# The Effect of Cognitive-Behavioral Counseling on Pre-conception Physical Activity in Women with High Body Mass Index: A Randomized Controlled Trial

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| ARTICLE INFO | ABSTRACT |
|---|---|
| | **Background & aim:** Obesity is one of the most important health problems for mothers and has been increasing in recent years. It has been showed that cognitive-behavioral counseling is an effective method to increase women's physical activity. The present study was conducted to determine the effect of cognitive-behavioral counseling on physical activity before pregnancy in women with high BMI.<br>**Methods**: This randomized control trial was carried out on 60 married women who referred to pre-conception clinic in Gonabad, Iran in 2020. Sampling was done by two-stage cluster random method and subjects were randomly assigned to two groups. The intervention group underwent six two-hour sessions of cognitive-behavioral counseling as three face-to-face and three virtual sessions. The control group only received the routine care. International Physical Activity Questionnaire (IPAQ), Depression Anxiety Stress Scale 21(DASS-21) and Silhouette Figure Rating Scale (SFRS) was used to collect data, which were completed before, immediately, after, and one month following intervention. The data was analyzed using Chi square, Fisher Exact test and T-test.<br>**Results:** There was no statistically significant difference in terms of average physical activity score between the intervention and control group before intervention. However, a significant difference was seen between intervention and control group in terms of physical activity immediately after the intervention and one month later (P < 0.001).<br>**Conclusion:** Considering that cognitive-behavioral counseling increases physical activity before pregnancy in women with high BMI, it is recommended to provide such counseling programs for these women in preconception clinics to improve their health before pregnancy. |

## Introduction

Obesity is a chronic disease that, in addition to physical and mental illnesses, reduces work capacity. Excess fat, especially in the abdomen, known as abdominal obesity, is associated with the development of hypertensive diseases, insulin resistance, and seborrhea (1). Overweight is alarmingly increasing in Iran due to urban development, lifestyle changes, changing diet patterns, and decreased physical activity (2).

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Individuals' obesity and overweight have an impact on their self-concept. Self-concept can be defined as a set of dynamic, organized, and complex learned beliefs, attitudes, and perceptions held by each individual (3-4).

Pregnancy is a unique period in women's lives, during which they experience significant physiological and psychological changes, leading to inactivity or low levels of physical activity. Interventions aimed at creating a healthy lifestyle by improving healthy nutrition, increasing physical activity, and providing psychological support are highly recommended (5). The World Health Organization (WHO) emphasizes women's health as an important and high-risk group and considers pre-conception and pregnancy obesity as the most concerning examples of female obesity globally (3). Since half of the population of these countries are women, as educators and mothers of the future generation, and since they transmit this attitude to the family, their health is of great importance (6). Women are usually prohibited from physical activity during pregnancy, and approximately 60% become sedentary during this period because they think that physical activity causes abortion or has an adverse effect on fetal health. Therefore, misconceptions are a factor that prevent women from engaging in physical activity (7).

According to the literature, cognitive aspects such as primary motivation, stress relief, body function, and life improvement positively affect physical activity, and insufficient time, costs, and a lack of encouragement are the factors inhibiting physical activity. Therefore, a multifaceted program is required to develop problem-solving abilities and maintain physical activity (8).

Cognitive-behavioral therapy (CBT) uses various behavioral techniques to modify behaviors by changing antecedents and outcomes and designing cognitive techniques that can identify, evaluate, and ultimately reconstruct dysfunctional beliefs. CBT also employs strategies to generalize the learned skills and behaviors to everyday life and sustain them over time (9). Since obesity and a lack of physical activity originate from dysfunctional cognitions and behaviors, it is recommended to change and modify these factors, which form the basis of counseling.

According to the evidence from the literature, CBT teaches cognitive and behavioral strategies to achieve and sustain positive lifestyle modifications. This approach is based on training problem-solving skills, self-monitoring, coping with negative automatic thoughts, and cognitive reconstruction (10). Gramp et al. (2006) concluded in their study that the level of physical activity was improved following CBT, which is low-cost, person-centered, and appropriate for eliminating negative thoughts at different times of life to increase self-efficacy (11).

Golkarian et al. (2018) in their study on the effectiveness of cognitive behavior therapy and diet therapy on weight reduction and promotion of lifestyle self-efficacy in obese people found that CBT compared to diet therapy significantly reduced weight and improved lifestyle self-efficacy in obese people. Their results also indicate the importance of both approaches, especially CBT, in promoting weight loss and lifestyle self-efficacy in obese people (12).

Since in the current health care system of our country there is no specific care strategy or program to change the behavior associated with pre-conception physical activity in obese and overweight individuals, there is a need for a model to change behavior. In the methods studied in reviewing the texts, the individual's awareness is often increased, and the amount of physical activity may decrease if the awareness decreases. Therefore, it is better to use a method in which the authorities are actively involved and focused on problem solving.

This study was performed to determine the effect of cognitive-behavioral counseling on pre-conception physical activity in women with high body mass index referred to comprehensive health service centers.

## Materials and Methods

This randomized control trial was performed from June to August 2020. This research has been approved by the ethics committee of Mashhad University of Medical Sciences under the code 980850.

This study was carried out on 60 married women who referred to pre-conception clinic in Gonabad Comprehensive Health Services Center No. 2.

Sampling was done by two-stage cluster random method. Since there was three

comprehensive health service centers in Gonabad, Iran, one center was selected by a simple random sampling using common lottery method. In the second stage, 75 subjects were selected by non-probability purposive sampling, who were assessed for eligibility from those five were excluded and the remained 70 subjects were randomly assigned to two groups (Figure 1).

The sample size was calculated based on a two-group clinical trial study conducted by Gramp et al. (2006) (11), in which about 30 people were included in each group. The sample size was calculated considering alpha = 0.05 and beta = 0.2. Since the calculated sample size was 30, taking into account the 17% drop, 35 people were considered in each group.

Inclusion criteria included consent to participate in the study, being Iranian and a resident of Gonabad, having at least diploma education, having no restrictions on mobility due to the physical illness, having an age range of 18–40 years, a body mass index of 25 and above, referred for pre-conception care, no problem to do physical activities, no abuse of drugs, alcohol, and tobacco use such as cigarettes and hookah, no obesity due to hypothyroidism or use of certain drugs such as corticosteroids, no mental illness, and having a normal or mild score of the Depression Anxiety Stress Scale 21 (DASS-21) .

Exclusion criteria included reluctance to continue participating in the study, becoming pregnant, the occurrence of any mental illness requiring medication during the intervention, not taking part in more than one counseling session, and participating in a physical activity program or sports club.

Group counseling sessions were conducted for all members of the intervention group in six two-hour sessions, twice a week for three weeks, by the midwife researcher (Table 1). In-person sessions were prohibited at the time of the study due to the COVID-19 pandemic; therefore, only the first three counseling sessions were held in person in groups of six people at specific hours and days in compliance with health protocols. Then, the remaining three sessions were held in absentia in the media of "tv3.livekade.ir." For this purpose, a group was set up on social networks to hold counseling sessions online through non-face-to-face methods. In the group on social

networks, the questions of the research subjects were answered, and homework and feedback were given to the research subjects electronically.

Data collection tools included demographic questionnaire, the International Physical Activity Questionnaire (IPAQ), DASS-21, and Silhouette Figure Rating Scale (SFRS). The demographic questionaire included eight questions (Age, BMI, individual education degree, husband's education degree, Occupation, husband's occupation, shape profile and household income). The International Physical Activity Questionnaire (IPAQ) was used to assess the level of physical activity. The IPAQ covered the activities performed in the last seven days, including 27 questions in three sections including section 1 Physical activity related to daily tasks; section 2: Physical activity for transportation (commuting); and section 3: Recreation, exercise, and physical activity in leisure time. This tool is based on scores classified into three levels of physical activity, as follows:

- Light activity (Category 1): This is the lowest level of physical activity, and those who do not meet Category 2 or 3 are considered inactive.
- Moderate activity (Category 2): Individuals in this category engage in three or more days of intense activity for at least 20 minutes a day, five or more days of moderate-intensity activity, or walk for at least 30 minutes a day, or five or more days of a combination of moderate-intensity or high-intensity weekly activity.
- Intense activity (Category 1): This category includes relatively intense activity for at least three days or seven or more days of a combination of walking, moderate, or high-intensity activity.

According to the IPAQ scoring protocol, a person's physical activity can be extracted and reported as the total rate of physical activity in the last week in terms of MET-min/week. The MET unit is the rate of energy expenditure for physical activity. The rate of a MET is approximately equal to the rate of energy consumed by a person at rest.

**Table 1.** Content of counseling sessions

| The session | Content of the session |
|---|---|
| The first session | Establishing communication and educating the client: the importance of physical activity and weight control before pregnancy; an explanation of cognitive behavioral counseling; and motivation to start the physical activity with this method. <br> Evaluation of the physical activity level of the client. <br> Homework: the amount of daily physical activity until the next session, make a note. |
| The second session | Behavioral activation: a review of assignments and previous session's handouts; behavior activation training; identification of target activities; setting realistic goals; planning to carry out activities <br> Homework: preparing a table of physical activities and the times they can consider them. |
| The third session | Cognitive Reconstruction: homework reviews, the role of negative thoughts in a person's behavior and how to deal with them, identifying negative thoughts. <br> Challenging negative thoughts; how to manage stress and teach relaxation and abdominal breathing techniques. <br> Homework: Daily recording of incidents Thoughts and feelings and challenging thoughts. |
| the fourth session | Continuing the cognitive reconstruction: checking homework; recognizing cognitive errors and discussing them; challenging negative thoughts and replacing them with logical thoughts; a worksheet dealing with negative thoughts; and recording the successes achieved in physical activity. |
| The fifth session | Problem Solving Skills: reviewing homework and providing feedback/teaching problem solving skills, defining the problem, finding different solutions, and deciding on a solution. <br> Designing an action plan to implement the solution and evaluating the consequences. |
| The sixth session | Homework review/evaluation of the physical activity of the group members and summarizing the points of the previous sessions/completing the physical activity questionnaire. |

Physical activity can be categorized as a multiple of resting energy expenditure. The total amount of physical activity is calculated as follows: The total amount of physical activity in the last week was: $(8×30×5) + (3.3×30×5) + (4×30×5) = 2295$ MET-minutes / week.

The DASS-21 questionnaire consisted of 21 questions. Questions 3, 5, 10, 13, 16, 17, and 21 are related to the depression subscale; questions 2, 4, 7, 9, 15, 19, and 20 to the anxiety subscale; and questions 1, 6, 8, 11, 12, 14, and 18 to the stress subscale. The questions are answered with four options. The range of responses varies from "never = 0" to "always = 3." Scores 6-8, 4-5, and 5-6 are mild depression, anxiety, and stress, respectively, and scores greater than 10, 14, and 17 are severe depression, anxiety, and stress, respectively.

Silhouette Figure Rating Scale (SFRS) was used to examine the perceived body image. On this scale, there were nine body images that each person

selected based on their perception of her body, in which figures 1 and 9 indicated the thinnest and fattest individuals, respectively (13).

The IPAQ tool was developed by an international physical activity team in Geneva in 1998, and its validity and reliability have been confirmed in 12 countries. The reliability of the questionnaire by Estebsari et al. (2010) was assessed by a test-retest method (r=0.86) (14).

Sahebi et al. (2005) confirmed the reliability of DASS-21 questionnaire for the Iranian population. Subjects answered each of these items on a 4-point Likert scale from 0 (does not apply to me at all) to 3 (completely applies to me). Cronbach's alpha coefficient for each component of depression, anxiety, and stress was 0.81, 0.74, and 0.78, respectively (15).

A Balas scale with an accuracy of 100 grams, which had scientific validity, was used for weighing the participants. The first author performed all weight measurements. The women

were weighed with minimal clothes and without shoes, and an inelastic tape meter with scientific validity was also used to measure height. To prove the reliability of the scale, a weight of 500 g was selected and checked daily before and during the study for accuracy and precision. The tape meter was checked with a plastic ruler before each use to prove its reliability.

In the study of Eskandrenejad et al. (2013), the concurrent validity of SFRS was obtained with a body mass index of r=0.7 (15). Seven members of the faculty of nursing and midwifery in Mashhad reevaluated the validity of SFRS.

At the beginning of the study, the researher the height and weight of subjects were measured. Subjects filled out IPAQ by self-report online before, immediately, and one month after intervention. The duration of filling out the questionnaire was about 11 minutes.

To meet ethical considerations, the confidentiality and privacy of the subjects were maintained. Additionally, after the end of the study, a group counseling session was held for the control group using cognitive-behavioral method.

Data were analyzed by SPSS software (version 21). The normality of quantitative variables was determined by the Kolmogorov-Smirnov test. The frequency distribution table and mean and standard deviation were used to describe the characteristics of the research units. For homogeneity of quantitative variables between the two groups in terms of intervening and contextual variables, an independent t-test was used if the data were normal; a Mann-Whitney test was used if the data were not normal; and Fisher and Chi-square tests were applied for homogeneity of qualitative variables.
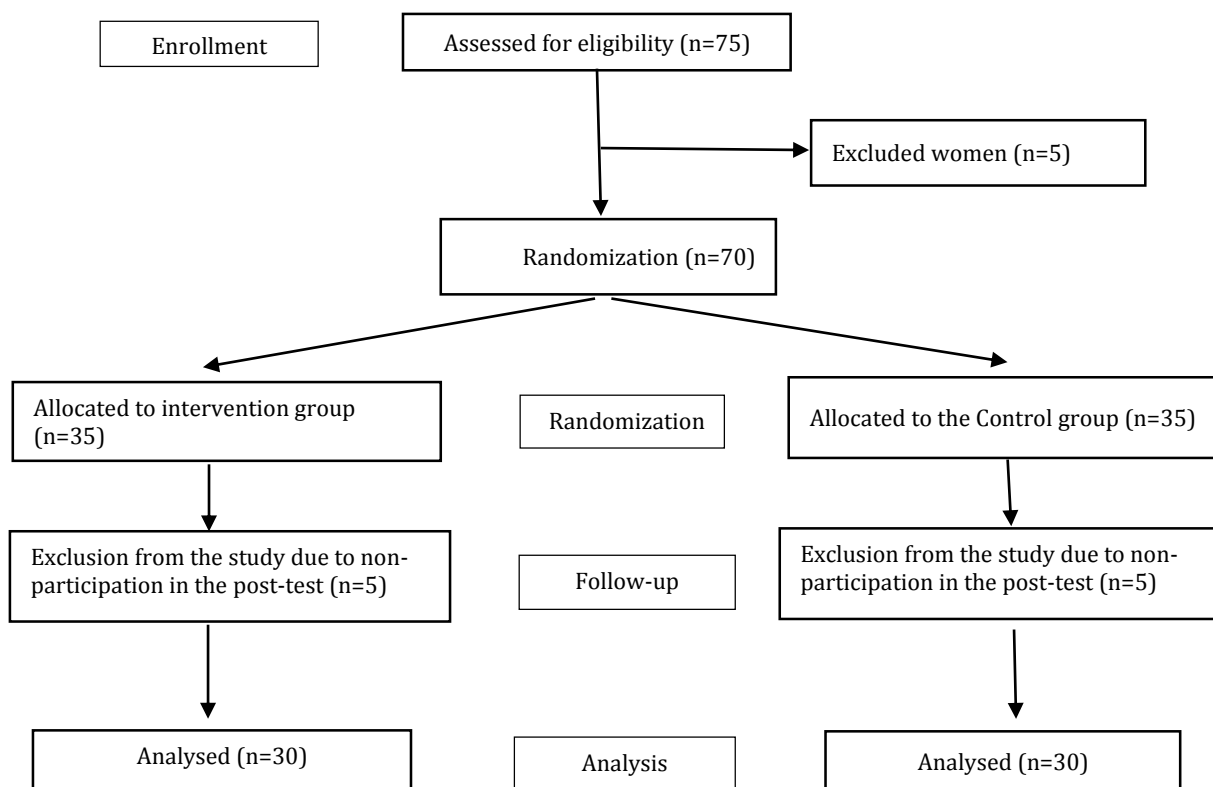


**Figure 1.** Patients' selection flow chart

The independent t-test and paired t-test or its non-parametric equivalent, as well as Mann-Whitney and Wilcoxon tests, were used to achieve the objectives of the study in both the pre-and post-intervention stages in the two groups. Pearson or Spearman correlation factors were used to determine the correlation of dependent variables or intervening variables in the pre-and post-intervention stages. The relationship between dependent variables and intervening and contextual variables in more than two groups was determined by one-way analysis of variance (ANOVA) and in two groups by an independent t-test or their equivalents, Kruskal-Wallis and Mann-Whitney, respectively. $P<0.05$ was considered statistically significant.

## Results

The mean age of research units was 25.17±7.06 years and 28.40±6.88 years in the intervention and control groups, respectively. The mean BMI of the research units was 28.39±3.46 kg/m2 and 27.24±2.11 kg/m2 in the intervention and control groups, respectively. According to the results of the independent t-test (Table 2), there was no statistically significant difference between the two groups in terms of mean BMI (P=0.12).

In terms of education level, 73.3% of the subjects (n=22) in the intervention group and 90% (n=27) in the control group had high education, while 66.7% of the subjects' spouses (n=20) in the intervention group and 63.3% (n=19) in the control group had high education. Approximately 40% of the subjects (n=12) in the intervention group were housewives, while 50% of the subjects (n=15) were employed in the control group. In the intervention and control groups, the occupations of most of the subjects' spouses were those of employees (50% and 40%, respectively), and 30% and 33%, respectively, were self-employed.

**Table 2.** Demographic data of the subjects in the intervention and control groups

| Variable | Intervention | Control | Test Result |
|---|---|---|---|
| | No. (%) | No. (%) | |
| **Age (Year)** | 25.17±7.06 | 28.40±6.88 | T=1.79, P*=0.078 |
| **BMI** | 27.24±2.11 | 28.39±3.46 | T=1.76, P*=0.12 |
| **Educational level** | | | |
| Diploma | 8 (26.7) | 3 (10) | $\chi^2$=.2.78, P**=0.095 |
| High Education | 22 (73.3) | 27 (90) | |
| **Husband's education level** | | | |
| Diploma | 10 (33.4) | 11 (36.6) | $\chi^2$= 0.58, P**=0.74 |
| High Education | 20 (66.7) | 19 (63.3) | |
| **Occupation** | | | |
| Housewife | 12 (40) | 11 (36.11) | |
| Student | 8 (26.7) | 4 (13.3) | $\chi^2$= 2.37, P**=0.30 |
| Employed | 10 (33.3) | 15 (50) | |
| **Husband's occupation** | | | |
| Unemployed | 1 (3.3) | 1 (3.3) | |
| Labor | 5 (16.7) | 7 (23.3) | $\chi^2$=0.72, P**=0.87 |
| Employed | 15 (50) | 12 (40) | |
| Self-employed | 9 (30) | 10 (33.3) | |
| **Shape profile** | | | |
| Light weight | 7 (23.3) | 0 (0.0) | |
| Normal weight | 13 (43.3) | 25 (83.3) | Fisher's Exact Test =37.13, P***=0.001 |
| Over weight | 8 (26.7) | 5 (16.7) | |
| Obese | 2 (6.7) | 0 (0.0) | |
| **Household income** | | | |
| Less than enough | 2 (6.7) | 1 (3.3) | |
| Enough | 24 (80) | 21 (70) | $\chi^2$= 1.86, P**=0.39 |
| More than enough | 4 (13.3) | 8 (26.7) | |

*T-test; **Chi-square test; ***Fisher Exact test

The intervention group had a normal body image of 43.3% (n=13), while the control group had a normal body image of 83.3% (n=25). The results showed that the intervention and control groups were homogeneous in terms of individual education (P=0.095), husband education (P=0.737), occupation (P=0.297), husband occupation (P=0.869), income (P=0.388), and sports activity (P=0.309).

Approximately 70% (n=21) in the intervention group and 60% (n=18) in the control group had intense physical activity before the intervention (P=0.358). There was a significant difference between the intervention and control groups in terms of physical activity after the intervention and one month later (P <0.001) (Table 3).

**Table 3.** Comparison of physical activity pre-intervention, immediately and one month after intervention in the two groups

| Variable | Pre-intervention | | Immediately after intervention | | A month after intervention | |
|---|---|---|---|---|---|---|
| | Intervention | Control | Intervention | Control | Intervention | Control |
| | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) | No. (%) |
| Intense Physical Activity | 21 (70.0) | 18 (60.0) | 29 (96.7) | 18 (60.0) | 30 (100.0) | 19 (36.7) |
| Moderate and Light Physical Activity | 9 (30.0) | 12 (40.0) | 1 (3.3) | 12 (40.0) | 0 (0.0) | 11 (36.7) |
| Chi-Square Test Result | $\chi^2$=0.659, P=0.417 | | $\chi^2$=11.882, P=0.001 | | $\chi^2$=13.469, P<0.001 | |

The results of the ANOVA with repeated measures indicated that the score of physical activity in the intervention group was significantly different before, immediately post, and one month after the intervention (P<0.001). However, there was no statistically significant difference in the control group (P=0.061) (Table 4).

According to the results of the independent t-test, there was no statistically significant difference between the intervention and control groups in terms of physical activity score before the intervention (P=0.57), while this difference was significant after the intervention (P=0.03). Moreover, in the intervention group, changes in physical activity immediately post-intervention were statistically significant compared to before the intervention (P<0.001) and compared to one month post-intervention (P<0.001) (Table 4).

**Table 4.** Comparison of physical activity mean before, immediately, and one month after the intervention in the two groups

| Physical Activity Score | Intervention $\overline{X} \pm SD$ (# MET) | Control $\overline{X} \pm SD$ (#MET) | P-value |
|---|---|---|---|
| Pre-intervention | 7250.53±5750.10 | 8406.88±9744.70 | P*=0.57 |
| Immediately after intervention | 12507.60±7313.89 | 8017.31±8870.90 | P*=0.03 |
| A month after intervention | 12441.23±7331.20 | 7983.88±8870.90 | P*=0.03 |
| ANOVA with repeated measures | P<0.001 | P=0.061 | |

*: T-test. # Measure the duration of physical activity in minutes per week.
MET unit is a unit used to estimate the energy consumption of physical activity. The value of one MET is approximately equal to the amount of energy consumption at rest in a person.

## Discussion

The present study was performed to determine the effect of cognitive-behavioral counseling on pre-conception physical activity in women with a high BMI referred to the comprehensive health service centers in Gonabad, Iran. Based on the results a significant difference was seen between intervention and control group in terms of physical activity immediately after the intervention and one month later in women with high BMI.

Filippa-Pimenta et al. (2012) found that CBT played a significant role in the weight loss of the women participating in their study. They suggested that eating disorders disappeared in people in the CBT group compared to those in the control group (17). In general, the results showed

the effective role of CBT in the treatment of eating disorders followed by a decrease in BMI (17-18). Anthony et al. (2007) also reported that CBT can play an effective role in the treatment of obesity. Accordingly, people who received CBT had more weight loss (19), which is consistent with the results of the present study, indicating that CBT can, directly and indirectly, reduce BMI by affecting the wrong nutritional behaviors (20).

According to the results of this study, the weight loss in the intervention group one month after the intervention was not statistically significant, but the weight loss of 1-2 kg was clinically acceptable and satisfied the participants. These findings could be attributed to the short period of study, as weight changes usually occur over time and are only achieved through physical activity, whereas weight change also necessitates a change in diet. Sohrabi et al. (2018) found that CBT improved self-concept and changed personal beliefs about appearance and self-efficacy of weight in addition to weight loss and retention (4). According to CBT results, it effectively reduces BMI, promotes weight loss and retention, and improves self-concept in overweight people (21).

In line with the current research, Gramp et al. (2006) in America conducted a study entitled group intervention of physical activity based on cognitive-behavioral approach. The purpose of this study was to compare the effect of group-based cognitive-behavioral intervention with a standard physical activity training program after birth (standard exercise treatment). The purpose of the cognitive behavioral counseling sessions was to focus on the participants to develop self-regulation skills for self-management and overcoming specific postpartum barriers to physical activity. The results showed that the participants of the cognitive-behavioral approach compared to the standard sports activity had a significant change in frequency and volume of physical activity. The results of this research are consistent with the current study and show the effect of cognitive behavioral counseling on physical activity. One of the limitations of this research was the voluntary participation of subjects which reduces the presence of unmotivated people in the study (11).

Raphael Rossini et al. (2011) showed that applying cognitive behavioral therapy, in addition to being effective in treating depressed people, can also be effective in reducing body mass index. During CBT, much attention was paid to motivating participants to expand their efforts towards healthy habits and reducing barriers to physical activity. The most motivation was seen among spouses. Based on the results, CBT for weight loss showed a positive effect on the lifestyle habits of the participant's family members, reducing energy consumption and promoting a more favorable attitude towards physical activity. The results of this research are consistent with the present study (22-23).

Contrary to the results of the current study, Tsiros et al. (2008) in America conducted a study to investigate the effectiveness of cognitive behavioral programs in improving body composition, diet, and physical activity in obese and overweight teenagers. Cognitive-behavioral intervention on teenagers' steps showed that the amount of physical activity did not increase. In this study, although CBT improves the body composition of adolescents, it was clearer that behavior change plays a role in this success, and changes in this range were due to other behavioral changes rather than increased physical activity. Also, because cognitive-behavioral counseling has had a direct relationship with a person's level of education in the previous studies, the lack of results in studies conducted on teenagers can be due to the low level of education, and further study on the adults can be helpful in this regard (24).

One of the strengths of the present study was conducting the intervention by the midwife researcher and the provision of routine care by other midwives to prevent bias in the intervention. One of the limitations of the current research is self-reporting, which may cause bias. Furthermore, a one-month follow-up may not be sufficient to assess behavioral maintenance. Women with a high BMI need to change their beliefs, attitudes, and physical activities, so consulting on a large scale with a variety of tools and prolonging the follow-up time is suggested for further research.

## Conclusion

The present study showed that cognitive-behavioral counseling can be effective in increasing

pre-conception physical activity in women with a high body mass index. The results of the study can be used in health planning and policymaking to provide such counseling programs for patients in health centers, in order to improve the health of women before pregnancy.

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## Conflicts of interest

The authors declared no conflicts of interest.

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