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Improving Physical Activity for Hypertensive Patients: A Trans-theoretical model-based Intervention

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Abstract

Aim: Hypertension (HTN) is considered to be the most important modifiable risk factor for cardiovascular morbidity and mortality. Although lifestyle modifications such as increase in physical activity (PA) are effective for lowering blood pressure (BP), it can often be difficult for hypertensive (HTN) individuals to modify their lifestyle and maintain such modification. So this study aimed at assessing the effectiveness of trans-theoretical model (TTM)-based intervention on PA in HTN patients.

Methods: This randomized controlled trial was conducted on 78 hypertensive patients (39 in the experimental group (EG) and 39 in the control group (CG)) from January 2015 to September 2015 in the city of Shiraz in southern Iran. The EG received TTM-based intervention about PA for four weeks. The study outcomes included PA stages of change, processes of change, exercise self-efficacy (ESE), decisional balance and PA, which were measured at the onset and at one week post-intervention. The data were analyzed using SPSS 16 software.

Findings: At one week post-intervention, PA increased significantly in the EG (1218.35±917.95) compared to the CG (810.28±785.21) (p=0.04). A significantly larger percentage of the EG (80.6%, n= 25) progressed to the stage of action compared with the CG (16.1%, n=5). Also one week post-intervention, the EG demonstrated higher ESE (p=0.004), higher decisional balance (p<0.001), and greater process of change (p=0.001) compared with the CG.

Conclusion: The present study showed that the TTM-based intervention effectively increased PA. So the use of TTM-based interventions can be effective in increasing the commitment to PA in HTN patients.

Keywords: Hypertension, Physical activity, Trans-theoretical model

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Introduction

Hypertension (HTN) is an independent risk factor for cardiovascular diseases (CVDs), and is considered to be the most important modifiable risk factor for cardiovascular morbidity and mortality. Prevalence of HTN is expected to reach 30% among the adults worldwide by 2025 [1]. Treatment strategies for people with HTN are anti-hypertensive drugs as well as various non-drug treatment options such as recommendations for reduced body weight or salt intake, lower alcohol consumption, and regular physical activity (PA). Meta-analyses of randomized controlled trials suggest that regular PA can reduce blood pressure (BP) in hypertensive (HTN) and normotensive persons [2].

Although lifestyle modifications such as increase in PA are effective for lowering BP, it can often be difficult for HTN patients to modify their lifestyle and maintain such modification. To address this problem, a behavior modification approach has been applied to lifestyle intervention, and has reportedly been more effective than conventional health education [3]. This approach is based on trans-theoretical model (TTM), which is an integrative and comprehensive model of behavior change that has drawn from all major theories of psychotherapy. This model has been used in numerous studies across 12 health behaviors, and is cited as one of the most important theoretical health promotion developments of the decade [4]. The constructs of this model include the stages of change, processes of change, self efficacy (SE) and decisional balance [5]. Stages of change indicate where people are in their intention to change, and assume that people move through five different stages including pre-contemplation, contemplation, preparation, action and maintenance [6]. Key facilitators that produce progress through these stages of change include processes of change, SE and decisional balance [7].

Although the TTM is theoretically sound, few studies have been conducted to examine the effects of TTM-based intervention on exercise behavior among HTN patients. These studies have presented inconsistent conclusions about adherence to regular exercise [8-10]. Chiang studied HTN patients based on the stages of change, and showed that a walking program had no significant effect on walking endurance [8]. In a study by Harris-Packer et al. comprising an eight-week PA intervention based on the stages of change conducted with 10 women with HTN, the total time spent walking for at least 10 minutes increased from pre- to post-intervention [9]. In a study by Fort, including an educational intervention for a healthy lifestyle based on the stages of change and SE in HTN patients, no significant

changes were observed with regard to SE and participation in PA [10].

The conflicting results from such studies could result from factors such as study duration, monitoring program, and type of intervention, including the number of behavioral determinants considered. So what kind of study, with which time and what constructs can have more effects require further study. This study aimed at assessing the effectiveness of TTM-based intervention on PA in HTN patients. To correct the defects of previous studies, the present study used the TTM fully in the field of PA in HTN patients.

Materials and Methods

Study design and study population

This randomized controlled trial was conducted in the city of Shiraz in southern Iran. The population was patients with HTN referred to Shiraz Healthy Heart House affiliated with the Cardiovascular Research Center of Shiraz University of Medical Sciences that promotes population- based (CVD) prevention activities. Inclusion criteria were that the patients should be diagnosed with primary HTN, have a systolic BP of less than 170 mm hg, be taking at least one anti- HTN medication, have completed at least 4th grade education, have no orthopedic limitations to walking, be cleared for moderate-intensity walking by a cardiologist, have a current PA level less than the criterion (30 minutes of fast walking five days a week), be in the stage of pre-contemplation, contemplation or preparation, and be ≤69 years of age. Exclusion criteria were diagnosis of CVD, diabetes or depression, having the history of heart attack or stroke, and taking drugs for weight loss.

Sample size, sampling, and randomization

According to Lee et al., at a 95% confidence interval and 90% power using the Pocake formula, the sample size for the present study was determined to be 31 subjects for each group [11,12]. Potential loss to follow-up was anticipated to be 25% per group, so 39 subjects were planned to be randomized to each group. The patients were selected by purposive sampling method. First, using the documents of patients referring to the Healthy Heart House, the records of qualified patients were initially recorded. The subjects were contacted, and those complying with the inclusion criteria were invited to the Healthy Heart House. At the House, the inclusion criteria were confirmed in person, and qualified subjects entered the study. The patients were randomly assigned, following unrestricted randomisation procedures (flipping a coin) to one of the two groups, experimental group (EG) and control group (CG), after recording all the basic measurements. 39 patients entered to the EG

and 39 patients entered to the CG.

Ethical considerations

Before entering the study, the research objectives were explained to the participants individually and informed written consent was obtained from all participants. The study was approved by the Ethics Committee of Tarbiat Modares University. This study has been registered at www.irct.ir (No. IRCT2016061428463N1).

Interventions

Thirty nine patients in the EG were divided into four groups. The patients attended a four-session training program in which the meetings were delivered on a weekly basis. The first session discussed consciousness raising, dramatic relief, and how to take a pulse. The second session was about decisional balance, self re-evaluation, environmental re-evaluation, social liberation, and self-liberation. The third session presented about SE, helping relationships, counter-conditioning, reinforcement management, and stimulus control. Examples of strategies for each construct are shown in Table 1 [6, 13-15]. The fourth session, first using the Karvonen formula, determined the target heart rate of each person during exercise [16]. Each subject was told their target heart rate and asked to take his/her pulse while walking to attain this value. The subjects were shown a video teaching fast walking, and were instructed practically by an exercise coach. At least 30 minutes of fast walking at an intensity of 40% to 60% maximum heart rate was prescribed to the EG for at least 5 days a week. The researchers provided no intervention to the CG.

Table 1: Baseline demographic and clinical characteristics

Patient characteristics	Experimental	Control	P-value
Age (year)	54.05±7.01	53.75±8.27	0.86
Gender, n (%)			
Male-	18(46.2%)	19(48.7%)	P>0.9999
Female-	21(53.8%)	20(51.3%)	
Job, n (%)			
Laborer-	5(13.2%)	6(15.4%)	P>0.9999
Employee-	3(7.9%)	2(5.1%)	
Self-employment-	2(5.3%)	3(7.7%)	
Housewife-	16(42.1%)	15(38.5%)	
Retired-	12(31.6%)	13(33.3%)	
Education, n (%)			
Under high school-	15(38.5%)	18(46.2%)	0.20
-High school	12(30.8%)	15(38.5%)	
-College education	12(30.8%)	6(15.4%)	
Income ($ US)	408.48±204.51	365.54±199.22	0.39
Number of anti- HTN drugs	1.55±0.68	1.41±0.57	0.46
Duration of consumption of anti- HTN drugs (year)	3.79±2.17	4.61±5.37	0.71

Data are means (SD) or numbers (%)

Age, income, number and duration of consumption of anti- HTN drugs are presented as mean±SD. Intergroup differences were tested by unpaired 2-tailed tests (age, income, number and duration of consumption of anti-HTN drugs). Other tests used were fisher exact test (gender) and Pearson χ^2 test (job, education**).**

Instruments

Stages of Exercise Behaviour Change Questionnaire (SECQS)

Stages of change were measured using the SECQS developed by Marcus et al. [17]. The subjects were asked to show which options best described their current level of PA (walking, biking, or playing ball for 30 minutes or more, 5 days a week) as active more than 6 months (maintenance), active less than 6 months (action), not active on a regular basis but occasionally engaged in activities and planning to start the next month on a regular basis (preparation), not active but may start in the next 6 months (contemplation), and not active and not planning to start in the next 6 months (pre-contemplation) [18]. The validity and reliability of the questionnaire have been confirmed in Iran by Roozbahani [18].

1. Processes of change questionnaire: Processes of change were evaluated using the Processes of Exercise Adoption (PEA) instrument. The PEA has 40-items (four items for each of the 10 processes of change), and uses a five-point numeric response scale (1 = never, 5 = repeatedly) [17,18]. Score of each process was earned with adding the scores of four items of each process dividing to four (score range 1-5) [17]. A higher score shows more frequent use of processes of change to perform PA [19]. The validity and reliability of the questionnaire have been confirmed in Iran by Roozbahani [18].

Decisional balance questionnaire

Decisional balance was measured using the decisional balance questionnaire developed by Marcus et al. [17]. The questionnaire measures a client's perceived benefits of (pros: 10 items) and barriers (cons: 6 items) to PA [17]. The participants were asked to indicate how important each statement was with respect to their decision whether or not to participate in PA behavior. The scale is ranked from 1 = not at all important to 5 = extremely important [18]. The averages of 10 pro items and the 6 con items were computed. The difference in the averages (pros – cons) is the decisional balance. Decisional balance scores greater than 0 show that your client sees more benefits than barriers to being physically active. A score less than 0 shows that your client sees more barriers than benefits to being physically active [17]. The validity and reliability of this questionnaire

have been confirmed in Iran by Roozbahani [18].

SE questionnaire

SE was measured using the exercise self-efficacy (ESE) scale developed by Bandura [20]. The scale has 18 items scored from 0 to 100 with higher scores representing greater confidence in ability to exercise. Scoring SE was obtained with adding 18 items together and dividing by 18 [18].

International PA Questionnaires (IPAQ) (short- form)

PA was measured using International PA Questionnaire (IPAQ) (short- form) [21]. The metabolic equivalent (MET) represents the amount of energy used per minute for a person at rest, and is equivalent to 3.5 ml of O_2 used per kg of body weight [22]. In the questionnaire, walking equals 3.3 MET, average PA equals 4 MET, and intense PA equals 8 MET. The total amount of PA for the preceding week was calculated as walking (MET × min × day) + average PA (MET × min × day) + intense PA (MET × min × day) [21]. The validity and reliability of the questionnaire have been confirmed in Iran by Moghadam [23]. All outcomes were assessed with the questionnaires. All patients were asked to fill out the questionnaires before and one week post-intervention.

Statistical methods

The data were analyzed using SPSS 22 software. Kolmogorov-Smirnov's statistical test was used for assessing the normal distribution of data. Chi-square, independent t-test, paired t-test were used for parametric data, and Mann-Whitney and Wilcoxon test were used for non-parametric data. The results were considered significant at $p = 0.05$.

Results

The average age of patients in the EG was 54 years, and in the CG, it was 53 years; the age difference between the two groups was not significant. Table 2 shows the characteristics of the EG and CG. Also there was no significant difference between the EG and CG for PA stages of change (p=0.06), processes of change (p=0.453), decisional balance (p=0.08), SE (p=0.655) and PA (p=0.06). Eight participants in the EG and 8 participants in the CG did not complete the one week post-intervention.

Table 2: Processes of change, self efficacy and decisional balance (examples of strategies)

Construct	Examples of strategies
Consciousness raising	Giving information about physical activity and its advantages and risks related to inactivity
Dramatic relief	Health risk feedback
Self re-evaluation	Healthy role models
Environmental re-evaluation	Empathy training
Social liberation	Showing alternative to the problematic behavior
Self liberation	Technics of goal fixation, and making plan about physical activity
Helping relationships	Education of important others (spouse, relative, friend, ...) in the direction encourage and support of physical activity
Counterconditioning	Recognizing the situation that leads to inactivity and the different scenarios that can be established to include physical activity
Reinforcement management	Making a reward list for each reached goal of physical activity
Stimulus control	Give some photos or message that can motivate doing physical activity
Self efficacy	Focusing on past success, goal setting, role modelling, education of caring others (family, friends, ...) in how to encourage their loved ones to conduct PA, and reduce anxiety.
Decisional balance	Problem solving

Obtained from Romain …..(Reference 6), Ridgers ,Jackson and and Glanz …..(References 13-15)

PA

At the one week post-intervention, the level of PA was increased significantly in the EG (1218.35±917.95 MET) compared with the CG (810.28±785.21MET) (p=0.04, Table 3). Also the level of PA significantly increased in the EG compared with the baseline (p= 0.025), but there was no significant increase in this variable for the CG (p = 0.136) (Table 3).

Table 3: Comparing the mean and SDs of transtheoretical constructs and physical activity at baseline and follow-up in the experimental and control groups

	Experimental		P-value Within group	Control		P-value Within group	P-value between groups*
	Baseline Mean(SD)	Follow-up Mean(SD)		Baseline Mean (SD)	Follow-Up Mean (SD)		
Processes of change	3.37±0.53	3.92±0.74	<0.001[a]	3.24±0.87	3.21±0.80	0.815[a]	0.001[c]
Consciousness raising	3.29±0.92	3.71±0.84	0.020[a]	3.09±1.20	2.89±1.17	0.278[a]	0.002[c]
Dramatic relief	3.98±1.08	4.18±0.81	0.135[b]	3.79±0.96	3.56±1.05	0.267[b]	0.073[d]
Environmental reevaluation	3.52±0.90	4.12±0.75	0.004[a]	3.51±1.13	3.31±1.02	0.327[a]	<0.001[c]
Self reevaluation	4.10±0.74	4.56±0.51	0.003[b]	4.04±1.02	3.95±0.84	0.664[b]	0.006[d]
Social liberation	2.87±0.84	3.66±0.92	0.001[a]	2.80±1.01	2.63±0.96	0.176[a]	0.001[c]
Counter conditioning	3.58±0.71	3.98±0.78	0.005[a]	3.35±1.18	3.42±0.90	0.682[a]	0.036[c]
Helping relationships	2.82±1.17	3.44±1.25	0.010[a]	2.69±1.12	2.75±1.18	0.791[a]	0.048[c]
Reinforcement management	3.10±0.71	3.98±0.83	<0.001[a]	2.80±1.23	3.02±1.07	0.201[a]	0.002[c]
Self liberation	3.89±0.79	4.21±0.77	0.008[a]	3.77±1.01	3.73±0.91	0.858[a]	0.033[c]
Stimulus control	2.76±0.86	3.76±1	<0.001[a]	2.68±1.19	2.83±1.19	0.433[a]	0.001[c]
Decisional balance	1.43±0.98	2±0.89	0.002[a]	0.84±1.01	0.97±0.76	0.457[a]	<0.001[c]
Self efficacy	38.75±22.88	52.45±23.99	0.002[a]	40.25±27.27	34.96±21.93	0.327[a]	0.004[c]
Physical activity	856.76±798.25	1216.50±992.73	0.025[a]	771.11±1341.71	865.19±852.65	0.136[a]	0.04[c]

a: Derived from Paired test, b= Derived from Wilcoxon, c= Derived from Independent t-test, d= Derived from Mann-Whitney. * Comparing the constructs between EG and CG in the follow-up.

Stages of change

At the one week post-intervention, a significantly larger percentage of the EG (80.6%, n= 25) progressed to the stage of action compared with the CG (16.1%, n=5) (Table 4).

Table 4: Physical activity stages of change in the experimental and control groups

Stage of change	Baseline (n=39)			Follow up (n=39)		
	Experimental	Control		Experimental	Control	
	N(%)	N(%)	P-value*	N(%)	N(%)	P-value*
Pre-contemplation	4 (10.3%)	9 (23.1%)	0.06	-	9(29%)	<0.001
Contemplation	7 (17.9%)	12 (30.8%)		-	6(19.4%)	
Preparation	28 (71.8%)	18 (46.2%)		6(19.4%)	11(35.5%)	
Action	-	-		25(80.6%)	5(16.1%)	

Processes of change

At the one week post-intervention, all processes of change except the dramatic relief increased significantly in the EG compared with the CG (Table 3). In the EG, all processes of change (except dramatic relief) increased significantly in at the one week post-intervention compared with the baseline (Table 3). At the one week post-intervention compared with the baseline, in the CG, no significant increase was observed in any of the 10 processes of change (Table 3).

Decisional balance

At the one week post-intervention, decisional balance increased significantly in the EG (1.96±0.96) compared with the CG (1.01±0.73) (p<0.001). At the one week post-intervention compared with the baseline, decisional balance increased significantly in the EG (p = 0.002, Table 3). In the CG, at the one week post-intervention compared with the baseline, no significant increase was observed in decisional balance (p= 0.457, Table 3).

ESE

At the one week post-intervention, significant improvement was observed in ESE in the EG (51.46±24.18) compared with the CG (34.37±20.67)(p=0.004). In the EG, ESE increased significantly at the one week post-intervention compared with the baseline (p=0.002, Table 3). In the CG, at the one week post-intervention compared with the baseline, no significant increase were observed in SE (p= 0.327, Table3).

Discussion

In this study, the intervention program based on the TTM led to the increase of PA among the HTN patients. One week post-intervention, PA increased significantly in the EG compared

to the CG. In Zhu's study, a TTM-based exercise stage-matched intervention (ESMI) in patients with coronary heart disease, after intervention, demonstrated longer moderate exercise duration in the ESMI group compared with the CG [24]. A study by Hashemi, with the purpose of evaluating the effectiveness of PA educational program based on TTM in women, showed a significant increase in the EG compared to the CG, which is consistent with this study [25]. The intervention also increased their level of PA significantly compared with the baseline. In a similar study by Solhi, after intervention, PA increased in the EG significantly compared with the baseline [26].

In the present study, progress in the stages of change was considered as one of the criteria for success in intervention. At the one week post-intervention, the EG showed improvement in the PA stages of change compared to the CG whereas 80.6% of the EG compared with 16.1% of the CG entered to the action stage. Studies of Mutrie, Woods and Plow about the trans-theoretical-based intervention on PA reported similar results [4,19,27].

At the one week post-intervention, the EG demonstrated significant increases in the use of processes of change as a whole, specifically in nine processes (consciousness raising, environmental reevaluation, self reevaluation, social liberation, counter, helping relationships, reinforcement management, self liberation and stimulus conditioning control) except dramatic relief, compared with the CG. Moeini's study with the purpose of investigating the 8-week training intervention based on TTM in enhancing the PA of 50 diabetic patients showed that after one month, all processes of change (except self reevaluation) increased significantly in the EG compared with the CG [28]. Educations that occurred frequently in recent years by the media about the hazards of inactivity and its role in cardiovascular diseases can be one of the reasons for no significant increase in dramatic relief in EG compared with CG. In Pinto's study, at 6 weeks, the intervention group demonstrated significant increase in the use of five processes (consciousness raising, social liberation, counter- conditioning, self-liberation and reinforcement management) compared to the CG [29]. The reason of significant increase of more processes of change in our study than Pinto's study can be attributed to the shorter follow up in our study (one week) than Pinto's study (6 weeks).

At the one week post-intervention, decisional balance increased significantly in the EG compared with the CG. In Moeini's and Pinto's studies, similar results were reported [28,29]. In other similar studies by Zhu and Hashemi, after intervention, a significant difference was

observed in perceived barriers and benefits in the EG compared with the CG [24,25]. Also the results of various studies have indicated that individual views about the advantages or disadvantages of activity play a decisive role in the behavior [30].

At the one week post-intervention, ESE increased significantly in the EG compared with the CG. In Geertz's study (after intervention) and Kaveh's study (one week after intervention), similar results were reported [5,31]. In Pirzade and Mostafavi's studies with longer follow up, similar findings were also observed [32,33]. Bandura found that SE was the strongest construct for predicting behavior change. He stated that since one of the most powerful tools to increase SE is dominance of performance of behavior, it is possible that changes in ESE occur following the successful and active partnership of individuals in exercise [30]. In the present study, it was also concluded that an increase in ESE was associated with increased PA. The limitation of this study was the relatively short follow up period of one week.

Conclusion

The present study showed that TTM- based intervention effectively increased PA. So use of TTM-based interventions can be effective in increasing the commitment to PA in HTN patients. It is suggested that future studies to evaluate the effects over a longer intervention period.

Conflict of interest

The authors declare that they have no competing interests.

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Authors' contributions

ZM contributed in the design, data collection, data analysis, and writing of the paper. AH, MHK, JK contributed in the design and writing of the paper. All authors read and approved the final manuscript.

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References

1. Börjesson M, Onerup A, Lundqvist S, Dahlöf B. Physical activity and exercise lower blood pressure in individuals with hypertension: Narrative review of 27 RCTs. Br J Sports Med 2016; 50(6): 356-61.

2. Semlitsch T, Jeitler K, Hemkens LG, Horvath K, Nagele E, Schuermann C, Pignitter N, Herrmann KH, Waffenschmidt S, Siebenhofer A. Increasing physical activity for the treatment of hypertension: a systematic review and meta-analysis. Sports Med 2013; 43(10): 1009-23.
3. Miura S, Yamaguchi Y, Urata H, Himeshima Y, Otsuka N, Tomita S, Yamatsu K, Nishida S, Saku K. Efficacy of a multicomponent program (patient-centered assessment and counseling for exercise plus nutrition [PACE+Japan]) for lifestyle modification in patients with essential hypertension. Hypertens Res 2004; 27(11): 859-64.
4. Woods C, Mutrie N, Scott M. Physical activity intervention: a trans-theoretical model-based intervention designed to help sedentary young adults become active. Health Educ Res 2002; 17(4): 451-60.
5. Kaveh MH, Golij M, Nazari M, Mazloom Z, RezaeianZadeh A. Effects of an osteoporosis prevention training program on physical activity-related stages of change and self-efficacy among university students, Shiraz, Iran: a Randomized Clinical Trial. J Adv Med Educ Prof 2014; 2(4): 158-64.
6. Romain AJ, Attalin V, Sultan A, Boegner C, Gernigon C, Avignon A. Experiential or behavioral processes: which one is prominent in physical activity? Examining the processes of change 1 year after an intervention of therapeutic education among adults with obesity. Patient Educ Couns 2014; 97(2): 261-8.
7. Loprinzi PD, Cardinal BJ, Si Q, Bennett JA, Winters-Stone KM. Theory-based predictors of follow-up exercise behavior after a supervised exercise intervention in older breast cancer survivors. Support Care Cancer 2012; 20(10): 2511-21.
8. Chiang CY, Sun FK. The Effects of a Walking Program on Older Chinese American Immigrants with Hypertension: A Pretest and Posttest Quasi-Experimental Design. Publ Health Nurs 2009; 26(3): 240-8.
9. Harris-Packer T, Forehand J, Hodges T, Leigh K. The Implementation of an Exercise by Prescription Program in Middle-aged Hypertensive African American Women. J Nurs Health Care 2015; 2(1): 24-8.
10. Fort MP, Murillo S, López E, Dengo AL, Alvarado-Molina N, de Beausset I, Castro M, Peña L, Ramírez-Zea M, Martínez H. Impact evaluation of a healthy lifestyle intervention to reduce cardiovascular disease risk in health centers in San José, Costa Rica and Chiapas, Mexico. BMC Health Serv Res 2015; 15: 577.
11. Lee LL, Arthur A, Avis M. Evaluating a

community-based walking intervention for hypertensive older people in Taiwan: A randomized controlled trial. Prev Med 2007; 44(2): 160-6.

12. Hajizadeh E, Asghari M. Methods and statistical analysis with looking to research method in the life sciences and health. 1st Edition. Tehran: Jahad of University, 2011. [In persian]
13. Ridgers ND, Timperio A, Brown H, Ball K, Macfarlane S, Lai SK, Richards K, Ngan W, Salmon J. A cluster-randomised controlled trial to promote physical activity in adolescents: the Raising Awareness of Physical Activity (RAW-PA) Study. BMC Public Health 2017; 17(1): 6.
14. Jackson D. How Personal Trainers Can Use Self-Efficacy Theory to Enhance Exercise Behavior in Beginning Exercisers. Strength Cond J 2010; 32(3): 67-71.
15. Glanz K, Rimer BK, Viswanath K. Health behavior and health education: theory, research,and practice. 4th Edition. USA: Jossey-Bass, 2008.
16. Nelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC, Macera CA, Castaneda-Sceppa C. Physical activity and public health in older adults: recommendation from the American college of sports medicine and the American heart association. Circulation 2007; 116(9): 1094-105.
17. Marcus BH, Forsyth LH. Motivating people to be physically active. Forsyth. Human kinetics: Champaign, IL; 2003.
18. Roozbahani N, Ghofranipour F, Eftekhar Ardabili H, Hajizadeh E. Factors influencing physical activity among postpartum Iranian women. Health Educ J 2014; 73(4): 66-76.
19. Plow M, Bethoux F, Mai K, Marcus B. A formative evaluation of customized pamphlets to promote physical activity and symptom self-management in women with multiple sclerosis. Health Educ Res 2014; 29(5): 883-96.
20. Bandura A. Self-efficacy: The exercise of control. New York: Freeman & Company, 1997.
21. IPAQ Research Committee. Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ)-Short and Long Forms. 2005 [cited 2015 July 8]. Available from: URL: International Physical Activity Questionnaire. https://www.google.com/search
22. Montoye HJ. Energy costs of exercise and sport. In: Nutrition in sport. Edited by Maughan RG. Oxford, UK: Blackwell Science Ltd., 2000; p: 53-72.
23. Moghadam M, Hajikazemi E, Roozber M F, Hoshyar rad A, Hosseini AG. Relationship between physical activity and

triceps skin fold thickness in adolescent girl student. Iran J Nurs 2011; 24(69): 62-8. [In Persian]

24. Zhu LX, Ho SC, Sit JW, He HG. The effects of a transtheoretical model-based exercise stage-matched intervention on exercise behavior in patients with coronary heart disease: a randomized controlled trial. Patient Educ Couns 2014; 95(3): 384-92.
25. Hashemi SZ, Rakhshani F, Navidian A, Mosani SR. Effectiveness of educational program based on trans-theoretical model on rate of physical activity among household women in Zahedan, Iran. J Health Syst Res 2013; 9(2): 144-52.
26. Solhi M, Ahmadi L, Taghdisi M H, Haghani H. The Effect of Trans Theoretical Model (TTM) on Exercise Behavior in Pregnant Women Referred to Dehaghan Rural Health Center in. Iran J Med Educ 2012; 11(8): 942-50.
27. Mutrie N, Carney C, Blamey A, Crawford F, Aitchison T, Whitelaw A. "Walk in to Work Out": a randomised controlled trial of a self help intervention to promote active commuting. J Epidemiol Community Health 2002; 56(6): 407-12.
28. Moeini B, Jalilian M, Hazavehei MM, Moghim Beigi A. Promoting Physical Activity in Type 2 Diabetic Patients: A Theory–Based Intervention. J Health Syst Res 2012; 8(5): 824-33. [In Persian]
29. Pinto BM, Lynn H, Marcus BH, DePue J, Goldstein MG. Physician-based activity counseling: intervention effects on mediators of motivational readiness for physical activity. Ann Behav Med 2001; 23(1): 2-10.
30. Hassani L, Shahab Jahanlu A, Ghanbarnejad A, Salimian Rizi A. Effect of educational intervention based on TTM model about regular physical activity among high school girl students in lenjan. J Prev Med 2014; 1(2): 22-30. [In Persian]
31. Geertz W, Dechow AS, Patra S, Heesen C, Gold SM, Schulz KH. Changes of Motivational Variables in Patients with Multiple Sclerosis in an Exercise Intervention: Associations between Physical Performance and Motivational Determinants. Behav Neurol 2015; 2015: 248193.
32. Pirzadeh A, Mostafavi F, Ghofranipour F, Feizi A. Applying Transtheoretical Model to Promote Physical Activities Among Women. Iran J Psychiatry Behav Sci 2015; 9(4): e1580.
33. Mostafavi F, Ghofranipour F, Feizi A, Pirzadeh A .Improving Physical Activity and Metabolic Syndrome Indicators in Women: A Transtheoretical Model-Based Intervention. Int J Prev Med 2015; 6: 28.