

Perceptual Factors (Awareness, Attitude) and Positive, Indeterminate and Negative Nurturing Factors Affecting Physical Activity of Pregnant Women Visiting Health-care Centers in Tehran: Examination and Analyses

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Abstract

Background

The purpose of this study was to examine the effect of perceptual factors (awareness, attitude) and positive, intermediate and negative nurturing factors on physical activity of pregnant women visiting health centers in Tehran.

Methods

The present research was an applied study in which a quasi-experimental research design (pre-test-post-test) with a control group was employed. The Pregnancy Physical Activity Questionnaire (PPAQ) and a questionnaire designed based on the results of needs assessment and dimensions of the PEN-3 model were used for the purposes of this study. This study is a randomized control trial (RCT).

Results

The results indicated that the intervention based on E-learning has a statistically significant effect on perceptual factors (awareness, attitude) in increasing physical activity of pregnant women in the experimental group. Furthermore, E-learning-based intervention has a significant effect on increasing physical activity of pregnant women in the experimental group compared to the control group.

Conclusion

Based on the research results, it can be said that there is a statistically significant difference between the experimental and control groups in the scores obtained from perceptual factors (awareness, attitude) in the pre-test and the experimental group. Furthermore, it is safe to say that there is a statistically significant difference between the experimental and control groups in the scores obtained from physical activity in the pre-test and the experimental group.

Background

Pregnancy is one of the most sensitive and significant stages of any woman's life. It is associated with changes in psychological needs (e.g., anxiety and depression) and physical demands (such as weight gain and higher cardiac output). Nevertheless, about 60% of all pregnant women eliminate or reduce their physical activity during pregnancy (1, 2). Research shows that reduced physical activity in pregnant women is highly stemmed from their misconceptions and attitudes during pregnancy. It has been proven that regular physical activity in the first six months of pregnancy reduces the prevalence of cesarean section, shortens the second stage of labor and reduces fetal complications. In Iran, the prevalence of required training in accordance with standard pregnancy care programs is not satisfactory. Women experience unavoidable weight gain during pregnancy, while the role of physical activity during pregnancy with the purpose preventing such problems is significant (3). Furthermore, guides specifically designed with the characteristics of pregnancy in mind are less available. Physical activity is defined by the World

Health Organization as “any physical movement produced by skeletal muscle that requires energy consumption, including activities such as working, playing, doing household chores, traveling, and taking responsibility for recreational activities” (4). Although many studies show the beneficial effects of physical activity on the overall health of mother and fetus and having a healthy pregnancy, about 60% of all pregnant women do not undertake any physical activity during pregnancy (1). Despite the prevalence of awareness on physiological manifestations of exercise during pregnancy, there is still no comprehensive understanding on the effects of exercise with different intensities and intervals during pregnancy on mother and fetus (5). The postpartum period can be introduced as an opportunity to change health-related habits throughout the life. Unfortunately, limited interventions have been proposed based on health education theories and models in this regard (6–7), and most studies have been descriptive and analytical. Considering the vital role of mothers, their health is significantly involved in the health of infants. Maternal factors during pregnancy such ways employed for reducing the concentration of blood in diabetic mothers, reducing back pain, increasing mental activity, improving quality of life and increasing physical function, type of nutrition, strategies used to cope with stress and overall care during this period constitute an important part of the mother's lifestyle during pregnancy (8). Significant developments have been achieved in technology and studies related to exercise for pregnant women, but the most optimal methods for encouraging pregnant women to engage in physical activity is yet to be examined and there are no studies on the implementation of an effective E-learning program, one that considers the cultural dimension of society, with the aim of increasing physical activity in pregnant women in Iran. It is also necessary to develop programs for the prevalence of exercises in pregnant women. Given the importance of physical activities during pregnancy and the necessity to implement suitable interventions in line with the improvement of the aforementioned attitude among pregnant women, it is also of paramount importance to use modern methods and technologies to entice women to increase their activity levels during pregnancy, the purpose of which would be to reduce the incidence of pregnancy-related diseases and hence to reduce the rate of cesarean section in Iran and the world. As such, this studied sought to offer an answer for the following question: what are the perceptual factors (awareness, attitude) that increase physical activity in pregnant women referring to health-care centers?

Materials And Methods

This research is an applied study in terms of purpose, which employs mixed method (quantitative and qualitative) design for data collection. The research was conducted in two stages. In the first stage of the research, the literature was first reviewed, followed by semi-organized interviews with pregnant women, with the purpose of obtaining the criteria and sub-criteria for increasing physical activity in pregnant women. The method employed at this stage of research was that of qualitative. In the second stage of the research, based on the information obtained from the previous stage, the researcher finally implemented an E-learning program intervention to increase physical activity in pregnant women visiting health centers in Tehran based on the PEN-3 cultural model, and thus, the second stage of the research was a quasi-experimental study which was performed in a quantitative manner. This study was in fact a

randomized control trial (RCT). Given the nature of the research, a quasi-experimental research design (pre-test/post-test) with a control group was employed for the purposes of the study.

The study population included all pregnant women aged 18 to 40 years with gestational age of 12–38 weeks visiting health-care centers in Tehran's District 5 out of all 22 districts of the city that had eliminated their physical activity during pregnancy.

In the qualitative stage, the sample size was determined based on the necessity of data saturation, and as such, interviewing continued until it was achieved. Sampling was performed using simple random sampling among those invited to participate in the study in the health center. Thus, after sending invitations to pregnant women who were in their first pregnancy and conducting telephone follow-ups by an expert and the head of the health center, 23 people were selected from the mothers who visited the health center.

Data Collection tools

A) Semi-structured interviews with semi-structured questions for small group discussion among pregnant women and their families, along with individual interviews with health care providers and health professionals

B) Questionnaires

1. Questionnaire for examining demographic variables including personal characteristics and disease information

2. Questionnaire designed based on the results of needs assessment and dimensions of PEN-3 model

This questionnaire was a researcher-made questionnaire, with three categories and 42 items. The categories include perceptual factors with 20 items, nurturing factors with 10 items, and enabling factors with 12 items. The items are scored on a 5-point Likert scale ranging from strongly agree to strongly disagree. The validity of the questionnaire was confirmed using content validity, while its internal reliability was confirmed following a confirmatory study among 250 pregnant mothers with similar traits to that of the study group. The reliability of the questionnaire was confirmed with Cronbach's alpha coefficient (0.85). The results of validity and reliability of the tools were presented.

3. Pregnancy Physical Activity Questionnaire (PPAQ)

This questionnaire is consisted of two parts, the first part pertains to the personal characteristics and the second part is consisted of 32 items on physical activity, which itself is divided into four groups of items, namely household/caregiving activities (16 items), transportation (3 items), occupational activities (5 items) and entertainment and sports (8 items). Activity intensity was calculated based on Metabolic equivalent of task (MET), which is a unit for estimating metabolic expenditure in physical activity per unit

of time. Its reliability was determined by conducting a preliminary study on 3 eligible pregnant women, attaining a Cronbach's alpha of 0.85.

Validity and Reliability of the questionnaire

Face validity: The questionnaires were first administered among at least 15 pregnant women visiting health centers, then the face validity was determined based on the importance of the items and by calculating the impact score. Items with an impact score higher than 1.5 were deemed appropriate for subsequent analysis.

Content validity: The opinions of the panel of experts were extracted and used accordingly to determine the content validity. To quantitatively evaluate the content validity, two coefficients of content validity ratio and content validity index were used.

Content Validity Ratio (CVR): At least 15 specialists and experts responded to each item through 3 choices for each (i.e., item is necessary, item is useful but not necessary, item is not necessary). Items whose resulting scores were larger than the relevant value of the Lawshe table were considered as necessary items.

Content Validity Index (CVI): To ensure that items were optimally designed to measure structures, three criteria of relevance, clarity, and simplicity were examined using 8-point Likert scale, as each item was examined by at least 15 specialists. CVI scores higher than 0.79 was deemed appropriate.

Reliability test: To determine the reliability of data collection tool, a modified questionnaire was distributed among 30 people in the study population and Cronbach's alpha value was calculated. An alpha value higher than 0.7 was considered proper for the purposes of this study.

Data analysis method

In the first stage, qualitative data were coded immediately after each group discussion and individual interview, and these sessions were continued until data saturation. The main themes and topics were extracted using MAX-QDA software and based on deductive qualitative content analysis. Descriptive statistical methods such as mean and inferential statistics were employed to analyze the data.

Integration through inclusive themes

In the process of thematic analysis, the themes formed in the interviews were integrated under comprehensive themes, and a network of themes, namely "Factors Affecting Physical Activity Based on the PEN-3 Cultural Model" was formed, which is shown in Fig. 1.

Quantitative data analysis

In this section, structural measurement models were employed to examine the accuracy of measuring structures by the corresponding indicators.

Table 1 shows that the confirmatory factor analysis of the constructs of the questionnaires on the impact of E-learning program with the aim of increasing physical activity of pregnant women visiting healthcare centers in Tehran based on the PEN-3 cultural model has a suitable fit and thus the constructs of the questionnaire measure the relevant variables properly.

Table 1
Results of factor analysis of questionnaire structures

	Item	Factor load	T-value
Awareness-related perceptual factors	During pregnancy, it is better to do less intense physical activity than before pregnancy.	0.25	3.41
	To prevent pregnancy-related overweight, physical activity is crucial.	0.37	5.41
	Exercise during pregnancy reduces the oxygen supply to the baby.	0.45	6.69
	During pregnancy, exercises should be performed on smooth surfaces without slopes.	0.37	5.42
	Pregnant women should avoid bending and hunching during exercise.	0.26	3.74
	Those who do not exercise give birth to diabetic babies more often.	0.38	5.56
	Exercise during pregnancy facilitates natural childbirth.	0.34	4.9`
	Doing proper daily exercise will not harm the mother and fetus.	0.09	23/1
	Physical exercise alleviates pregnancy-related complications such as low back pain and pelvic pain, constipation and extreme fatigue.	0.36	5.19
	Heavy exercises should be avoided during pregnancy.	0.29	4.13
	Performing light exercises to warm up is essential before starting exercise during pregnancy.	0.45	6.58
	Stretching and strength exercises during pregnancy should be performed only in consultation with an expert.	0.34	4.89
	Exercising during pregnancy avoids the risks of high blood pressure.	0.19	2.63
	Exercise during pregnancy leads to a faster return to the mother's initial weight after delivery.	0.35	5.03
	Pregnant women should try to avoid lifting any weights during pregnancy.	0.59	8.99
	Exercising during pregnancy leads to fitness and weight control.	0.17	2.42
To prepare before exercise, performing 15 minutes of light exercises is necessary.	0.49	7.37	
It is necessary to consult with a professional before doing any exercise during this period.	0.21	2.93	

	Item	Factor load	T-value
	Exercise reduces the risk of musculoskeletal disorders.	0.30	4.28
	In the third trimester of pregnancy, the intensity of exercise should decrease.	0.39	5.69
Attitude-related perceptual factors	I believe that by exercising I can easily cope with complications like gestational diabetes.	0.56	8.90
	I believe that exercising during pregnancy reduces the fatigue caused by the pregnancy.	0.65	10.65
	I believe that by exercising during this period, I can cope with the stress and anxiety of childbirth.	0.56	8.89
	I believe that exercising during pregnancy helps me to do my daily activities better.	0.62	10.13
	I believe I can easily maintain my fitness by exercising during pregnancy.	0.54	8.57
	I believe that exercising can reduce my postpartum depression.	0.48	7.50
	I believe that I can have an easier delivery if I exercise during pregnancy	0.43	6.58
	I believe that having an active role in pregnancy care is of paramount importance in determining my health and performance.	0.48	7.51
	I believe that despite economic problems, I can maintain my health by changing my lifestyle (such as exercise, diet, etc.).	0.37	5.68
	I believe that cooperation with health care providers in doing pregnancy exercises can lead to improved health levels.	0.53	8.26

Given that all significance variables of model parameters except the item “doing daily basic exercise will not harm the mother and fetus” is greater than 1.96, the validity of the measurement structures for the relevant variables at a significant level is confirmed.

In the research model, the root mean square error of approximation (RMSEA) is 0.038 which is less than 0.1. Moreover, other fitness indicators are also listed in the table below. As can be seen, they confirm the significance and fit of the model.

Descriptive statistics of variables

The results of descriptive statistics on the pre- and post-test of the variables of “awareness” and “attitude” in the experimental and control groups are given in Table 2.

Table 2
Pre- and post-test results of variables in experimental and control groups

Variable (pre-test)	Experimental group		Control group	
	Mean	SD	Mean	SD
Awareness	24.30	12.51	22.45	13.11
Attitude	22.31	6.70	24.32	6.42
Perceptual factors	46.61	12.74	46.77	14.13
Increased physical activity	82.26	12.75	82.43	14.51
Post-test				
Awareness	30.42	10.44	25.82	11.00
Attitude	43.56	5.31	34.79	4.57
Increased physical activity	127.11	13.17	100.00	12.88

Inferential statistics

Default values for analysis of covariance

According to the values of Table 3 and considering that the level of significance for all the variables of “awareness”, “attitude”, “perceptual factors” and “increase in physical activity” is higher than 0.05, it can be concluded that the relevant variable has a normal distribution.

Table 3
Default values of covariance analysis for research variables

Variables	Kolmogorov-Smirnov	Significance level		
Awareness	0.208	0.000		
Attitude	0.089	0.000		
Increased physical activity	0.117	0.000		
Homogeneity of variances	Levene value	df1	df2	Significance level
Awareness	0.001	1	198	0.971
Attitude	0.037	1	198	0.847
Increased physical activity	0.135	1	198	0.714
Homogeneity of regression slope	Df	F	Significance level	
Awareness	1	1.723	1.191	
Attitude	1	3.595	0.059	
Increased physical activity	1	0.004	0.951	

Furthermore, according to the same table and considering that the significance level of Levene test for all the variables of “awareness”, “attitude”, “perceptual factors” and “increase in physical activity” is higher than 0.05, it can be argued that the experimental and control groups have homogeneous variances.

Considering that none of the variables of “awareness”, “attitude”, “perceptual factors” and “increase in physical activity” are significant in examining the homogeneity of regression slope ($P > .05$), we conclude that the assumption of homogeneity of regression slope holds.

Examining the hypotheses

1. Intervention based on E-learning has a significant effect on perceptual factors (awareness, attitude) with the purpose of increasing physical activity in pregnant women in the experimental group.

To test Hypothesis 1, multivariate analysis of covariance was performed while controlling the possible effect of pre-tests, the results of which can be seen in Table 4. Covariance analysis is a comprehensive type of analysis of variance in which the effect of one or more control or interfering variables and covariates is excluded from the equation while comparing the means of one or more groups and estimating one or more independent variables. In fact, this analysis is a statistical method that allows the effect of one independent variable on the dependent variable to be examined while eliminating the effect of another variable.

Table 4
Multivariate statistical indices in analysis of variance of dependent variables

Trace	Value	F	Hypothesis df	Error df	Sig.	Size
Pillai's Trace	0.202	24.859	2	197	0.000	0.202
Wilks Lambda	0.789	24.859	2	197	0.025	0.202
Hotelling's Trace	0.752	24.859	2	197	0.025	0.202
Roy's Largest Root	0.252	24.859	2	197	0.025	0.202

The results from Wilkes lambda test indicated that the effect of interventions based on E-learning on the combination of variables of perceptual factors (i.e., awareness and attitude) was significant ($F = 24.859$, $p < 0.05$). The above test allowed the use of multivariate analysis of variance (MANOVA). The size of the difference effect is proper considering the eta-value (0.202). The results of multivariate analysis of covariance in Table 5 showed that the mean scores of perceptual factors, i.e., awareness (2080.125) and attitude (2284.880) were significantly higher in pregnant women in the experimental group than those in the control group, and as such it can be concluded that Intervention based on E-learning has a significant effect on perceptual factors (awareness, attitude) that aim to increase physical activity of pregnant women in the experimental group.

Table 5
Results of multivariate analysis of covariance on dependent variables

Dependent variables	Sum of squares	Df	average of squares	F	Sig.	Size
Awareness	2080.125	1	2080.125	4.592	0.033	0.023
Attitude	2284.880	1	2284.880	45.029	0.000	0.185

2. Intervention based on E-learning has a significant effect on increasing physical activity in pregnant women of the experimental group compared to those of the control group.

According to Table 6, pregnant women ($F = 320.395$, $P < 0.05$) received a significant impact from the intervention based on E-learning in the physical activity variable. As a result, the null hypothesis is rejected and thus the research hypothesis is accepted. In other words, E-learning-based intervention has a significant effect on the level of physical activity in pregnant women.

Table 6
Results of one-way analysis of covariance for physical activity

Dependent variables	Sum of squares	Df	average of squares	F	Sig.	Size
Physical activity	36996.391	1	36996.391	320.395	0.000	0.619

Conclusion

In this study, positive, indeterminate and negative perceptual factors (awareness, attitude) affecting physical activity in pregnant women referred to health centers in Tehran were examined, and the following results were obtained:

Hypothesis 1: Intervention based on E-learning has a significant effect on perceptual factors (awareness, attitude) that increase physical activity of pregnant women in the experimental group.

Based on the research results, it can be said that there is a statistically significant difference between the experimental and control groups in the scores obtained from perceptual factors (awareness, attitude) in the pre-test and the experimental group. After instructing the intervention based on E-learning in various sessions for pregnant women, the tested perceptual factors (awareness, attitude) were evidently affected. Perceptual factors (awareness, attitude) of pregnant women were improved, thus confirming the research hypothesis. The results of the research are consistent with those of Garshasbi et al. (2014). Garshasbi et al. (2014) performed a study to examine sports beliefs and behaviors and physical activity of women during pregnancy and postpartum based on the theory of planned behavior, in which the amount of physical activity and sports beliefs of 200 women in the period 1 year after birth was assessed using the Global Physical Activity Questionnaire and the Sports Beliefs Questionnaire. The results indicated that the most common behavioral beliefs in pregnancy and postpartum are that exercise improves mood and spirit, reduces stress, controls weight and results in fitness. Wife, mother and health care workers were the most influential people (9). To elaborate, it is safe to argue that the very first step in physical activity training is to improve awareness and attitude on the importance and manner of physical activity, as improving awareness and attitude naturally leads to behavioral changes. In our country today, the amount of training required according to standard pregnancy care programs is not optimal. It seems that mothers are highly concerned about sports during pregnancy owing to their lack of knowledge about permitted sports and the relevant procedures, and since incorrect information is one of the factors affecting their behavior, it causes women to opt for a rather sedentary life during pregnancy (10). Increasing awareness and readiness during pregnancy allows the mother to go through this stage of life with fewer complications, and as such pregnancy poses a good opportunity to educate pregnant women to be aware of the benefits of proper physical activity and healthy lifestyle. Increasing women's awareness on physical activity and physical exercises during pregnancy and changing their attitude will naturally lead to behavioral changes their behavior.

Hypothesis 2: Intervention based on E-learning has a significant effect on increasing physical activity in pregnant women of the experimental group compared to those of the control group.

Based on the findings of the study, it is safe to say that there is a statistically significant difference between the experimental and control groups in the scores obtained from physical activity in the pre-test and the experimental group. After instructing the intervention based on E-learning in various sessions for pregnant women, the increase in physical activity was evident and the physical activity of pregnant women was increased, hence confirming the research hypothesis. The results of this study are in line with

those of Kazemi et al. (2007), Abbasi et al. (2015), and Taheri et al. (2016). The increase in the mean score of physical activity in the women of the experimental group indicates that the experimental group has actively sought to follow the standard activity recommendations presented in the training class. In this study, the activity of mothers in the experimental group has improved. Kazemi et al. (2007) concluded that the rate of physical activity in women without gestational hypertension was significantly higher than the group with hypertension (11). Shakeri et al. (2012) performed a study to determine the effect of physical activity training during pregnancy on the level of physical activity of pregnant women. In this interventional and quasi-experimental study, two groups of 140 pregnant women in their first pregnancy who referred to healthcare centers in Zanjan were selected and randomly divided into experimental and control groups. Based on the results, the amount of physical activity in women in the experimental and control groups before the intervention was not significantly different. But after the intervention, the amount of physical activity in the experimental group was significantly higher than the control group (12). The results of another study revealed that the administration of pregnancy training classes promotes behaviors related to a healthy lifestyle and leads to increased physical activity. It seems that using the experiences and verbal advices of midwives and studying written training materials can improve the level of physical activity of women during pregnancy. Therefore, it is necessary to recommend physical activity during pregnancy (13).

Abbreviations

PPAQ: Pregnancy Physical Activity Questionnaire; RCT: Randomized Control Trial; MET: Metabolic Equivalent of Task; CVR: Content Validity Ratio; CVI: Content Validity Index; RMSEA: Root Mean Square Error of Approximation

Declarations

Ethics approval and consent to participate

The Research Ethics Committee approved the research of this study. All pregnant women in this trial were informed about participating in the survey and gave written informed consent for the study.

Consent for publication

Not applicable.

Availability of data and materials

All data generated during the process of this research are included in this article.

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activity during pregnancy.

Competing interests

The authors declare that they have no competing.

Authors' contributions

LK comprehended the trial, completed the collection, categorized the data. SR presented supervise during data collection and collaborated to temporary and interpretation final data. SHN performed manage during the development of the study and data collection, participated in the analysis of the data. FSH prepared the draft, and edited the repetitive draft. All researchers read, concluded, and approved the final draft.

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Ethical approval for this study was registered by the Research Ethics Committee in January 2019 and has been registered with *National Research Ethics Committee* and reference number is IR.MODARES.REC.1397.091.

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Figures

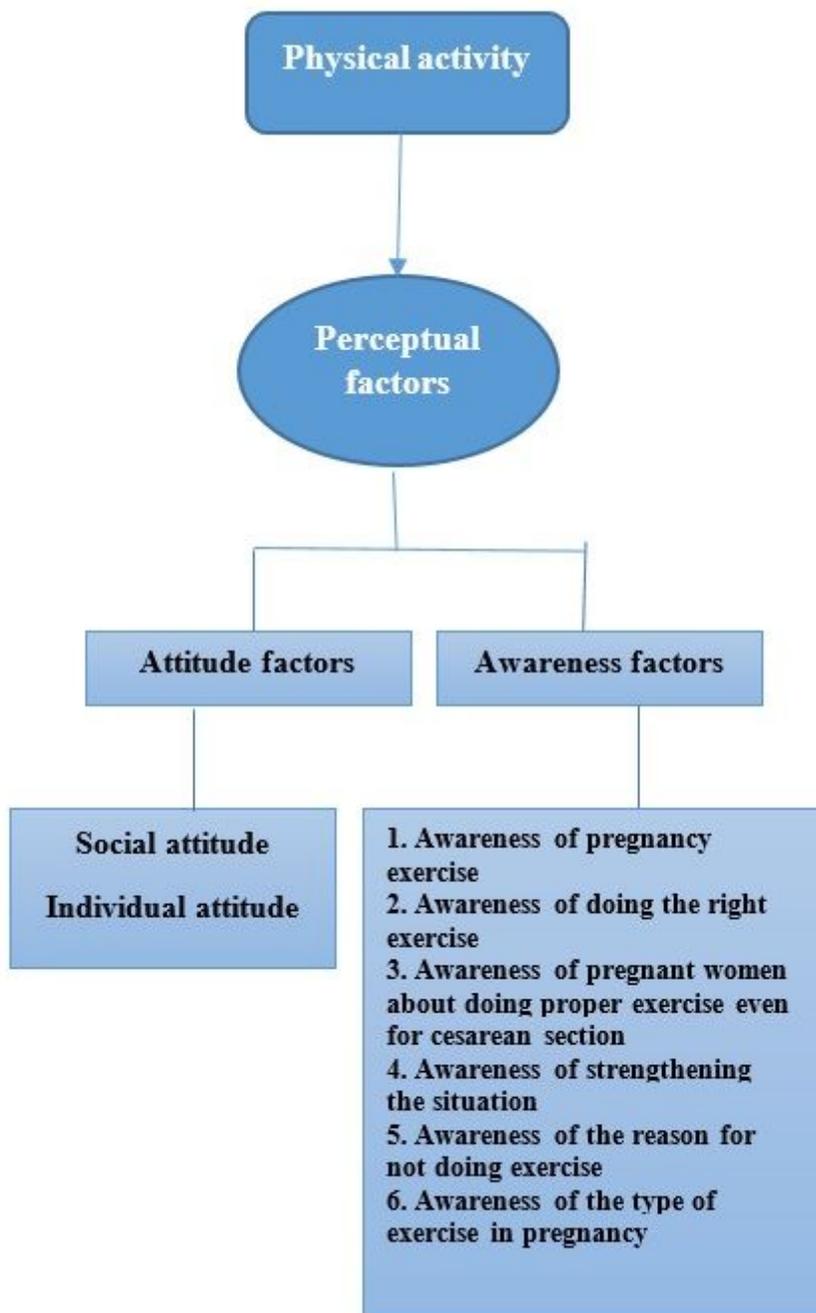


Figure 1

Conceptual model of factors affecting physical activity based on PEN-3 cultural model