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The impact of training based on the transtheoretical model on increasing physical activity in overweight and obese housewives

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Abstract

Background Due to the nature of their activities, housewives are often at higher risk of weight gain. Considering the importance of interventions and the role of housewives in the family, the present study was designed and conducted to examine the impact of training based on the Transtheoretical Model on increasing physical activity in overweight and obese housewives.

Methods This quasi-experimental study was conducted on 120 overweight and obese housewives attending comprehensive health centers in Yazd, Iran. The sampling method was multi stage, and participants were randomly assigned to two groups: intervention (60 participants) and control (60 participants). The educational intervention consisted of six 90-minute sessions held over one and a half months (one session per week) in person. The educational content provided to the intervention group was based on the Transtheoretical Model. Data collection tools included standardized physical activity and behavior change questionnaires based on the Transtheoretical Model, Data were analyzed using SPSS version 27 with paired t-tests, independent t-tests, and chi-square tests.

Results Independent t-test results showed after the intervention, the differences between two group were statistically significant ($P=0.001$). Additionally, independent t-test results showed no significant difference in physical activity levels between the intervention and control groups before the educational intervention ($P=0.312$), whereas the difference became statistically significant after the intervention ($P=0.001$).

Conclusion The findings of this intervention demonstrated that interventions based on the Transtheoretical Model effectively improve behavior, identify barriers and benefits of physical activity, and enhance self-efficacy in overweight and obese housewives. This study revealed that the Transtheoretical Model, through identifying perceived barriers and benefits (via the training provided) and, most importantly, improving self-efficacy and behavior, led to an increase in physical activity among housewives.

Keywords Obesity, Overweight, Educational intervention, Transtheoretical model, Women

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Introduction

Middle age is one of the most critical periods in women's lives [1–3]. This age group constitutes half of the population in developing countries [4, 5]. So, achieving health for all social groups is a priority [6, 7]. One of the challenges that middle-aged housewives often face is overweight and obesity [8]. The prevalence of obesity varies across different regions of the world. Liu et al. (2023) reported a global prevalence of obesity among middle-aged women at 9% [9]. In Kuwait, 40.6% of woman were overweight and 42.1% were obese [10] and among Tanzanian women were 50.4% [11]. In Iran, many of people suffered from overweight and obesity [12]. The age-weighted prevalence of overweight and obese among women was (37.5% and 35.5%) compared to men (47and 22.9%) [13], in 2017, about 64.0% of men and 81.2% of women were obese or overweight [14]. Abiri et al. (2023) reported overweight and obesity prevalence rates of 20.1% and 13.44%, respectively, in Iran [15]. In a study by Abdollahi et al. (2023), the prevalence of obesity among Iranian middle-aged women was 23.3%, and the prevalence of overweight was 48.5% [16]. Similarly, Dastgheib et al. (2021) reported a 62.7% prevalence of overweight among women in southern Fars Province [17].

Overweight and obese middle-aged women face numerous challenges [18]. Such as infertility [19], psychiatric disorders like depression [20], fatty liver disease, prediabetes, and hypertension [21], cardiovascular diseases [22], certain cancers [23], fertility disorders [24], and diabetes [25].

So preventing obesity and implementing interventions to control it and promote preventive behaviors among middle-aged women is essential [26].

One of the most significant health interventions for overweight and obese individuals is engaging in adequate physical activity and preventing physical inactivity [27]. Despite this, the global age-standardized prevalence of insufficient physical activity was 31·3% in 2022 [28]. He et al. (2021) reported that 63.6% of the Chinese population had low levels of physical activity [29]. Al-Tamimi et al. (2022) found that only 14% of the population in the Philippines engaged in physical activity at minimal levels [30]. In Iran, based on the results of the 2021 National Survey of Non-Communicable Disease Risk Factors, the prevalence of physical inactivity in individuals over 18 years of age was 56.3%. Notably, the prevalence was significantly higher among women (63.8%) compared to men (46.8%) [31]. Factors associated with physical activity follow a network of causality, encompassing environmental and individual factors. Environmental factors include access to sports facilities, parks, green spaces, safe cycling and walking paths, necessary regulations, and skilled coaches. Individual factors involve awareness and attitudes toward the benefits of physical activity, understanding the risks of inactivity, self-efficacy, and the ability to overcome barriers to physical activity [31]. As physical activity is connected to obesity and overweight [32, 33], we can say developing interventions to increase physical activity levels in overweight and obese women is a public health priority [34], many studies proved this link [35–38], However, implementing certain interventions faces barriers. Addressing these barriers requires cognitive and behavioral processes that emphasize individual reassessment of the benefits of adopting new behaviors and personal and environmental capabilities (balance and decision-making). These considerations have led researchers and health professionals to favor behavioral change theories for improving physical activity across diverse populations.

One model successfully employed in physical activity interventions is the Transtheoretical Model [39]. This model emphasizes individual decision-making abilities over social and biological influences on behavior and provides a simple yet effective method for classifying target populations for intervention and planning [40]. According to this model, change is a process, not an event, and individuals go through different stages of change. Relapse can occur at any stage, which should be considered a natural occurrence, allowing individuals to gain experience and progress to the next stage [41, 42]. The Transtheoretical Model comprises five stages of behavior change (pre-contemplation, contemplation, preparation, action, and maintenance) and cognitive and behavioral processes, enabling individuals to progress through these stages [43]. Research indicates that combining stages and processes of change effectively guides exercise interventions. The most effective educational programs are theory-driven, rooted in behavior change models [44–47].

Finally choosing an appropriate health education model is the first step in designing an educational program, with effective communication strategies depending on mastery of the best theories and approaches. Adopting and maintaining an active lifestyle through progressing individuals along the stages of readiness for physical activity is possible. Given that women constitute half of the population and play a pivotal role in personal health and family health patterns, it is essential to conduct appropriate studies and interventions to promote the health of this group. Therefore, the present study was designed to determine the effect of an educational intervention based on the Transtheoretical Model on increasing physical activity in overweight and obese housewives.

Methods

Research method

This quasi-experimental study (as the sampling was non-random but group assignment was random) was

conducted in 2024 among overweight and obese housewives in Yazd, Iran.

Participants

The target population consisted of middle-aged housewives (aged 30–50 years) who were overweight or obese and attending comprehensive health centers in Yazd during 2023–2024. The sample was drawn from eligible housewives who met the inclusion criteria: having an active health record at the centers, being 30–50 years old, possessing a medical certificate confirming overweight or obesity, and committing to regular attendance in the educational program. Exclusion criteria included lack of consent to participate, missing more than two sessions of the educational program, experiencing traumatic events during the intervention (as confirmed by verbal questioning), relocating outside the study area, and incomplete pre- or post-tests.

Sample size and sampling method

The sample size was calculated using the following formula, with a 95% confidence level, 80% power, and a 10% attrition rate. Based on a similar study by Zarei et al. (2022), which examined the effect of a Transtheoretical Model-based intervention on knowledge, attitudes, and practices for exclusive breastfeeding among third-trimester mothers in Golestan, 60 participants per group were determined [48]. The sampling method was Multi-stage (include: cluster sampling, randomize sampling). Since Yazd has several comprehensive health centers, each center was considered a cluster. Two centers were randomly selected, with one designated as the intervention group and the other as the control group. From each center, 60 participants were randomly chosen to form the groups (in intervention group: 20 person had overweight and 60 woman had obesity, in control group 26 person had overweight and 34 woman had obesity).

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 (\delta_1^2 + \delta_2^2)}{(\mu_1 - \mu_2)^2}$$

Data collection tools

The questionnaire used in this study has previously been published [49, 50].

Data were collected using a questionnaire comprising the following components:

1. **Demographic Information Questionnaire**: This included demographic characteristics such as age, employment and educational status, smoking habits, and income level.
2. **Stages of Change Questionnaire**: the questionnaire consisted of two parts. The first part was based on the change structures of the participants' physical activities. This part comprised of 4 sections: behavioral change (12 items, including awareness-raising, dramatic relief, environmental re-evaluation, self-reassessment, and self-liberation), perceived benefits of physical activity (17 items covering physical, mental, financial, and social benefits), barriers to physical activity (28 items related to workplace/school, walking or cycling, home activities, and leisure time), and self-efficacy (4 items). This questionnaire was translated by experts and its Cronbach's alpha coefficient was 0.72% based on a pilot study [49]. The Kappa coefficient on the validity of the stages of change questionnaire was also obtained to be 76 by Ghahremani et al. in a study aimed at enhancing physical activities [50]. The second part of the questionnaire was the short form of the International Physical Activity Questionnaire, which determined the physical activities of the research samples per week based on MET-min/week. Metabolic Equivalent of Task (MET) is a unit used to estimate energy consumption in physical activities. If an individual's MET is equal to one, it means s/he is inactive. In case the MET is higher than one and less than three, there is low level of physical activity. If the MET is greater than or equal to three and less than six, the intensity of physical activity is moderate, and if the MET is greater than 6, the intensity of physical activity is high. To calculate the intensity of activities, the MET value of each activity is multiplied by the time spent in one day or within a week. This questionnaire was translated by experts and its Cronbach's alpha coefficient was 0.72% based on a pilot study [49].

Educational intervention

The intervention was designed based on a similar study by Rakhshani et al. (2021) [49] and was as follows:

The intervention program was conducted for a 2-month period for the intervention group. It consisted of 6 face-to-face consultation sessions, each for 90 min in a month, and 1 follow-up sessions (weeks 5–8) after the consultation sessions for the intervention group. The first consultation session included the completion of a questionnaire for each individual to determine their health status. Then, the researcher, with the help of a training center specialist and a physical education instructor, delivered a speech on physical activity and highlighted its importance, and provided a basis for preparing the participants to change in order to do physical activities. The second session involved a group discussion between the participants in the study and expressing their views on whether physical activity was beneficial or not, so that each participant would reach a decision-making balance

and perceived self-efficacy. In the event of a gap in the decision of each participant, the researcher and the psychologist of the center explained and advised them on how to increase their will. The participants were also guided to outline their goals to have physical activities and specify their direction. Group discussion on the benefits of physical activity, fostering decision-making balance, and perceived self-efficacy. In the third consultation session, the researcher evaluated the levels of the participants' thinking and preparation to change by displaying educational videos. In the fourth session, discussion on Behavioral change. The 5 and 6 session focused on reaching the goals of the previous three sessions. During the weeks 5–8, the researcher reviewed the extent of the participants' progress in physical activity and re-evaluated the level of their activities as well as the stage of change. The researcher also encouraged them and tried to find out the reasons for their failure. At the end of the 8th week, the researcher completed the questionnaire on the level of physical activity and the stages of change for the intervention and control groups. It should be noted that after the end of the intervention, the control group was given some sports and health pamphlets.

The sessions covered the following topics:

Session	Goal	Educational Topic	Duration (minutes)	Teaching Method	Instructor
1	Introduction to the program	Initial familiarity, building trust, and session objectives	90	Lecture, Q&A	Research team and expert
2	Importance of physical activity	Group discussion on the benefits of physical activity, fostering decision-making balance, and perceived self-efficacy	90	Lecture, group discussion, Q&A	Psychologist and researcher
3	Readiness for physical activity	Assessment of readiness and mindset for change through educational videos	90	Video presentations	Physical education expert and researcher
4	Behavioral change assessment	Identifying individual goals and addressing gaps with support from a psychologist	90	Lecture, group discussion, Q&A	Researcher
5 & 6	Review and consolidation	Evaluating progress, discussing barriers and achievements, and encouraging participants	90	Lecture, group discussion, Q&A	Researcher

Data collection procedure

Ethical approval was obtained from the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.SCHEANUT.REC.1403.026). Permissions were secured from comprehensive health centers. Participants were invited to join the study through verbal communication. Standardized questionnaires were uploaded online (Porseshnameonline.com) for participants to complete. Each questionnaire required approximately 120 min, and participants had five days to complete them.

Data analysis

Data were analyzed using SPSS software, version 27. Descriptive statistics, including means, standard deviations, and frequencies, were employed to summarize the demographic and baseline characteristics of the participants. The normality of the data distribution was assessed using the Kolmogorov-Smirnov test. For the comparison of qualitative variables between the intervention and control groups, the chi-square test was utilized. Quantitative

Table 1 Comparison of demographic characteristics of participants in the intervention and control groups

Variable		Intervention Group (Mean ± SD or %)	Control Group (Mean ± SD or %)	*P*-value
Age (years)		39.80 ± 4.69	40.20 ± 4.78	0.645
BMI		29.06 ± 2.64	29.72 ± 2.35	0.913
BMI Category	Overweight	33.33%(20)	43.33%(26)	0.617
	obesity	66.66% (40)	56.66%(34)	
Marital Status	Single (%)	16.66% (10)	18.33% (11)	0.321
	Married (%)	83.33% (50)	81.66% (49)	
Education Level	Primary (%)	55% (33)	66.70% (40)	0.607
	Secondary (%)	25% (15)	20% (12)	
	High School (%)	11.7% (7)	8.3% (5)	
	University (%)	8.3% (5)	5% (3)	
Smoking History	No (%)	83.3% (50)	81.6% (49)	0.596
	Yes (%)	16.7% (10)	18.3% (11)	
Medical History	No (%)	80% (48)	78.3% (47)	0.822
	Yes (%)	20% (12)	21.7% (13)	
Income Level	Low (%)	1.7% (1)	3.3% (2)	0.336
	Moderate (%)	68.3% (41)	66.6% (40)	
	High (%)	30% (18)	30% (18)	

Table 2 Comparison of the constructs of the transtheoretical model in the intervention and control groups before and after the intervention

Construct	Group	Before Intervention (Mean ± SD)	After Intervention (Mean ± SD)	*P*-value**
Behavior	Intervention	18.75 ± 3.12	37.43 ± 4.43	< 0.001
	Control	18.24 ± 2.12	18.68 ± 3.17	0.917
P-value*		0.871	< 0.001	
Perceived Benefits	Intervention	26.90 ± 4.30	53.28 ± 6.43	< 0.001
	Control	28.99 ± 7.28	27.20 ± 4.82	0.124
P-value*		0.057	< 0.001	
Perceived Barriers	Intervention	75.55 ± 13.30	45.23 ± 5.64	< 0.001
	Control	75.20 ± 9.64	75.21 ± 10.02	0.162
P-value*		0.052	< 0.001	
Self-Efficacy	Intervention	6.25 ± 1.49	10.13 ± 2.31	< 0.001
	Control	6.03 ± 2.48	6.38 ± 1.48	0.273
P-value*		0.926	< 0.001	

*Independent t-test

** paired t-test

variables and intergroup differences were analyzed using the independent t-test. To examine the effect of education, the Independent T-test test and paired T-test were used as well and to examine intragroup changes before and after the intervention, the paired t-test was applied. A significance level of 0.05 was used for all statistical tests.

Results

Table 1 presents the demographic characteristics of the intervention and control groups. The chi-square test showed no significant differences between the groups in terms of marital status ($P = 0.321$), education level ($P = 0.607$), smoking history ($P = 0.596$), medical history ($P = 0.822$), and income ($P = 0.336$). Similarly, the independent t-test revealed no significant differences between the groups regarding age ($P = 0.645$) and body mass index (BMI) ($P = 0.913$). These findings indicate demographic homogeneity between the two groups, enhancing the validity of the study results as any observed differences can be attributed to the intervention rather than baseline group differences.

Table 2 compares the mean and standard deviation of the constructs of the Transtheoretical Model in the intervention and control groups before and after the intervention. Due to the normal distribution of the data (by using Kolmogorov-Smirnov test) we used independent t-test, the independent t-test results showed no significant differences between the two groups before the intervention regarding behavior ($P = 0.871$), perceived benefits ($P = 0.057$), perceived barriers ($P = 0.052$), and self-efficacy ($P = 0.926$). However, after the intervention, significant differences were observed in all constructs ($P < 0.001$).

Table 3 Comparison of physical activity scores in the intervention and control groups

Variable	Group	Before Intervention (Mean ± SD)	After Intervention (Mean ± SD)	*P*-value
Physical Activity	Intervention	340.8 ± 90.2	726.3 ± 201.6	< 0.001
	Control	341.9 ± 94.8	342.3 ± 108.8	0.051
P-value*		0.312	0.01	
BMI	Intervention	29.06 ± 2.64	28.98 ± 2.35	0.068
	Control	29.72 ± 2.35	29.82 ± 2.64	0.950
P-value*		0.913	0.056	

*Independent t-test

** paired t-test

Table 3 compares physical activity scores in the intervention and control groups. Before the intervention, the independent t-test revealed no significant difference in physical activity scores between the groups ($P = 0.312$). After the intervention, however, a significant difference was observed ($P = 0.01$). Paired t-test results showed a statistically significant increase in physical activity scores within the intervention group after the intervention ($P < 0.001$).

Discussion

This study aimed to examine the impact of education based on the Transtheoretical Model on increasing physical activity among overweight and obese housewives in Yazd. The findings revealed that Transtheoretical Model-based interventions effectively improved behavior, identified barriers and benefits of physical activity, and enhanced self-efficacy in overweight and obese women.

Comparing the demographic characteristics of the intervention and control groups, the results indicated that most participants in both groups were middle-aged, highlighting the relatively young age of housewives. The majority had primary education, no specific diseases, and no history of smoking. Chi-square analysis showed no significant differences in most demographic variables between the two groups, confirming demographic homogeneity. This homogeneity strengthens the study's validity, as any observed differences in outcomes can be attributed to the intervention rather than pre-existing differences between the groups.

The results showed that after education the mean score of physical activity behavior significantly increased in the intervention group compared to the control group. This finding aligns with previous studies, including those by Mahdifar et al. (2024), which examined body image perception and physical activity behavior in adults using the Transtheoretical Model [45], Okube et al. (2024), which evaluated the effectiveness of Transtheoretical Model-based health education interventions in promoting lifestyle changes among adults with metabolic syndrome [51], and Ghaffari et al. (2024), which assessed the impact of Transtheoretical Model-based educational interventions on increasing physical activity participation among female employees [52]. Okube et al. (2024) highlighted that the Transtheoretical Model is an effective and practical method for promoting physical activity and should be incorporated into health programs [51]. Similarly, Ghaffari et al. (2024) emphasized the effectiveness of theory-based behavioral change models and health education programs in promoting physical activity and combating sedentary lifestyles among women [52]. The present study also demonstrated that focusing on a group of overweight and obese women with more free time and engaging them in educational sessions could lead to behavioral changes. Additionally, involving physicians and physical education experts in the training process increased participants' awareness, motivating them to participate actively in physical activities.

The study further revealed that TTM intervention could affect on perceived in the intervention group compared to the control group. This finding is consistent with prior studies, including those by Sönmez Sari et al. (2024) [53], Borhani et al. (2024) [54], Dunkel et al. (2024) [55], and Shi et al. (2025) [56]. These studies reported that Transtheoretical Model-based educational interventions effectively enhanced perceived benefits, with Sönmez Sari et al. (2024) demonstrating that the Transtheoretical Model increased adults' knowledge of the benefits of physical activity [53], Borhani et al. (2024) showing its efficacy in improving perceived benefits among rural women in Iran [54], Dunkel et al. (2024) highlighting its positive impact on lifestyle changes and self-management in diabetic patients [55], and Shi et al. (2025) emphasizing its role in increasing perceived benefits among the elderly [56]. Regarding perceived barriers, the results showed that Transtheoretical Model-based education significantly reduced the mean score of perceived barriers to physical activity in the intervention group compared to the control group. This finding aligns with the study by Saeidi et al. (2024), which investigated the effect of stage-matched Transtheoretical Model interventions on medication adherence in hypertensive patients [57]. The findings also align with the studies by Li et al. (2024), which applied the Transtheoretical Model to improve physical activity and health-related quality of life among elderly individuals with frailty [58], and Ezika et al.

(2024), which investigated the effectiveness of Transtheoretical Model-based interventions in promoting physical activity among rural residents [59]. Both studies confirmed the Transtheoretical Model's efficacy in reducing perceived barriers and enhancing physical activity levels. Their study demonstrated that Transtheoretical Model-based interventions effectively reduced barriers related to physical activity and other health-related behaviors. In the cultural context of Yazd, where women often prioritize household responsibilities over other activities, promoting a proper culture of physical activity and addressing barriers can significantly improve physical activity levels among women.

The present study demonstrated that in intervention group self-efficacy significantly increase for compared to the control group. This finding is consistent with studies by Liu et al. (2025), which examined the impact of educational interventions on self-efficacy in physical activity [60], Ahern et al. (2024), which explored behavior change interventions related to exercise self-efficacy [61], and Al-Haroni et al. (2024), which evaluated the effect of educational interventions on exercise self-efficacy [62]. These studies highlighted that self-efficacy is closely tied to personal knowledge and attitudes, and interventions targeting physical activity can enhance self-efficacy by fostering a sense of personal competence.

Finally, the results showed that Transtheoretical Model-based education significantly increased physical activity levels in the intervention group compared to the control group. This finding aligns with studies by Reis et al. (2024), which investigated the effects of physical education interventions on children's physical activity and fitness [63], Rocliffe et al. (2024), which assessed the impact of interventions on physical education and sports [64], and Cipriano et al. (2024), which explored physical activity interventions in educational settings [65]. These studies emphasized the importance of educational interventions in promoting physical activity and suggested that such approaches should be prioritized in health policies due to their accessibility and cost-effectiveness.

Strengths

One of the strengths of this study is the design of the educational intervention based on the Transtheoretical Model, which emphasizes behavior and the identification of barriers and benefits. Another strength is the focus on overweight and obese housewives, a group often overlooked in educational interventions. Additionally, the study utilized various teaching methods in the educational sessions and provided valuable educational content.

Limitations

A limitation of this study is the reliance on self-reported data, which could lead to inaccurate responses. Moreover, the presence of the researcher during the questionnaire completion may have influenced the accuracy of participants' answers. Another limitation is the short follow-up period; thus, it is recommended that future studies employ longer intervention periods. Finally, the cultural differences specific to the study location may limit the generalizability of the results to other regions. To address this, it is suggested that similar interventions be designed and implemented in other provinces.

Conclusion

The results of this intervention demonstrated that Transtheoretical Model-based interventions effectively improved behavior, identified barriers and benefits of physical activity, and enhanced self-efficacy among overweight and obese women. This study showed that the Transtheoretical Model, through identifying perceived barriers and benefits (via educational sessions) and, most importantly, enhancing self-efficacy and behavior, led to increased physical activity levels in housewives. These findings could be beneficial not only for the housewives and their families but also for comprehensive health centers and counseling clinics. Additionally, the results provide valuable insights for designing and planning future interventions, which can be utilized by related organizations such as the Ministry of Health, medical universities, healthcare centers, and psychology clinics.

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Author contributions

TR, ZJ, MJ, ST, AK and AKHJ conceived and designed the study. ZJ and AKHJ analyzed and interpreted the data, and drafted the manuscript. TR, ZJ, MJ, ST, AK and AKHJ were involved in the composition of the study tool, supervision of the research process and critical revision and review of the manuscript. All the authors read and approved the final manuscript.

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Data availability

The datasets used and/or analyzed during the current study can be made available by the corresponding author on reasonable request.

Declarations

Ethical approval and consent to participate

The study procedures were carried out following the Declaration of Helsinki. This study was approved by the Ethics Committee of Shiraz University of Medical Sciences. Informed consent was taken from all the participants. Informed consent was taken from all the participants. There was an emphasis on maintaining privacy in keeping and delivering the information accurately without mentioning the names of the participants. The participants were

given the right to leave the interview at any time if they wished to leave the interview process, and they were promised to have the study results if they want.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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