *"be practical"*, *"not be too expensive"*, *"be free"*, *"allow connection with smartwatch and ideally with the National Health System or health insurance with information available to private hospitals as well"*;
- Specificity: *"adapted to each pregnant woman's reality"*, *"specific to each person"*, *"exercise adapted to various pregnancy and postpartum conditions"*, *"exercises suitable for high-risk pregnancies"*, *"adapt exercises to the stages of pregnancy"*;
- Contact with professionals: *"allow contact with experienced professionals in the field of exercise and health"*, *"allow monitoring by professionals"*, *"have a chat/share forum among pregnant women"*, *"have direct chat with professionals"*, *"daily support with information for pregnant women and mothers"*;
- Exercise prescription: *"availability of recorded workouts"*, *"have videos with short workouts"*, *"have tips and exercise suggestions"*, *"inform when to resume physical activity after childbirth"*, *" have breathing exercises"*;
- Data evaluation and recording: "*allow data recording in case of gestational diabetes or hypertension"*, *"records on exercise evaluation and postpartum*

recovery progress", "help with sleep issues during pregnancy", "assess psychological well-being", "include breastfeeding records";

- Motivational and fear: *"have pop-up alerts", "have reminders", "have active and motivational notifications", "help pregnant women overcome the fear of exercising by being advised by health and fitness professionals".*

Besides the practical suggestions, it is also important to note that a few participants also mentioned that there were some concerns regarding the use of the app, such as the following examples: *"with the app, human contact is lost. I recognize that it is useful for recording and reading, but only that", "my concern is that women will follow the app's guidance more than their doctor's"* and *"nothing replaces in-person and physical contact, especially at this stage".*

Discussion

User perspective is an actual trend for focusing on end users' point of view and preferences, as they are the people for whom the software is designed. Therefore, this study investigated the usage profiles, preferences, and needs of pregnant and postpartum women regarding a mobile app designed to promote active and healthy lifestyles.

There are numerous applications available and increasingly used during pregnancy and postpartum, as women feel the need for additional information beyond the routine health monitoring associated with these stages. However, the results of a previous study [12] reveal that while 53% of women have or have had a general fitness application, 87% do not use or have not used a specific application for pregnancy and postpartum. The literature identifies a lack of reliable information in many of the currently available applications for pregnancy and postpartum, recommending that future resources for these stages should include validated information supervised by health professionals and incorporate features that prioritize personalization, a factor that attracts women to use these applications [6, 9, 10]. Considering these premises and gap, the present study aimed to explore the usage profiles, preferences, and needs of pregnant and postpartum women regarding the features of a mobile application designed to promote active and healthy lifestyles.

The sample for this study included 235 pregnant or postpartum women with babies born between 2021 and 2023. The average age of the participants was 36 ± 4.67 years, reflecting the current trend towards later pregnancies [18]. These pregnancies can be associated with certain health conditions and require specialized care with more specific information on health, lifestyle, and behaviors to ensure maternal and fetal well-being [19, 20]. Later pregnancies, where the expectant mother is aged 35 years or older, may increase health risks for the fetus, including a higher prevalence of certain conditions [21, 22]. In these circumstances, maintaining a healthy lifestyle becomes even more crucial. The trend towards later motherhood and its potential risks highlight the importance of creating and developing specific tools, to help these future mothers stay healthy and informed throughout their pregnancy and postpartum period [23].

Regarding physical activity (PA) during pregnancy, it was found that 20% of the participants were physically inactive. Among the active pregnant women, 28% engaged in PA for 60 to 90 min daily, a higher percentage compared to the 26% who exercised for 30 to 44 min. The sample analysis revealed that some participants had a high daily training volume, indicating that some might have an athletic profile. In terms of weekly PA frequency, 39% exercised 1 to 2 times per week, 31% exercised 3 to 4 times per week, and only 10% exercised 5 to 7 days per week. As described in the results, the activities were grouped into categories, with Health and Wellness Training being the most practiced during pregnancy. Walking accounted for 90% of the activities in this category, followed by pre- and post-natal fitness programs, Pilates, and group classes. It is important to note it was not possible to conclusively determine if the participants were physically active according to WHO recommendations, as walking is commonly associated with light intensity. Although the WHO advocates that any movement is better than none [24], moderate and vigorous intensities offer superior benefits [25, 26]. It is crucial to educate women about the criteria for moderate to vigorous intensity so they can understand the differences and benefits and adjust their behavior to meet the recommended guidelines. These results are in accordance with previous literature, which also indicate that 36.2% of women did not engage in any PA during pregnancy [6], which is slightly higher than the 20% found in the present study. Additionally, the specific demographic characteristics of Portugal, such as an aging population and low birth rates in the last years [27], highlight the importance of promoting physical activity among pregnant women to ensure long-term maternal and fetal health.

Regarding PA in the postpartum period, 37% of the participants were physically inactive. Among the women who engaged in PA postpartum, 23% trained for 60 to 90 min daily, and 26% for 30 to 44 min. Similar to the pregnancy period, data analysis showed that some participants had a high daily training volume, which may be associated with an athletic profile. In terms of weekly PA frequency, about 48% exercised 1 to 2 times per week, and only 11% exercised 3 to 4 times per week. Health and Wellness Training was the most practiced, specifically walking, which accounted for about 87%, followed

by pre- and post-natal fitness programs at 18%, group classes at 6%, and Pilates at 5.5%. The increase in the percentage of physically inactive women postpartum (37%) compared to pregnant women (20%) can be attributed to several causes. The postpartum period is more challenging in terms of time management, as it involves the acquisition of new roles inherent to motherhood along with the time spent caring for the baby [3, 28].

The preferred location for PA was outdoors, with 36% of participants choosing this option, followed by the gym at 30% and home at 29%. Given that the study period was between 2021 and 2023, it is reasonable to assume these preferences may be linked to habits developed during the Covid-19 pandemic in 2020, when many people adapted to exercising outdoors and at home [29]. The preference for physical activity locations, such as gyms, outdoors, and at home, was also consistent with a previous study [6], emphasizing the importance of apps that provide versatile options.

The low utilization of pregnancy-specific apps 13%, despite high general fitness app usage 53%, reflects a global trend [10], suggesting market opportunities for specialized maternal health apps. Hughson et al. [12], as mentioned in the conceptual framework, concluded that there is a lack of reliable information in many currently available apps for pregnancy and postpartum. Future app resources for these stages should include validated information supervised by healthcare professionals and incorporate features that prioritize personalization, a factor that attracts women to use these apps [13, 14]. In Portugal, the aging population, combined with mothers having children later in life [30], further emphasizes the need for tailored health interventions. This increases the potential for specialized apps to support maternal health.

Regarding PA with professional supervision, 52% trained with a professional during pregnancy, and 47% did it during postpartum. This decrease may be associated with the higher rate of physical inactivity identified in postpartum, related to the previously described challenges of the postpartum period and the nature of the questionnaire used [3, 28]. However, it is important to understand that women value personalized support during these special phases.

The preferences most frequently mentioned by women regarding a specific application for pregnancy and postpartum include: knowing the recommendations for an active and healthy lifestyle, as well as updated recommendations on PA during pregnancy and postpartum; accessing exercise sessions to perform at home and outdoors; having direct contact with health and exercise professionals; accessing guidance on childbirth and parenting preparation programs and postpartum recovery; recording health and fitness parameters, PA or training plans, and daily step counts, distance traveled, and walking speed; and ensuring interoperability with other software applications. Other preferences that should be considered, although identified as less relevant, include: interoperability with social networks and/or contact with other pregnant and postpartum women; recording parameters related to emotional state, food diary, and sleep patterns; and accessing exercise sessions to perform in the gym. In sum, the participants want an app that is specific to their needs, reliable, secure, allows them to keep in touch with professionals and is easy to use. The creation of a specific app for promoting an active and healthy lifestyle can be a quick and practical way to provide information to pregnant women and new mothers. This tool can be very useful for these women to experience a safer and healthier pregnancy and postpartum period, not only by accessing reliable, trustworthy, and updated information but also by interacting with health and exercise professionals. It can also be a useful tool for the health and exercise team, allowing interdisciplinary communication with other team members, which will benefit the more individualized health monitoring of the pregnant women and mothers we follow [11, 31].

Implications for app development

The results of this study have several implications for the development of future maternal health apps. These apps should be highly specific, offering tailored and secure exercise recommendations and support. New and expectant mothers emphasize the importance of direct interaction with health professionals, so the app should facilitate connections between users and professionals, including features for real-time communication and consultation. Additionally, the app should enable data collection and monitoring, incorporating comprehensive tracking tools. By addressing these needs, app developers can create more effective and user-friendly apps that support maternal health.

Limitations

The cross-sectional design, self-reported data, and sampling methods were the most important limitations of this study. The sample was predominantly made up of women living in the Lisbon and Tagus Valley region and is therefore not representative of the entire population of Portuguese women.

Strengths

Despite the limitations, the study also has strengths to be noted. It is the second study conducted with Portuguese women with a relatively large sample size (more than 200 participants). This work may inform mHealth policy recommendations and adds to the growing body of eHealth knowledge by providing detailed women's preferences, needs, and barriers.

Recommendations for future research

By providing valuable information, helping with self-monitoring, and fostering meaningful interactions with a multidisciplinary team of health and exercise professionals, this app has the potential to positive impact the women. Therefore, after the creation of the app framework analyzed in this present study, it will be pertinent to test the pilot and evaluate its impact through intervention studies with pregnant and postpartum women. The inputs of exercise and health professionals should also be included in the pilot study regarding the framework and software under development.

Future studies should consider creating a specific questionnaire for pregnant women and new mothers separately, so that it can be implemented in various pregnancy and postpartum monitoring locations, such as health centers, clinics, and gyms.

Sustainable development goals

The objectives of the study are aligned with the Sustainable Development Goals of the United Nations 2030 Agenda: SDG3 - Good Health & Well-Being, i.e., ensure healthy lives and promote wellbeing for all at all ages; SDG4– Education, i.e., ensure inclusive and equitable quality education and promote lifelong learning opportunities; SDG5 - Gender Equality, i.e., enhancing the use of technology, and to promote the empowerment of women.

Conclusions

Specific apps can be a useful and valuable tool for improving the health and well-being of women during pregnancy and postpartum, which are pivotal times for adopting healthy habits.

The results highlighted the necessity of creating apps that are precise, trustworthy, and specific to the unique needs of women during these special and unique phases of life. Developing the "Active Pregnancy" app according to the insights from this study, considering the desires and concerns of pregnant women and new mothers, has the potential to truly empower these women. Considering the present results, particularly the importance perceived by mums-to-be and new mums of being accompanied by a multidisciplinary team involving health and exercise professionals, both areas should be involved in building and improving this app in the future.

Abbreviations

app	mobile applications
PA	Physical activity
ICT	Information and communication technologies
mHealth	mobile health

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12884-025-07635-8.

Supplementary Material 1

Author contributions

RSR developed conceptualization and methodology, carried out the project administration and supervision, and secured the funding acquisition. LA and CF carried out investigation, data collection and curation, software and formal analysis. LA, CF, CM and RSR performed the validation, visualization, writing and editing. LA and CF wrote the original draft in Portuguese. CM wrote the original draft in English. RSR revised the final version. All authors read and approved the final manuscript.

Funding

The article processing charges was supported by Santarém Polytechnic University & SPRINT - Sport Physical Activity and Health Research & Innovation Center [Fundação para a Ciência e Tecnologia - FCT Unit 6185], by national funds through FCT– Foundation for Science and Technology, I.P. (Portugal), within the scope of the project Active Pregnancy [2023.14896.PEX]. PI: Rita Santos-Rocha. LMA is supported by national funds through FCT– Fundação para a Ciência e Tecnologia - Foundation for Science and Technology, I.P. (Portugal), within the scope of the project Active Pregnancy [2023.14896.PEX]. DOI: https://doi.org/10.54499/2023.14896.PEX.
Website: https://sprint-sci.com/en/research-innovation/research-projects-external/active-pregnancy-202314896pex.
YouTube Channel: @GravidezAtiva-ActivePregnancy.

Data availability

Data availability is possible upon request and approval of the research team.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Board of the Santarém Polytechnic University (nr. 6 A-2025ESDRM). The participants' informed consent was obtained through initial proceeding of the Google Forms Survey.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Santarém Polytechnic University - Sport Sciences School of Rio Maior (ESDRM), Av. Dr. Mário Soares, 110, Rio Maior 2040-413, Portugal
[2]SPRINT - Sport Physical Activity and Health Research & Innovation Center, Av. Dr. Mário Soares, 110, Rio Maior 2040-413, Portugal

Received: 17 December 2024 / Accepted: 21 April 2025
Published online: 10 May 2025

References

1. Santos-Rocha R, editor. Exercise and physical activity during pregnancy and postpartum. Evidence-based guidelines. 2nd ed. Cham, Switzerland: Springer International Publishing; 2022.
2. Hayman M, Brown WJ, Brinson A, Budzynski-Seymour E, Bruce T, Evenson KR. Public health guidelines for physical activity during pregnancy from around the world: a scoping review. Br J Sports Med. 2023;57:940–7. https://doi.org/10.1136/bjsports-2022-105777.
3. Dipietro L, Evenson KR, Bloodgood B, Sprow K, Troiano RP, Piercy KI, Vaux-bjerke A, Powell KE. Benefits of physical activity during pregnancy and postpartum: an umbrella review. Med Sci Sports Exerc. 2019;51:1292–302. https://doi.org/10.1249/mss.0000000000001941.

4. Ribeiro MM, Andrade A, Nunes I. Physical exercise in pregnancy: benefits, risks and prescription. J Perinat Med. 2022;50:4–17. https://doi.org/10.1515/jpm-2021-0315.
5. Physical Activity and Exercise During Pregnancy and the Postpartum Period. ACOG committee opinion, number 804. Obstet Gynecol. 2020;135:e178–88. https://doi.org/10.1097/aog.0000000000003772.
6. Santos-Rocha R, Ferreira M, Pimenta N, Branco M, Oviedo-Caro M, Szumilewicz A. Understanding and involving the perspective of pregnant women as users when designing the framework of e-Health and exercise interventions during pregnancy: preliminary study. Healthcare. 2024;12:1121. https://doi.org/10.3390/healthcare12111121
7. Sardi L, Idri A, Redman LM, Alami H, Bezad R, Fernández-Alemán JL. Mobile health applications for postnatal care: review and analysis of functionalities and technical features. Comput Methods Programs Biomed. 2020;184:105114. https://doi.org/10.1016/j.cmpb.2019.105114.
8. Lazarevic N, Lecoq M, Bœhm C, Caillaud C. Pregnancy apps for Self-Monitoring: scoping review of the most popular global apps available in Australia. Int J Environ Res Public Health. 2023;20:1012. https://doi.org/10.3390/ijerph20021012
9. Mazaheri Habibi MR, Moghbeli F, Langarizadeh M, Fatemi Aghda SA. Mobile health apps for pregnant women usability and quality rating scales: a systematic review. BMC Pregnancy Childbirth. 2024;24:34. https://doi.org/10.1186/s12884-023-06206-z.
10. Nissen M, Huang S-Y, Jäger KM, Flaucher M, Titzmann A, Bleher H, Pontones CA, Huebner H, Danzberger N, Fasching PA, et al. Smartphone pregnancy apps: systematic analysis of features, scientific guidance, commercialization, and user perception. BMC Pregnancy Childbirth. 2024;24. https://doi.org/10.1186/s12884-024-06959-1.
11. Yu H, He J, Wang X, Yang W, Sun B, Szumilewicz AA. Comparison of functional features of Chinese and US mobile apps for pregnancy and postnatal care: A systematic app store search and content analysis. Front Public Health. 2022;10. https://doi.org/10.3389/fpubh.2022.826896.
12. Hughson J-aP, Daly JO, Woodward-Kron R, Hajek J, Story D. The rise of pregnancy apps and the implications for culturally and linguistically diverse women: narrative review. JMIR Mhealth Uhealth. 2018;6:e189. https://doi.org/10.2196/mhealth.9119.
13. Tinius RA, Polston M, Bradshaw H, Ashley P, Greene A, Parker AN. An assessment of mobile applications designed to address physical activity during pregnancy and postpartum. Int J Exerc Sci. 2021;14:382–99. https://doi.org/10.70252/AQIG9215
14. Brunelli L, De Vita C, Cenedese F, Cinello M, Paris M, Samogizio F, Bava M, Dal Cin M, Zanchiello S, Stampalija T. The role of mobile apps for pregnancy and postnatal care in promoting maternal and child health. Eur J Pub Health. 2021;31. https://doi.org/10.1093/eurpub/ckab164.076.
15. Brunelli L, De Vita C, Cenedese F, Cinello M, Paris M, Samogizio F, Starec A, Bava M, Dal Cin M, Zanchiello S, et al. Gaps and future challenges of Italian apps for pregnancy and postnatal care: systematic search on app stores. J Med Internet Res. 2021;23:e29151. https://doi.org/10.2196/29151.
16. Franco S, Santos Rocha R, Simões V, Ramalho F, Vieira I, Ramos L. Tendencias de fitness En Portugal Para 2023 (Fitness trends in Portugal for 2023). Retos 2023, *48*, 401–12, https://doi.org/10.47197/retos.v48.97094
17. Bardin L. *Content Analysis*; Edições 70: Lisbon, 2016.
18. Bayrampour H, Heaman M, Duncan KA, Tough S. Advanced maternal age and risk perception: A qualitative study. BMC Pregnancy Childbirth. 2012;12. https://doi.org/10.1186/1471-2393-12-100.
19. DGS. Programa Nacional Para a vigilância Da Gravidez de Baixo Risco (p. 112). Direção geral de Saúde. Direção-Geral da Saúde: Lisboa; 2015.
20. Dunne J, Foo D, Dachew BA, Duko B, Gebremedhin AT, Nyadanu SD, Pereira G, Tessema GA. Diabetic and hypertensive disorders following early pregnancy loss: a systematic review and meta-analysis. eClinicalMedicine. 2024;71:102560. https://doi.org/10.1016/j.eclinm.2024.102560.
21. Sparić R, Stojković M, Plešinac J, Pecorella G, Malvasi A, Tinelli A. Advanced maternal age (AMA) and pregnancy: a feasible but problematic event. Arch Gynecol Obstet. 2024;310:1365–76. https://doi.org/10.1007/s00404-024-07678-w.
22. Hochler H, Lipschuetz M, Suissa-Cohen Y, Weiss A, Sela HY, Yagel S, Rosenbloom JI, Grisaru-Granovsky S, Rottenstreich M. The impact of advanced maternal age on pregnancy outcomes: A retrospective multicenter study. J Clin Med. 2023;12:5696. https://doi.org/10.3390/jcm12175696
23. Bagherzadeh R, Gharibi T, Safavi B, Mohammadi SZ, Karami F, Keshavarz S. Pregnancy; an opportunity to return to a healthy lifestyle: a qualitative study. BMC Pregnancy Childbirth. 2021;21:751. https://doi.org/10.1186/s12884-021-04213-6.
24. WHO. WHO guidelines on physical activity and sedentary behaviour. World Health Organization: Geneva; 2020.
25. Sun J, Wu H, Zhao M, Magnussen CG, Xi B. Dose-response association of leisure time physical activity with mortality in adults with major chronic diseases. Front Nutr. 2022;9:1048238. https://doi.org/10.3389/fnut.2022.1048238.
26. ACSM. ACSM's Guidelines for Exercise Testing and Prescription. 11th ed. Wolters Kluwer Health; 2021.
27. Pimentel D, Sousa Gomes C. Beyond the crisis: fertility variations and the family policies in the Portuguese municipalities. Espace Populations Sociétés. 2022. https://doi.org/10.4000/eps.12990.
28. Borodulin K, Evenson KR, Herring AH. Physical activity patterns during pregnancy through postpartum. BMC Womens Health. 2009;9. https://doi.org/10.1186/1472-6874-9-32.
29. Caputo EL, Costa DJS, Mariano IM, Lobo LG, Ribeiro ALA, Gonçalves JC, Freitas MP, Zuchinali P, Jeronimo JS, Ribeiro PAB, et al. Studies of physical activity and COVID-19 during the pandemic: an updated scoping review. BMC Sports Sci Med Rehabilitation. 2024;16:218. https://doi.org/10.1186/s13102-024-00967-6.
30. Almeida-Santos T, Melo C, Macedo A, Moura-Ramos M. Are women and men well informed about fertility? Childbearing intentions, fertility knowledge and information-gathering sources in Portugal. Reproductive Health. 2017;14. https://doi.org/10.1186/s12978-017-0352-z.
31. Daly LM, Horey D, Middleton PF, Boyle FM, Flenady V. The effect of mobile application interventions on influencing healthy maternal behaviour and improving perinatal health outcomes: a systematic review protocol. Syst Reviews. 2017;6:26. https://doi.org/10.1186/s13643-017-0424-8.

Publisher's note