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Can mobile software-based physical activity education enhance the quality of life in perimenopausal women?

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Abstract:

BACKGROUND: Menopause is a natural occurrence signifying the cessation of menstrual bleeding in middle-aged women. Perimenopause refers to a period of 2–8 years leading up to menopause, characterized by irregular cycles or the absence of menstruation for less than 12 months. The perimenopausal phase can be challenging for women due to the negative impact of associated symptoms on their quality of life. Recognizing the potential benefits of physical activity in mitigating these symptoms, this study aimed to evaluate the impact of physical activity education delivered via WhatsApp, using the Health Belief Model as a foundation, on the quality of life in perimenopausal women.

MATERIALS AND METHODS: This quasi-experimental study involved 80 women aged 40–50 recruited from comprehensive health centers in Isfahan. Cluster sampling was employed for participant selection. The study employed three questionnaires: the "International Physical Activity Questionnaire," "Menopausal Women Quality of Life," and the Health Belief Model Questionnaire. For the intervention group, education based on the Health Belief Model was delivered via WhatsApp via videos, posters, and podcasts every two weeks (a total of 5 packages). Additionally, exercise training videos were sent to participants. Data was collected two months after the intervention and analyzed using SPSS 26, with independent and paired *t*-tests applied (significance level: 0.05).

RESULTS: The results indicated a significant increase in knowledge scores, Health Belief Model constructs, and physical activity levels within the intervention group, whereas no significant changes were observed in the control group. Notably, menopausal symptom scores decreased in the intervention group, particularly in psychological symptoms, and there was a significant decrease in the overall quality of life score ($P = 0.018$).

CONCLUSION: Providing education via WhatsApp, grounded in the Health Belief Model, enhanced physical activity levels and improved the quality of life among perimenopausal women. This approach holds promise for promoting well-being in perimenopause.

Keywords:

Education, Health Belief Model, menopause, physical activity, quality of life

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Introduction

During middle age, women universally go through menopause, signifying the cessation of menstrual bleeding. Women whose menstrual cycle has undergone changes or those who have had less than 12 months since their last menstrual bleeding,[1] which encompasses the period spanning from 2 to 8 years before the onset of menopause.[2] The perimenopausal phase can give rise to an array of physical, mental, and sexual symptoms in women, which collectively diminish their quality of life.[3]

Globally, approximately one billion women experience menopause and the perimenopausal phase.[4] In Iran alone, there are five million women of menopausal

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age.[5] The intensity of menopausal symptoms tends to be greater during the perimenopausal phase compared to menopause itself.[6] A substantial proportion of women, ranging from 60% to 80%, grapple with vasomotor symptoms during the perimenopausal period.[7] The duration of experiencing vasomotor symptoms during perimenopause can extend to as long as 7 years. Furthermore, researchers have established a link between vasomotor symptoms and elevated risk factors for cardiovascular diseases, reduced bone density, and fractures.[8] The likelihood of experiencing depression during the perimenopausal phase is double that of the premenopausal period,[9] which can potentially result in sleep disturbances, sexual dysfunction, and Alzheimer's disease.[10]

Several studies have underscored the positive impact of physical activity on mitigating mental and physical symptoms and enhancing the quality of life during perimenopause,[11,12] Engaging in physical activity during this phase can help alleviate hormonal imbalances. Notably, there exists an inverse relationship between depression symptoms during perimenopause and the level of physical activity.[7] Physical activity contributes to psychosomatic well-being by bolstering self-esteem, improving sleep quality, and reducing pain.[13,14]

Women tend to engage in less physical activity as they age, menopause, and after it.[15] Nejadghaderi and colleagues, in their 2021 study involving 3420 women aged 35–54, reported an inactivity rate of approximately 54%.[16] A sedentary lifestyle, characterized by insufficient physical activity, exacerbates the severity of menopausal symptoms.

The menopause experience varies from person to person and is influenced by cultural, social, and individual knowledge factors.[5] The lack of education regarding perimenopause has left many women ill-prepared for this stage of life, with 68% of them seeking information when symptoms manifest.[11] Multiple studies have demonstrated that education can enhance knowledge and promote physical activity. Although in some studies the education has not been successful.[17] The effectiveness of health education programs hinges on the judicious application of models and theories, including the health belief model.[3] Key constructs within this model encompass perceived susceptibility, perceived severity, perceived benefit, perceived barrier, and self-efficacy.[18] The health belief model emphasizes that by instilling the correct health beliefs, it is feasible to influence people's motivation and behavior. One of the behaviors that research grounded in this model has proven effective in enhancing is physical activity.[4,5] But Using health belief model in some studies has not increased the physical activity of people.[19,20]

The World Health Organization emphasizes leveraging new technologies to promote physical activity.[21] Digital tools can facilitate the delivery of physical activity education within primary healthcare settings.[22,23] Mobile health education is a cost-effective and potent tool for health promotion and education.[22] Kashfi *et al*.[24] demonstrated an improvement in the quality of life for menopausal women through physical activity education via WhatsApp. Similarly, using web-based education, McGuire and colleagues successfully augmented the perceived benefits and diminished barriers to physical activity among middle-aged women.[25]

There remains a gap in research explicitly targeting perimenopausal women utilizing WhatsApp for physical activity education grounded in the health belief model. Given the substantial population of perimenopausal women, the adverse impact of this phase on their quality of life, the benefits of physical activity during this period in ameliorating menopausal symptoms, the relatively low level of physical activity among women, the advantages of WhatsApp-based education, and the potential of education informed by the health belief model in enhancing physical activity, we have embarked on a research endeavor aimed at measuring the impact of physical activity education based on the health belief model delivered through WhatsApp on the quality of life of women aged 40–50 years.

Materials and Methods

Study design and setting

The current investigation constitutes a randomized controlled trial study. It focuses on women aged 40–50 who have been directed to comprehensive health centers in Isfahan. Cluster sampling was employed as the chosen sampling method, with each health network in Isfahan City serving as a designated cluster. The city's health system is geographically divided into two health networks. Within each health network, two comprehensive health centers were randomly selected to form the intervention group, and an additional two comprehensive health centers were chosen for the control group, resulting in eight centers. People in different health centers did not communicate with others (referred to as "flow 1").

Study participants and sampling

In terms of inclusion criteria, individuals within the age range of 40–50 years were considered, along with a willingness to participate in the study, the presence of signs indicating changes in menstrual bleeding, the absence of menopausal status, the absence of medical conditions preventing engagement in physical activities, no use of hormone therapy, and proficiency in utilizing WhatsApp software. Conversely, exclusion

criteria encompassed individuals who lacked interest in continued participation, had physical impairments impeding exercise, had experienced psychological events like the loss of a family member, did not have access to WhatsApp software, or failed to complete the required questionnaires, resulting in their exclusion from the research.

Reluctance to continue participating in the study, failure to respond via WhatsApp, non-completion of the questionnaire, undergoing surgery, and encountering psychological events like the loss of a family member were the reasons for participants' discontinuation.

Data collection tool and technique

To assess the desired variables, except for demographic information such as age, education, and weight, three questionnaires were employed to measure physical activity, quality of life, and the constructs of the health belief model.

The initial questionnaire aimed to gauge participants' physical activity levels using the "International Physical Activity Questionnaire - Short Form" (IPAQ-SF). This questionnaire delved into the number of days and the time spent engaging in moderate-intensity physical activity, vigorous-intensity physical activity, and walking sessions lasting at least 10 min within the past week. The cumulative score of IPAQ-SF was expressed in PA Metabolic Equivalent of Task (MET)-minutes per day or week. The total weekly PA MET minutes were calculated by summing the MET minutes for each level of physical activity (moderate intensity = 4.0 MET, vigorous intensity = 8.0 MET, and walking = 3.3 MET).[26]

The second questionnaire, the "Menopausal Women Quality of Life" (MENQOL), that encompassed questions in four dimensions: vasomotor, physical, psychomotor, and sexual. Responses to these questions were rated on a six-point scale, with a score of 1 indicating "not at all," 2 representing "very little," 3 denoting "low," 4 signifying "average," 5 indicating "severe," and 6 representing "very severe." The questionnaire's validity and reliability were verified in a study conducted by Abdi *et al*.[27]

The third questionnaire was employed to assess the constructs of the health belief model, and it included 5 questions on perceived sensitivity, 5 questions on perceived severity, 9 questions on perceived benefits, 8 on perceived barriers, and 7 on self-efficacy. Participants responded to all the questions using a Likert scale ranging from 0 to 4, with 0 indicating complete disagreement and 4 indicating complete agreement. This questionnaire was developed for Iranian research by Hosseini *et al*.[28]

All participants received a link to the electronic questionnaire before and two months after the intervention. In cases of non-completion, telephone follow-up was conducted to ensure data collection.

Intervention

Initially, a WhatsApp group was established, with all participants from the intervention group becoming members. The intervention process was structured into two distinct phases.

In the first phase, educational materials were disseminated to the participants via videos, podcasts, and text messages within the WhatsApp group, following a bi-weekly schedule.[29] The initial part included a 15-minute podcast and a 15-minute video presentation focusing on the project's methodology, the significance of addressing perimenopause, its associated symptoms, and guidance for self-assessing menopausal symptoms (perceived sensitivity). The second segment of the package comprised a 15-minute podcast and a 10-minute video highlighting the consequences of insufficient physical activity (referred to as perceived severity). The third component consisted of a 15-minute podcast and an aggregate of 15 minutes of video content, emphasizing the advantages of physical exercise, especially during the perimenopausal phase. Participants were encouraged to identify their physical activity barriers and propose solutions. Subsequently, the fourth part involved a review of the barriers and solutions submitted by the participants, accompanied by a 10-minute video presentation and the distribution of posters elucidating obstacles to physical activity. The final component, Part 5, entailed a 15-minute video discussing self-efficacy and educational techniques for enhancing self-efficacy in physical activity. This section covered various aspects such as planning a consistent exercise routine, creating step-by-step and incremental task plans, self-rewarding progress in the exercise regimen, for example, small gifts like sports T-shirts, hobby , producing educational guides (education about how to do training(, and preventing relapses. Participants were also encouraged to develop personalized physical activity plans aligned with their daily routines, utilizing role models as references. The plans of several women who succeeded in implementing their plans were put in groups.

Furthermore, the intervention involved providing exercise education by posting 20–40-minutevideos thrice a week. These videos encompassed resistance training, stretching, and aerobic endurance exercises.

For participants who did not respond within two weeks after distributing educational packages, follow-up efforts were initiated, commencing with a reminder message. If

there was still no response, individuals were contacted by phone. Additionally, weekly feedback and progress reports were collected throughout the two months of physical training education. Upon concluding the study, educational packages were made available to all participants [Figure 1].

Statistical analysis

In the final stage of our study, we processed the data acquired through the questionnaires using SPSS version 26 software. We employed various statistical techniques, including descriptive statistics such as frequency, percentage, mean, and standard deviation. Additionally, we applied the Chi-square test to analyze the qualitative variables.

To assess the differences in mean scores related to knowledge and constructs within the Health Belief Model, as well as physical activity, menopause symptoms, and quality of life between the control and intervention groups before any intervention took place, we conducted independent *t*-tests.

Furthermore, we utilized paired *t*-tests to examine the mean scores about awareness and constructs within the health belief model, physical activity, menopause symptoms, and quality of life before and two months after the intervention in both groups. Our study employed a significance level of <0.05.

Ethical consideration

The educational intervention was planned and carried out after registering this intervention in the Iranian Registry of Clinical Trials (IRCT) and getting a code (IRCT20210602051478N1). The present study was confirmed by the Ethics Committee of Isfahan University of Medical Sciences under the ethical code IR.MUI.RESEARCH.REC.1400.075. Also, before the implementation of the project, the informed consent form was completed by the women.

Results

This study investigated the impact of physical activity training, grounded in the health belief model, on the

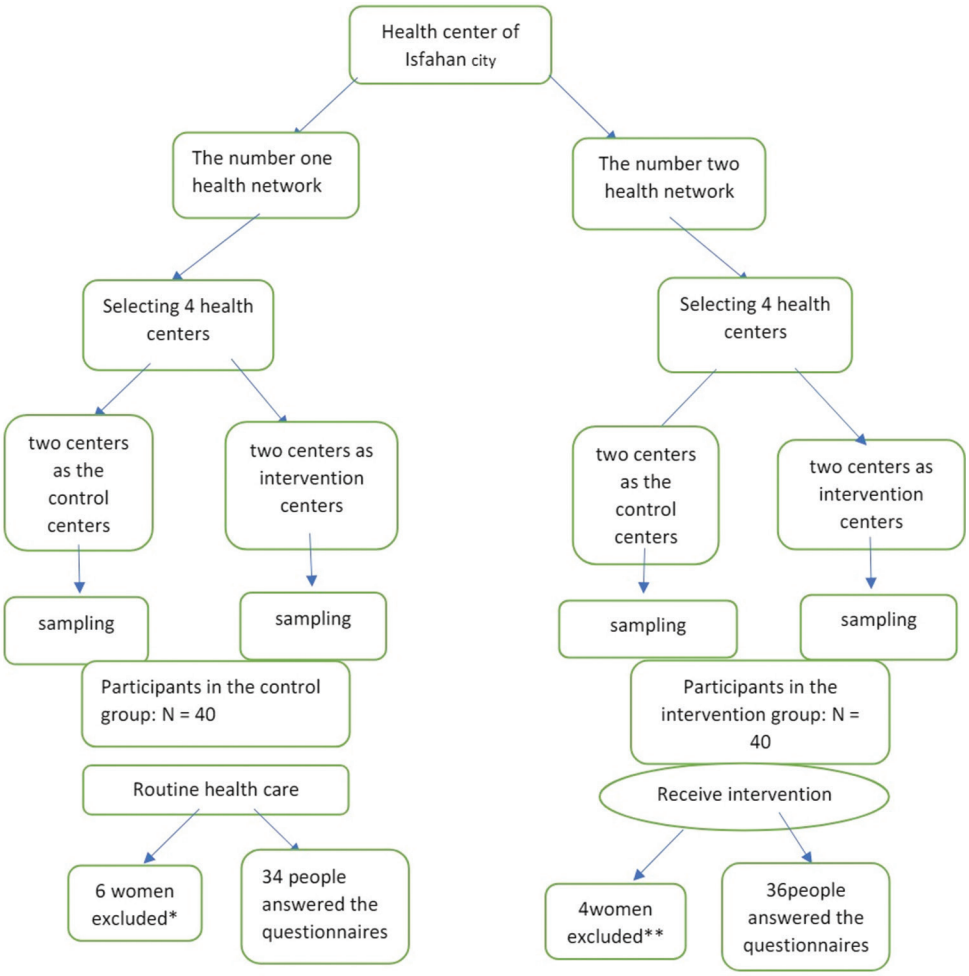

Figure 1: Flow diagram of the study participants

quality of life among perimenopausal women aged 40–50 who sought services at comprehensive health centers in Isfahan from 2021 to 2022.

The average age of participants in the intervention group was 45.38 ± 2.7, while in the control group, it was 46.38 ± 3.17. No statistically significant difference was observed between these two groups (*P*: 0.159). Regarding body mass index (BMI), the mean BMI in the intervention group was 26.23, whereas in the control group, it was 26.25 (*P* = 0.982).

A frequency distribution table illustrating the research participants' marital status and educational backgrounds reveals that the highest frequency in both the intervention and control groups was associated with married individuals. Likewise, the highest frequency, in terms of educational attainment, for both groups was attributed to individuals with a diploma level of education. Notably, the difference between the two groups regarding marital status and education level was not statistically significant.

The independent *t*-test analysis revealed no statistically significant differences in various parameters between the two groups before the intervention, as summarized in Table 1. These parameters included knowledge (*P* = 0.598), perceived sensitivity (*P* = 0.135), perceived severity (*P* = 0.183), perceived benefits (*P* = 0.856), perceived barriers (*P* = 0.521), and self-efficacy (*P* = 0.936).

Table 1: Comparison of the frequency distribution of marital status and educational background

Variables	Intervention Group	Control Group	*P**
Education			
Sub-Diploma	3 (8.3%)	1 (2.9%)	
Diploma	20 (55.6%)	22 (64.7%)	0.656
Associate Degree	4 (11.1%)	5 (14.7)	
Bachelor	8 (22.2%)	6 (17.6%)	
Master's Degree	1 (2.28%)	0	
Marital Status			
Single	7 (19.4%)	4 (11.8%)	0.378**
Married	29 (80.6%)	30 (88.2%)	

*,**Independent *t*-test

Upon closer examination of Table 2, it becomes evident that in the control group, the scores for awareness and constructs of the health belief model remained relatively stable after the intervention, with no significant changes compared to the pre-intervention period. However, in the intervention group, there was a notable increase in the scores for knowledge, and constructs of the health belief model (except for the perceived barriers score), indicating improved understanding after the intervention. Notably, the perceived barriers score decreased, suggesting that participants perceived fewer obstacles to their goals.

Diagram 1 illustrates the physical activity levels in both groups before and two months after the intervention. The independent *t*-test analysis demonstrated no significant differences in physical (*P* = 0.577), vasomotor (*P* = 0.529), mental (*P* = 0.966), or sexual (*P* = 0.574) symptoms between the two groups before the intervention.

Table 3 presents a comprehensive overview of symptom scores across various domains before and after the intervention, highlighting noteworthy findings. In the control group, there was a substantial increase in symptom scores in all domains following the intervention compared to the pre-intervention phase.

Conversely, symptom scores declined in all domains within the intervention group after the intervention. However, it is essential to note that this decline was statistically significant solely within the mental domains.

Before the intervention, the control group's average quality of life score was 74.38 ± 22.77. Remarkably, this score experienced a significant increase two months post-intervention, reaching 89.52 ± 24.73 (*P* = 0.001).

In contrast, within the intervention group, the average quality of life score before the intervention was 74.97 ± 24.37. Subsequently, it decreased significantly to 67.23 ± 20.14 two months after the intervention (*P* = 0.018).

Discussion

The primary objective of this research was to explore the impact of health belief model-based education on

Table 2: Mean scores of knowledge, health belief model constructs in both groups in two times

Variables	Intervention Group			Control Group		
	Before Intervention	Two Months after Intervention	*P**	Before Intervention	Two Months after Intervention	*P***
Knowledge	12.72±1.90	17.97±2.17	<0.001	12.94±1.51	2.28±12.91	0.945
Perceived Sensitivity	18.36±3.50	21.55±2.77	<0.001	19.47±2.51	20.00±2.42	0.304
Perceived Severity	15.69±2.74	17.16±2.33	0.003	16.52±2.42	17.05±2.59	0.245
Perceived Benefits	26.19±3.63	29.91±2.60	<0.001	26.00±5.10	27.26±4.35	0.168
Perceived Barriers	13.13±4.89	10.97±4.89	<0.001	12.26±6.37	12.23±6.07	0.978
Self-Efficacy	29.36±7.07	35.91±6.83	<0.001	29.50±7.41	26.82±11.9	0.187

*,**t-paired test

Table 3: Mean Scores of Domains of Quality of Life in both Groups in Two Times

Symptoms	Interventional Group			Control Group		
	Before Intervention	Two Months after Intervention	*P*	Before Intervention	Two Months after Intervention	*P*
Physical	42.88±14.20	40.31±11.67	0.245	41.08±12.58	50.41±14.39	0.001
Mental	18.27±7.28	14.13±5.92	0.001	18.35±7.47	21.67±8.32	0.013
Sexual	6.58±4.03	5.97±3.13	0.280	7.14±4.32	9.08±4.39	0.037
Vasomotor	7.22±3.68	6.80±3.13	0.11	7.79±3.87	8.35±3.65	0.035

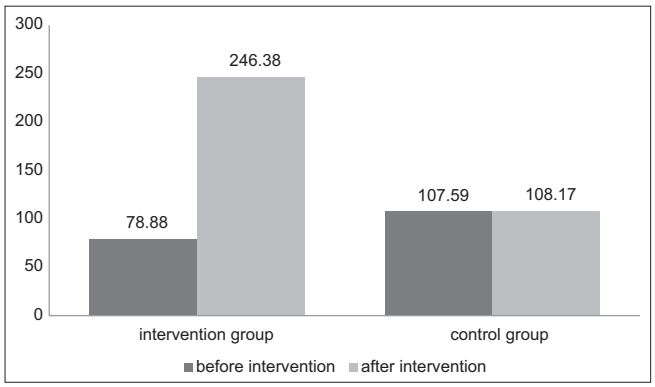

Diagram 1: "Physical activity level of two groups before and after the intervention according to IPAQ questionnaire scores"

enhancing the quality of life among perimenopausal women through the promotion of physical activity.

Following a two-month intervention in the intervention group, there was a notable increase in both knowledge scores and the constructs associated with the health belief model. The findings of this study are consistent with those of Juravand's research, highlighting a shared strength in both studies. Despite the distance education, an attempt has been made to exchange opinions and interact with the audience regarding the educational content sent. Additionally, both studies strived to craft educational messages to heighten perceived sensitivity and self-efficacy.[29] Notably, self-efficacy stands out as the most pivotal construct within the health belief model, predicting an individual's engagement in physical activity.[28] Post-intervention, there was a significant increase in physical activity levels within the intervention group. This outcome aligns with earlier studies involving postmenopausal and perimenopausal women.[30-33] Javadi Vala's educational intervention, employing the peer group, was similarly effective in boosting physical activity and improving menopausal symptoms, thereby enhancing the quality of life. Our study utilized a roleplay method, mirroring this approach.[30]

A comprehensive review conducted in 2022, which analyzed 12 articles, revealed that using mobile software could effectively enhance physical activity among middle-aged women experiencing menopausal symptoms.[34] In studies with a distance education approach, the result of our study on increasing physical activity is consistent with the results of the studies.[24,29,35] Conversely, Khodaveisi *et al*.[20] failed to improve physical activity, possibly attributable to differences in teaching methods. Their training sessions were conducted face-to-face over three 90-min sessions. One of the advantages of WhatsApp-based education is its easy access to educational resources like videos and podcasts, available for repeated use without restrictions regarding time or location.[24]

In our study, a two-month post-intervention assessment revealed a reduction in psychological symptoms, while the results of previous studies regarding the impact of physical activity on menopausal symptom control and quality of life have been inconsistent. Dabruska's research yielded findings consistent with ours, where a 12-week exercise program for postmenopausal women improved vitality and mental health scores.[36]

The physical activity regimen in our study encompassed resistance, stretching, and endurance (aerobics) exercises. In line with our study, Sosha's research also indicated that resistance and stretching exercises can enhance the quality of life for postmenopausal women.[37] In contrast, Taylor's study found that only walking, treadmill walking, and cycling exercises did not change the quality of life among postmenopausal women.[38] Alcaraz's review highlighted the need for further investigations into the exercises effective in alleviating menopausal symptoms.[39] We suggest that a combination of sports can be effective. Notably, our study did not observe a significant decrease in sexual symptoms following the intervention. A review study also suggests that despite reporting positive effects of physical activity, the evidence supporting the introduction of physical activity as a strategy to mitigate negative menopausal sexual symptoms remains limited, calling for further research.[40]

Li *et al*.[41] conducted a study to assess the effectiveness of training emphasizing a healthy lifestyle in managing menopausal symptoms and lifestyle-related behaviors. Through face-to-face and online training and music therapy integration, they successfully improved nutritional behaviors, physical activity, and menopausal symptoms.

Limitations and recommendation

This project faced several limitations. Firstly, the researchers could not assess the participants' physical activity levels. Lastly, the study had a relatively short follow-up period.

Conclusion

The findings from this study indicate that implementing physical activity education based on the health belief model through WhatsApp can enhance the health belief model constructs, increase physical activity, and ultimately lead to an improved quality of life among perimenopausal women. Given the compelling evidence of nutrition's impact on menopausal symptoms, we suggest a combination of nutrition education and physical activity education in future research.

Declaration of patient consent

The authors certify that they have obtained patient consent forms. In the form, the patients have given their consent for demographic and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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