



Effect of Education Based on Trans-Theoretical Model on Physical Activity of Reproductive Aged Women Referred to Health Centers in Zanjan

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ABSTRACT

Background: Despite the health benefits of physical activity, many people still adopt sedentary lifestyles. This study aimed to investigate the effect of education based on trans-theoretical model (TTM) on physical activity of women of reproductive age in Zanjan.

Methods: This was a quasi-experimental study. Using convenience sampling method, the sample size of 120 women was selected and randomly allocated to study groups. The data was collected using a short version of Physical Activity Change Algorithm Questionnaire and IPAQ (International Physical Activity Questionnaire) before and 3 months after intervention. In addition to training sessions, the intervention 2 group was trained to use pedometer.

Results: Before the intervention most of the women were in contemplation and preparation stages and 3 months after the intervention, women in intervention groups moved to action and maintenance stages ($P < 0.001$). There was significant difference in mean time of weekly walking and physical activity in three groups 3 months after the intervention ($P < 0.001$). These changes were more prominent in women who used pedometer.

Conclusion: The findings showed that education based on the trans-theoretical model was effective in promoting the physical activity. Using the pedometer along with education had effect on improvement of the physical activity.

1. Introduction

Many studies have shown that physical activity is essential for health and is a way to prevent chronic diseases [1]. However, physical inactivity and sedentary lifestyle are common worldwide; and this is unlikely to improve in the next years. As an important part of a healthy lifestyle at all ages, the physical activity is considered as one of the health indicators of communities [2]. It can promote people health, It can promote people health, prevent major diseases and disabilities such as cardiovascular diseases, blood pressure,

stroke, type 2 diabetes, breast and colon cancer, osteoporosis, back pain, and depression, boost the immune system, and improve independence at old ages [3-5]. Inadequate physical activity is estimated to account for about 30% of ischemic diseases, 21-35% of breast and colon cancers, and 27% of diabetes [6].

The physical activity is defined as any physical movement that is created by musculoskeletal system and requires energy expenditure. According to World Health Organization, people should exercise for at least three days a week for 30 minutes at a moderate intensity (150 minutes



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per week) to be physically active and enjoy the benefits of physical activity [7]. Despite being aware of benefits of mobility and physical activity and knowing that the sedentary living is one of the main potential risk factors of chronic diseases and premature death. It is unfortunately reported that in 2018, more than 80% of world's population are not physically active [8]. Many strategies have been developed over the years to increase the physical activity rate, but most of adults are still physically inactive [9]. Despite the emphasizing on benefits of physical activity, the rate of physical inactivity is increasing in many countries [10]. In Iran, the prevalence of inactivity among women aged 15-64 is reported to be 76.3% [3]. Industrial development and urbanization has decreased mobility and fewer people allocate their time to physical activity [11].

The physical activity of women has been studied widely. The UK's Health Department recommended to exercise for an average of one hour a day. However, the studies have shown that 40% of men and 60% of women do not observe this recommendation [12]. Miller *et al.* (2002) stated that women have a lower physical activity than men at all ages [13]. Dishman *et al.* (2006) showed that men are twice as likely as women to participate in sports activities [14]. In Iran, the physical activity is not common, especially among women; a large part of population is inactive [15].

It seems that there is necessity to study the psychological mechanisms associated with physical inactivity. The studies have shown that various factors such as demographic characteristic [16], attitudes, individual beliefs [17], environmental and social factors [16], and cognitive factors such as perceived benefits and barriers, social support, self-confidence, and self-efficacy impact on level of physical activity [18]. The physical activity is a complex behavior; so the physical activity interventions should be developed based on theories [19]. Since the benefits and effectiveness of regular physical activity in promoting individuals' health are well recognized, the studies should investigate the ways of adopting and maintaining this healthy behavior. A meta-analysis that conducted in 2014 showed that the theory-based interventions have a significant impact on promoting physical activity. The trans-theoretical model is one of the theories that has been used to promote and maintain physical activity in individuals and has played an effective role in promoting physical activity [20].

The trans-theoretical model represents the change in behavior as a process that goes through certain stages. Prochaska *et al.* (2016) developed this model for change of behavior by focusing on decision-making. It can predict the behavior and its time [21]. The trans-theoretical model is an integrated model of behavior change and consists of multiple constructs including decisional balance, self-efficacy, stages of change, and change processes. The stages of change are considered as the most important construct of this model and include pre-contemplation, contemplation, preparation, action, and maintenance. The decisional balance is another construct of trans-theoretical model; it is the basis of decision-making and focuses on perceived benefits and perceived disadvantages of a behavior. The self-efficacy is the other construct of trans-theoretical

model; it focuses on individuals' trust in their ability to perform an action without assistance of others. Meanwhile, the pedometer is a valid tool that can measure the number of steps of individuals as an indicator of physical activity in daily life with a very low error rate. This tool shows the activity more clearly [22]. In Iran, many studies have examined physical activity using a pedometer. Baghiani Moghadam *et al.* (2013) were the first in Iran who examined women's physical activity using a pedometer [23].

Today, women's health and social well-being is recognized as a human right which impacts on family and community health. The dimensions of women's health include physical, mental, social, cultural, emotional, and spiritual well-being; it is influenced by physiological, social, economic, and political factors. The women play an important role in caring for themselves and their children, the elderly, and sick and disabled people. The widespread participation of women in formal, public, and voluntary health activities plays an important role in health successes of societies and health systems. The researchers believe that it is not possible to promote health in the world without considering women's health in policy-making and program planning as well as women's empowerment [24].

Considering the sensitive role that the women play in health of family and society, their health should be considered as a priority. On the other hand, Zanjan has different cultural and linguistic features that affect the physical activity behavior of women. Therefore, this study aims to promote physical activity among women of reproductive age in Zanjan based on trans-theoretical model.

2. Materials and Methods

2.1. Study Design

This was a quasi-experimental pre/post-test study. The population consisted of all women of reproductive age who referred to three health centers in east of Zanjan. The study was approved by the Ethical Committee of the Zanjan University of Medical sciences with funding number of 1137930. The women were informed about the study and intervention process. Then, the written informed consent was completed by them. The inclusion criteria included having medical contraindication for physical activity, being in reproductive age, education level of diploma and higher, having a smartphone, and not being pregnant. The exclusion criteria included getting pregnant during the study, occurrence of a medical problem during the study, unwillingness of subjects to cooperation in study, and being absent more than 2 times in face-to-face meetings that were held in 5 sessions for intervention groups.

2.2. Sample Size and Sampling Method

The convenience sampling method was used to select the sample. Considering 95% confidence level, 80% power of the test and changing in mean score of physical activity by 10 and standard deviation of 14, 120 sample size was calculated using sample size calculation formula for

experimental studies: $2(Z_{1-\alpha/2} + Z_{1-\beta})^2 \sigma^2 / (\mu^1 - \mu^2)^2$ and 40 subjects were assigned to each group.

2.3. Questionnaire

The research tools included demographic characteristics questionnaire (6 questions on age, marital status, physical Activity Change Algorithm Questionnaire consists of 4 questions; the validity and reliability of Persian version of Physical Activity Change Algorithm Questionnaire was confirmed by Roozbehani *et al.* (2014) [25]. In this questionnaire, individuals were asked whether they had regular physical activity. According to their responses, they were assigned to pre-contemplation (person does not exercise and has no idea to start it in the next 6 months), contemplation (person does not exercise but intends to start it in the next 6 months), preparation (person decides to start exercising in next month), action (person exercises enough in less than 6 months), and maintenance (person has been exercising enough for more than 6 months) stages.

Adequate exercise is any physical activity or exercise that is performed 3 times a week for 20 minutes or more and speeds up heart or breathing rate or makes body sweaty [26]. The IPAQ (International Physical Activity Questionnaire) had 7 questions which examined the intensity of physical activity and walking over the past 7 days and reported the results of physical activity based on met-minutes/week; one met equals to energy expenditure in one minute of rest. The validity of this questionnaire was confirmed by Vashghani and its reliability was reported to be 0.83 [37].

Based on met scores, IPAQ classifies subjects into low activity (less than 600 met), moderate activity (600-3000 met), and high activity (more than 3000 met) groups [11]. In order to evaluate the level of physical activity, in addition to using the questionnaire, the pedometer application was used in intervention 2 group. Before and three months after the intervention, the participants monitored their steps for a week using the mobile application and recorded them at daily calendar that was designed and provided for this purpose. The questionnaires were completed before and 3 months after intervention by three groups.

2.4. Developing and Conducting Intervention

The educational intervention was conducted in 25 sessions for 5 consecutive weeks on 1st and 2nd intervention groups; women received general and special education intervention according to various stages of preparation to engage in physical activity. The education sessions were held for intervention groups in training halls of three health centers in the east of Zanjan. The general trainings were conducted in two sessions of 45-60 minutes for each group. This education aimed at raising awareness about the benefits of physical activity and complication of sedentary life style and increasing women's sensitivity to the threat of chronic disease arising from inactivity. In these two sessions, by encouraging women to think and pay attention to the impact of exercise on their life, tried to increase women's perception of the benefits of exercise. Increasing the knowledge and their understanding of the concept of health and its dimensions and the role of physical activity in achieving health and ways to be active were the other objectives of these two session. In the second part of

the education program conducted in 18 sessions of 30 minutes in small groups. This education was based on the different stages of women's preparation to engage in physical activity. For women in pre-action stages (pre-contemplation, contemplation and preparation) focused on increasing awareness and women's emotional preparation for change and initiation of physical activity and for action stages (action and maintenance), focused on the skills to perform and maintain physical activity. In general training sessions, the PowerPoint lecture method along with pamphlets, posters, educational booklets, whiteboards, and markers were used to achieve dynamic learning. In the second part of the education, Q&A, small group discussion, and role playing were used.

2.5. Data Analysis

The collected data was analyzed using Kolmogorov-Smirnov, Chi-square test, analysis of variance, Kruskal-Wallis, Wilcoxon, and McNemar's test at SPSS software, version 20.

3. Results and Discussion

The mean age in intervention groups 1 and 2 and control group was 33.10, 32.73, and 31.35 respectively. In terms of education, diploma was more frequent at all three groups. The majority of women were married and had one or two children. According to chi-square test, there were no significant differences in demographic characteristics including education, age, body mass index, number of children and occupation between study groups. In term of stages of change before the intervention, there was no significant difference between groups ($P = 0.659$) and most of women were in contemplation and preparation stages. After the intervention the difference was significant ($P < 0.001$) and women in intervention groups moved to action and maintenance stages and these changes was more prominent in women who used pedometer. (Table 1). There was no significant difference in mean time of weekly walking and moderate physical activity in three groups before the intervention, after the intervention, there was difference in mean score of physical activity between groups ($P < 0.001$). Women in intervention groups had higher weekly walking and moderate physical activity compare to control group and these difference was more obvious in women who used pedometer. (Table 2). This study examined the effect of education based on trans-theoretical model on physical activity of women of reproductive age and conducted by designing appropriate educational content based on individual stages of changes. After educational intervention, the intervention groups showed improvement in stages of change compared to control group.

The first objective of this study was to compare the women of three groups in stages of change before and 3 months after intervention. According to results of pre-intervention change measurement, most of participants at intervention 1 and 2 groups and control group were in pre-action stage (pre-contemplation, contemplation, and preparation) and 3 months after intervention, most of the members of intervention groups were moving forward in

Table 1: Stages of change between and within study groups, before and 3 months after intervention

Stages of change		Intervention 1		Intervention 2		Control		Chi square test Pvalue
		N	%	N	%	N	%	
Before intervention	Pre-contemplation	3	7.5	4	10	7	17.5	0.659
	Contemplation	12	30	10	25	7	17.5	
	Preparation	10	25	8	20	7	17.5	
	Action	4	10	8	20	7	17.5	
	Maintenance	9	22.5	7	17.5	11	27.5	
After intervention	Pre-contemplation	0	0	0	0	13	33.3	0.001
	Contemplation	5	13.1	2	5.4	8	20.5	
	Preparation	14	36.8	12	32.4	7	17.9	
	Action	10	26.3	17	45.9	5	12.8	
	Maintenance	9	23.7	6	16.2	6	15.3	
		McNemar: 0.058		McNemar: 0.009		McNemar: 0.452		

direction of stages of change to improve and promote their physical activity and had progressed to action stages (action and maintenance). This increase in number of participants in action stages can be related to educational strategies which were applied in this study. The structure of change stages is based on this hypothesis that education can improve individuals' progress during the stages. Based on change processes, providing appropriate information for participants (awareness raising) is effective for progress in stages of behavior change. The awareness raising programs such as "lectures on physical activity and diseases caused by sedentary life style" are very helpful for people who are in contemplation and preparation stages and can change their tendency to move to action stage. Hashemi *et al.* (2013) examined the effect of trans-theoretical model-based education on physical activity of housewives in Zahedan [28]. The results showed that before the education, there was no significant difference between study groups in stages of change structure; after the intervention, however, there was significant increase in mean score of model constructs in intervention group. Solhi studied the change in physical activity of pregnant women and showed that the subjects progressed from early stages of behavior to higher levels [29]. Moodi *et al.* (2017) [30] investigated the effect of trans-theoretical model-based curriculum on physical activity behavior change processes among employees at Birjand universities. The results showed that three months after the intervention, more than half of subjects in intervention group were in action stage; the difference between two groups was significant. These results showed the positive effect of training on transition from early stages of change and adoption of physical activity in intervention group. In other study on employees at a public hospital in South Africa, Skaal *et al.* (2012) examined the effectiveness of a six-month trans-theoretical model-based education intervention on participants' physical activity and showed that more than half of participants entered action stage at post-test evaluation; this was consistent with findings of present study [31]. Jalilian *et al.* (2013) studied 97 employees at Ilam University and showed that three months after the trans-theoretical model-based educational intervention, the number of participants who entered the physical activity increased significantly and the number of participants who were in pre-contemplation stage was

decreased [32]; this is consistent with findings of present study. Results showed that change in physical activity stages was more prominent in women in intervention 2 group who used pedometer. Scientific evidence suggests that inactive adults need a tool such as a pedometer to motivate them to start their daily physical activity and keep continuous. With using pedometer they can easily move around by counting their daily walking levels [33].

The second objective of this study was to compare the women in three groups in terms of physical activity before and 3 months after the intervention. Before the intervention, the mean score of physical activity of intervention 1 and 2 groups and control group was 3467/77, 4672/87 and 3184/77 respectively; after the intervention, it was 4761/96, 7254/46 and 2685/82 respectively. This difference was statically significant ($P < 0.05$). The results of present study showed that none of women had intense physical activity before and after the intervention.

Keshavarz *et al.* (2019) investigated the effect of "stages of change model" on physical activity of 176 active health volunteer in Rasht who served 29 urban health posts. The results showed that educational intervention and using stages of change model led to improvements in mean score of constructs and ultimately, the promotion of physical activity behavior [34]; this is consistent with findings of present study. Abdollahi *et al.* (2016) investigated the effect of education based on self-efficacy promotion on women's physical activity after childbirth and showed that two months after the educational intervention, there was a significant increase in women's physical activity in experimental group compared to control group [35].

Alinia *et al.* (2012) evaluated effect of intervention based on trans-theoretical model on adolescent girls' sports in Tonekabon and found that there is significant difference among female students in terms of stages of change, processes of change, decisional balance, and self-efficacy [36]. So, they recommended the use of this model in sports interventions. Hazavehei *et al.* (2008) conducted a study among the students and showed that physical activity was promoted among students; they even had an intense physical activity [37]. At present study, none of women had intense physical activity. This difference may be due to age group of sample and diverse tasks of women who did not have enough time to perform the desired behavior.

Table 2: Mean physical activity score in three groups before and 3 months after the intervention

Variable		Intervention 1	Intervention 2	Control	Kruskal-wallis Pvalue
		Mean rank	Mean rank	Mean rank	
Walking Minute /week	Before	60.9	61.8	58.6	0.910
	After	67.9	72	33.5	0.0001
Moderate physical activity Minute/ week	Before	58.8	58.8	63.8	0.752
	After	67.8	72.5	33.7	0.0001
Intense physical activity Minute/week	Before	60.9	61.7	58.8	0.910
	After	64.3	53.4	54.7	0.232
Energy (calories) expenditure per week	Before	56.6	66.3	58.4	0.416
	After	61.1	76.2	36.3	0.0001

Solhi conducted a study on students to improve their physical activity behavior. It was shown that a number of students performed intense physical activity after the intervention [38]; this is not consistent with findings of present study. This may be due to differences in age group; middle school students exercised during sports class hours and engaged in intense physical activities. Results showed that change in mean time of weekly walking and physical activity was more prominent in women in intervention 2 group who used pedometer. Pedometer use has played an important role in increasing the daily physical activity of healthy people and patients aged 65-40 years.

The results of studies showed that the use of pedometers has led to an increase in the number of steps by 1400 to 3000 beyond the level of routine daily steps [33,39]. In community health program, the use of motivational tools such as pedometers is a good incentive to encourage people to increase their daily physical activity [40].

4. Conclusion

According to findings, it was concluded that the education based on trans-theoretical model was effective in changing the physical activity behavior of women of reproductive age in eastern region of Zanjan. This behavior change was more obvious in women who used pedometer. Therefore, we suggest the use of this model and pedometer to promote physical activity in reproductive aged women in Zanjan.

Authors' Contributions

L.Kh., F.J., and Kh.H., designed the study. L.Kh., performed the experiments. L.Kh., and F.J., performed data acquisition, L.Kh., drafted the manuscript. Kh.H., and F.J., supervised data and analysis and edited the manuscript.

Conflict of Interest

The Authors declare that there is no conflict of interest.

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