



## Association of Health Belief Model Constructs with Stages of Exercise Behavior Change in Prevention of Osteoporosis among Iranian Female Employees

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#### Authors

Shaahmadi Z.<sup>1</sup> MSc,  
Fallahi A.\*<sup>2</sup> PhD,  
Azadi N.A.<sup>3</sup> PhD,  
Pashei T.<sup>4</sup> PhD

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<sup>1</sup>Student Research Committee, Kurdistan University of Medical Sciences, Sanandaj, Iran

<sup>2</sup>Social Determinants of Health Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran

<sup>3</sup>Biostatistics Department, Public Health Faculty, Iran University of Medical Sciences, Tehran, Iran

<sup>4</sup>Public Health Department, Health Faculty, Kurdistan University of Medical Sciences, Sanandaj, Iran

#### \*Correspondence

Address: Health Faculty, Kurdistan University of Medical Sciences Sanandaj, Kurdistan, Iran. Postal code: 6617713446

Phone: +98 (87) 33621803

Fax: +98 (87) 33665159

arezofalahi91@gmail.com

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### ABSTRACT

**Aims** Female employees are more prone to develop osteoporosis. Exercise is the main factor preventing osteoporosis and an efficient method to increase bone density. This study was aimed to evaluate the relationship between health belief model constructs and stages of exercise behavior change in the prevention of osteoporosis among Iranian female employees.

**Instruments & Methods** This cross-sectional study was carried out in Iran, in 2016. A total of 585 female employees were selected through multi-stage sampling. A three-part questionnaire, including demographic information, health belief model constructs and stages of exercise behavior change was completed by the participants through self-report. The obtained data were analyzed by SPSS 22 software.

**Findings** The findings showed that 64.1% of female employees had no exercise activity. Perceived benefits and perceived self-efficacy were directly correlated with cues to action external and cues to action internal, respectively ( $p < 0.01$ ). The means of perceived benefits, perceived self-efficacy and cues to action external showed statistically significant differences during the stages of exercise behavior change ( $p < 0.05$ ). In logistic regression, the remains of the influencing factors of exercise behavior were perceived self-efficacy and cues to action external.

**Conclusion** Exercise activity among the female employees was low. Interventional studies seem necessary to be conducted to promote exercise behavior in female employees

**Keywords** Exercise; Osteoporosis; Women

### CITATION LINKS

[1] Effect of early menopause on bone mineral ... [2] The silent thief: Osteoporosis and women's health ... [3] Epidemiology and economic burden ... [4] Frequency of osteoporosis and osteopenia in ... [5] A home-based, transtheoretical change model designed strength training intervention to increase exercise ... [6] A cross-sectional survey of calcium intake in relation ... [7] Risk factors of osteoporosis among adults ... [8] Osteoporosis prevalence among women ... [9] The survey physical activity status of employed ... [10] Exercise in the prevention of falls in older people: A ... [11] Interventions for the prevention of falls in older adults ... [12] The role of physical activity in the ... [13] The transtheoretical model: Applications to ... [14] Design and implementation of an osteoporosis ... [15] Predicting osteoporosis prevention ... [16] Osteoporosis knowledge, beliefs, and ... [17] Women's Health ... [18] Development and evaluation of ... [19] Development and validation of a health belief model based instrument for ... [20] Assessing motivational readiness and ... [21] Stages of change for physical activity ... [22] Transtheoretical model: Examining ... [23] Application of the Trans-Theoretical Model ... [24] The transtheoretical model of behavior ... [25] Health education and promotion theories ... [26] Perceived exercise benefits and barriers of ... [27] Toward a reconceptualization of communication ... [28] The effectiveness of interventions to promote mammography ... [29] Health behavior and health education: Theory ... [30] Socio-economic, educational, and status characteristics ... [31] Insufficiently active Australian college students ... [32] The physical activity, fitness and health ... [33] The relationships among constructs in the health belief ... [34] Can health promotion model constructs ... [35] Self-efficacy and health ... [36] Stages of change in adolescents: An ... [37] Korean adolescents' exercise behavior and its relationship ... [38] Self-efficacy: Toward a unifying theory of behavioral ...

## Introduction

Osteoporosis is the most prevalent metabolic bone disease, a chronic debilitating disease in which minerals and bone matrix are reduced [1]. This asymptomatic disease is accompanied by a bone fracture in the case of no prevention and treatment [2]. In Europe, 22 million women and 5.5 million men suffer from this disease [3]. Its prevalence in women is four times greater than in men [4], and about 200 million women worldwide suffer from this disease [5]. Bone density in Asian women is less than American and European women [6]. Seventy percent of women and 50% of men in Iran over the age of 50 suffer from osteoporosis [5]. Studies have shown that working women are more affected by this disease [7, 8]. In Iran, female employees are more prone to develop osteoporosis due to insufficient physical activity [9]. Gender, menopause, skeletal size, cigarette, caffeine and alcohol consumption, reduced estrogen level, early menopause (Before the age of 45), reduced calcium intake and lack of physical activity are the major factors affecting this disease [4].

Prevention and treatment of osteoporosis include pharmaceutical and non-pharmaceutical interventions [10]. Non-pharmaceutical treatments, especially proper physical activities are less costly and have fewer complications than pharmaceutical treatments [11]. Doing regular exercise is an effective, safe and cheap method to prevent and postpone the incidence of osteoporosis, to increase muscular strength and to create balance, and coordination in the body [12].

The efficacy of physical activity in the prevention of osteoporosis has been proven based on the transtheoretical model. The transtheoretical model is an integrative model to conceptualize the process of intentional behavior change. In this model, behavior change is time-consuming and the person goes through five non-linear stages of behavior. These stages include precontemplation, contemplation, preparation, action, and maintenance [13].

Another common model in the prevention of osteoporosis is the health belief model, which includes perceived severity, perceived susceptibility, perceived benefits, perceived barriers, perceived self-efficacy, and cues to action, constructs [14]. Numerous studies have documented the significance of the above constructs in adopting preventive measures [15, 16].

Despite the studies conducted on prevention of osteoporosis based on transtheoretical model and health belief model, the association of health belief model constructs with stages of exercise behavior change to prevent osteoporosis has not been investigated so far. The questions answered in this study include: How much effective are perceived susceptibility, perceived benefits, perceived

barriers, perceived self-efficacy and cues to action in the prevention of osteoporosis in each stage of exercise behavior change based on the transtheoretical model? and how are these constructs related to each other?

In general, considering the high incidence of osteoporosis in female employees [8], importance of women's health [17], role of physical activity in prevention of osteoporosis [12] and scarcity of studies on association of health belief model constructs with stages of exercise behavior change in prevention of osteoporosis, the current study was aimed to determine the relationship of health belief model constructs with stages of exercise behavior change in prevention of osteoporosis among Iranian women employees.

## Instruments and Methods

**Study design and eligibility criteria:** This descriptive-analytical study was performed in Kermanshah, Iran, in 2016. The inclusion criteria comprised of the women aged  $\geq 30$  years, absence of menopause, working in governmental sectors and tendency to take part in the study. The exclusion criterion of the study was suffering from osteoporosis.

**Sampling:** A total of 585 female employees from governmental organizations and offices of Kermanshah city were included in the study through multi-stage sampling. First, a list of all organizations ( $n=120$ ) was prepared and 30 of them were selected via simple random sampling. Then, the women were included in the study via simple random sampling. If there were few working women in each organization, the census was carried out, and if an organization had many subsets, a number of them were selected through simple random sampling and proportional to the subset size, a proportion of the working women was selected randomly to complete the questionnaires.

The author distributed the questionnaires among the participants at 9:00 am. The questionnaires were checked for being completed, and the incomplete ones were returned to be completed. All working women (100%) were willing to participate in the study and completed the questionnaires fully in spring 2016. It should be noted that the questionnaire took 12-15 minutes to complete.

**Instruments:** The instrument used in this study for data collection was a three-part questionnaire. The first part included demographic information (Age, marital status, income and education) and the second part involved a 30-item questionnaire about health belief model constructs [18], including 4 items on perceived susceptibility, 4 items on perceived severity, 5 items on perceived benefits, 5 items on perceived barriers, 5 items on perceived self-efficacy, 2 items on cues to action internal and 5 items on cues to action external, with a five-point

Likert scale. The validity and reliability of the questionnaire in the Iranian community had been confirmed by Soleymanian *et al* [19]. The third part of the questionnaire, designed by Marcus *et al.*, consisted of stages of exercise behavior change based on the transtheoretical model (precontemplation, contemplation, preparation, action, and maintenance) [20]. The reliability of this scale in the Iranian population had been confirmed through the Kappa coefficient (0.78) [9].

**Data analysis:** The collected data were fed into SPSS 22 software and analyzed by descriptive statistics (Mean, standard deviation, frequency, and frequency percentage) and inferential statistics (one-way ANOVA, chi-square, Pearson correlation coefficient, and regression logistic) after determining the normality. Binary logistic regression was used to estimate the probability of achieving to the criteria to perform and do not perform exercise behavior.

## Findings

The mean age of the participants was 73.62±0.26 years. Table 1 presents the demographic information of the participants. None of the demographic variables were significantly correlated with stages of exercise behavior change. Perceived susceptibility was found to have a statistically significant difference with education so that the score of this construct in women with higher education was higher ( $p < 0.05$ ).

Of participants, 111 (19%) were in precontemplation stage, 126 (21.53%) were in contemplation stage, 138 (23.58%) were in preparation stage, 96 (16.41%) were in the action stage and 114 (19.48%) were in maintenance stage of exercise behavior change.

Perceived benefits and self-efficacy had a significantly direct correlation with cues to action internal and external. Perceived barriers had a significantly reverse correlation with cues to action internal and perceived severity ( $p < 0.01$ ; Table 2).

Table 3 presents the mean and standard deviation of

health belief model constructs during the stages of exercise behavior change in female employees. The results of ANOVA indicated a significant difference for the means of perceived self-efficacy, perceived benefits and cues to action external during the stages of exercise behavior change ( $p < 0.05$ ). Perceived self-efficacy and perceived benefits were found to be higher in the action and maintenance stages of exercise behavior than other stages, but cues to action external in contemplation stage of exercise behavior were reported to be higher than other stages.

As shown in Table 4, in logistic regression, however, the remains of the influencing factors of exercise behavior were perceived self-efficacy and cues to action external. Interestingly, exercise behavior increased 1.58 times and 1.48 times when perceived self-efficacy and cues to action external was increased one unit, respectively. Perceived self-efficacy was the most important predictor of exercise behavior among female employees.

**Table 1)** Demographic characteristics of Iranian female employees (n=585, the numbers in parentheses represent percentages)

Percent	Frequency
<b>Age (Year)</b>	
30-35	252 (43.1)
36-40	132 (22.6)
41-45	123 (21.0)
46-50	78 (13.3)
<b>Marital Status</b>	
Single	131 (22.4)
Married	408 (69.7)
Divorced	25 (4.3)
Widow	15 (2.6)
Separated	6 (1.0)
<b>Educational Status</b>	
Diploma	29 (4.9)
Bachelor-Associate degree	493 (84.3)
Master degree or higher	63 (10.8)
<b>Economic Situation (\$)</b>	
150-300	71 (12.1)
300-600	345 (59)
Higher of 600	169 (28.9)

**Table 2)** Relationship between determinants of exercise behavior based on HBM model among female employees

Variables	Perceived Susceptibility	Perceived severity	Perceived benefit	Perceived barrier	Self-efficacy	Cues to action internal	Cues to action external
Perceived Susceptibility	1						
Perceived severity	.082*	1					
Perceived benefit	.005	.142**	1				
Perceived barrier	-.063	-.088*	-.058	1			
Self-efficacy	.017	.007	.305**	-.031	1		
Cues to action internal	.052	.045	.187**	-.010	.146**	1	
Cues to action external	.026	.056	.254**	-.119**	.188**	.140**	1

\*\* $p < 0.05$  (two-tailed); \* $p < 0.01$  (two-tailed)

**Table 3)** Comparison of means and standard deviations of the HBM constructs across the stages of exercise behavior change among female employees

Health belief model constructs	PC	C	P	A	M	x <sup>2</sup>	df	p-value
Perceived susceptibility	12.46±2.99	11.81±3.41	12.02±2.73	12.06±3.04	11.89±2.92	3.817	4	0.43
Perceived severity	11.98±2.90	12±3.15	12.47±2.98	12.17±2.86	12.35±2.76	2.815	4	0.58
Perceived benefit	15.47±4.24	15.42±4.07	15.71±3.98	14.66±3.56	16.88±4.33	11.831	4	0.01
Perceived barrier	14.96±3.21	14.92±3.54	14.89±3.31	15±3.34	14.44±3.17	1.906	4	0.75
Self-efficacy	14.66±3.50	14.79±3.62	15.27±3.48	16.02±3.04	16.38±4.08	2.874	4	0.04
Cues to action internal	5.71±2.35	6.19±2.28	6.01±2.11	6.26±2.06	6.30±2.08	5.842	4	0.21
Cues to action external	15.11±3.59	16.20±3.67	15.19±3.43	15.47±3.21	15±3.78	9.698	4	0.04

PC: Pre-contemplation; C: Contemplation; P: Preparation; A: Action; M: Maintenance; \*\*p<0.05 is significant

**Table 4)** Results of logistic regression analysis on exercise behavior among female employees (n=585)

Predictors	b	S.E	Odds Ratio	95%CI	Wald	p-value
<b>Model 1</b>						
Perceived susceptibility	0.02	1.20	1.04	0.98-1.21	0.07	>0.05
Perceived severity	0.46	0.34	1.08	0.89-1.19	0.35	>0.05
Perceived benefit	0.38	0.16	1.42	1.07-1.95	1.21	<0.05
Perceived barrier	-0.09	0.13	1.27	1.13-1.68	1.64	<0.01
Perceived Self-efficacy	0.32	0.13	1.38	1.24-1.68	5.43	<0.05
Cues to action internal	-0.02	0.03	0.97	0.98-1.18	0.79	>0.05
Cues to action external	0.07	0.06	1.22	1.06-1.31	1.52	<0.05
<b>Model 2</b>						
Perceived self-efficacy	0.38	0.16	1.49	1.35-1.94	5.26	<0.01
Perceived barriers	-0.07	0.01	0.68	0.62-1.03	0.81	>0.05
Cues to action external	0.08	0.03	1.19	1.02-1.48	1.82	<0.05
Perceived benefit	0.31	0.14	1.02	0.98-1.22	0.89	>0.05
<b>Model 3</b>						
Perceived self-efficacy	0.52	0.29	1.58	1.35-1.63	5.23	<0.01
Cues to action external	0.08	0.02	1.22	1.12-1.38	1.91	<0.05

Lack of exercise behavior was coded as 0 and exercise behavior was coded as 1; Model (likelihood ratio) chi-square=17.10, df=2, p<0.01  
Nagelkerke R<sup>2</sup>=8.5%; Percent correctly classified=69.6%

## Discussion

The present study investigated the relationship of health belief model constructs with stages of exercise behavior change in the prevention of osteoporosis among the Iranian female employees in 2016. The findings revealed more than half of female employees had no exercise activity (64.1%). In line with our findings, Dumith *et al.* reported that the majority of participants were in precontemplation stage of exercise behavior and only 5.2% of them were in the action stage [21]. However, in contrast to our findings, Nigg showed that the majority of the youth (49.3%) were in the maintenance stage of exercise behavior and merely 6.3% were in precontemplation and contemplation stages of exercise behavior [22]. The multiple roles of women at home and work, absence of a specific place and time for exercise activities in most of the organizations, lack of credit allocation to sports activities, too much engagement of women because of responsibilities at home and more dependence of children on mother, their low perception of benefits of exercise and severity of diseases due to lack of exercise, obstacles such as lack of sports equipment, men's negligence towards exercise activities of their wives, fear and anxiety of starting exercise activities due to lack of unfamiliarity with exercise and its

non-institutionalization during childhood, and unaffordability to supply sports equipment and membership in sports clubs can be the major factors involved in locating women in early stages of exercise behavior change. These results highlight the attention of managers, policymakers, and planners of women's health over and over.

The results of the present study show that the mean of perceived benefits during the stages of exercise behavior showed a statistically significant difference, minimum value being reported in the action stage. In contrast to our findings, Emdadi *et al.* [23] and Marshall and Biddle [24] reported a difference for perceived benefits during the stages of exercise behavior, being higher in the action and maintenance stages than other stages based on the transtheoretical model. It should be noted that possible recurrence and return to previous stages of exercise behavior in the action stage [25] and more attention to barriers of exercise behavior can be the reasons for the low score of perceived benefits in this stage [26].

Moreover, the findings of the current study showed that the score of cues to action external in the precontemplation stage was higher than other stages. In contrast to the findings of the present study, studies have shown that the mean of cues to

principles of the health belief model, cues to action in people performing preventive behaviors is higher than other individuals [29]. Social learning theory also considers social support important in doing the behavior [30]. Many studies have confirmed this finding that lack of social support reduces physical activity [31, 32]. The participants in this study have probably not received encouragement, support and accompaniment on the part of their families, managers or colleagues to continue sports activities. On the other hand, individuals may feel in contemplation stage that they receive high social support during the exercise behavior, but when individuals perform the behavior in the real world, social support is likely to diminish due to the problems of the people around them or other organizations.

The findings showed no statistically significant difference for perceived susceptibility and severity during the stages of exercise behavior change. In disagreement with our results, the findings of Juniper *et al.* indicated that people who were in higher stages of exercise behavior change, had higher perceived severity and susceptibility than those who were in lower stages of exercise behavior [33]. According to the principles of the health belief model, interaction between perceived susceptibility and perceived severity is regarded as a perceived threat [29]. Screening osteoporosis in female employees and people at high risk may reveal the perceived susceptibility and severity of the disease more and more.

Furthermore, the findings showed no statistically significant difference in perceived barriers during the stages of exercise behavior change. Based on the theoretical principles of Pender's model of health promotion, barriers prevent and stop the behavior [34]. Similar understanding of barriers and presence of equal sports barriers for the female, similar sports rules, and regulations in organizations, few questions on perceived barriers and incomplete coverage of all barriers from the perspective of female employees are possible reasons for absence of difference in the score of perceived barriers during the stages of exercise behavior change.

Perceived self-efficacy, another construct of health belief model, had a statistically significant correlation with stages of exercise behavior change and was Self-efficacy was the most important predictor of exercise behavior among female employees. The results of Schwarzer and Fuchs indicated that self-efficacy can be a more potent predictor of doing exercise behavior than other constructs [35]. Berry *et al.* [36] and Kim [37] showed that self-efficacy is the most important predictor of exercise behavior. According to the principles of Bandura's social cognitive theory, the self-efficient people have less fear of behavior change. On the other hand, when an individual achieves a behavior,

his/her self-efficacy will be enhanced [38]. According to our findings, cues to action external played an important predictor in exercise behavior. Cues to action seem to arise from social influence, stimulate overt behavior, and promote health behavior. Cues to action external such as the support of managers, colleagues, and spouses are vital for performing exercise behavior among Iranian female employees. The cross-sectional design of the study, not following the results over time, completing the questionnaire through self-report, absence of working women in private sector and absence of homemakers were some of the limitations of this study.

## Conclusion

The exercise activity of female employees was at a low level, and support of family, friends, government and social institutions could be effective in doing exercise. Identification of cultural and social barriers to exercise behavior from the perspective of female employees through the qualitative approach and designing educational interventions based on health belief model to promote exercise behavior among the female employees can be taken into account by researchers in future studies. The findings of this research can be helpful for the planners and policymakers of women's health, managers of organizations, families and working women to reduce the barriers and provide an appropriate environment to perform exercise activities.

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**Conflict of Interest:** The authors declare that they have no conflict of interest.

**Authors' Contribution:** Shaahmadi Z. (First author), Introduction author/ Original researcher/ Statistical analyst (30%); Fallahi A. (Second author), Methodologist/ Discussion author (30%); Azadi N.A. (Third author), Assistant researcher/ Statistical analyst (25%); Pashei T. (Fourth author), Assistant researcher (15%)

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## References

- 1- Gallagher JC. Effect of early menopause on bone mineral density and fractures. *Menopause*. 2007;14(3 Pt 2):567-71.
- 2- Munch S, Shapiro S. The silent thief: Osteoporosis and women's health care across the life span. *Health Soc Work*. 2006;31(1):44-53.
- 3- Svedbom A, Ivergård M, Hernlund E, Rizzoli R, Kanis J. Epidemiology and economic burden of osteoporosis in Switzerland. *Arch Osteoporos*. 2014;9:187.
- 4- Bayat N, Haji Amini Z, Alishiri GH, Ebadi A, Hosseini M, Laluee A. Frequency of osteoporosis and osteopenia in post-menopausal military family's women. *Ann Mil Health Sci Res*. 2008;6(1):25-30. [Persian]
- 5- Karimzadeh Shirazi K, Wallace LM, Niknami Sh, Hidarnia AR, Torkaman G, Gilchrist M, et al. A home-based, transtheoretical change model designed strength training intervention to increase exercise to prevent osteoporosis in Iranian women aged 40-65 years: A randomized controlled trial. *Health Educ Res*. 2007;22(3):305-17.
- 6- Chang SF. A cross-sectional survey of calcium intake in relation to knowledge of osteoporosis and beliefs in young adult women. *Int J Nurs Pract*. 2006;12(1):21-7.
- 7- Kahsay AB, Gashe FE, Debessai ZG, Tegegne A, Bezabih T. Risk factors of osteoporosis among adults in Ethiopia, the case of Tigray region: A case control study. *J Public Health Epidemiol*. 2014;6(2):92-100.
- 8- Urmal S, Jaspreet Kaur S, Sharma K. Osteoporosis prevalence among women in a selected hospital, Ludhiana, Punjab. *Int J Health Sci*. 2014;2(1):88-91.
- 9- Jalilian F, Emdadi Sh, Mirzaie Alavijeh M, Barati M. The survey physical activity status of employed women in Hamadan University of Medical Sciences: The relationship between the benefits, barriers, self-efficacy and stages of change. *Toloo e Behdasht*. 2010;9(4):89-99. [Persian]
- 10- Carter ND, Kannus P, Khan KM. Exercise in the prevention of falls in older people: A systematic literature review examining the rationale and the evidence. *Sports Med*. 2001;31(6):427-38.
- 11- Chang JT, Morton SC, Rubenstein LZ, Mojica WA, Maglione M, Suttrop MJ, et al. Interventions for the prevention of falls in older adults: Systematic review and meta-analysis of randomised clinical trials. *BMJ*. 2004;328:680.
- 12- Schmitt NM, Schmitt J, Dören M. The role of physical activity in the prevention of osteoporosis in postmenopausal women-an update. *Maturitas*. 2009;63(1):34-8.
- 13- Marcus BH, Simkin LR. The transtheoretical model: Applications to exercise behavior. *Med Sci Sports Exerc*. 1994;26(11):1400-4.
- 14- Turner LW, Hunt SB, Di Brezzo R, Jones C. Design and implementation of an osteoporosis prevention program using the health belief model. *Am J Health Stud*. 2004;19(2):115-21.
- 15- Gammage KL, Klentrou P. Predicting osteoporosis prevention behaviors: Health beliefs and knowledge. *Am J Health Behav*. 2011;35(3):371-82.
- 16- Edmonds ET. Osteoporosis knowledge, beliefs, and behaviors of college students: Utilization of the health belief model [Dissertation]. Tuscaloosa AL: The University of Alabama; 2009.
- 17- Kwolek D. Women's Health Education. *J Gen Intern Med*. 2003;18(6):490-1.
- 18- Kim KK, Horan ML, Gendler P, Patel MK. Development and evaluation of the osteoporosis health belief scale. *Res Nurs Health*. 1991;14(2):155-63.
- 19- Soleymanian A, Niknami S, Hajizadeh E, Shojaeizadeh D, Montazeri A. Development and validation of a health belief model based instrument for measuring factors influencing exercise behaviors to prevent osteoporosis in pre-menopausal women (HOPE). *BMC Musculoskelet Disord*. 2014;15:61.
- 20- Marcus BH, Rakowski W, Rossi JS. Assessing motivational readiness and decision making for exercise. *Health Psychol*. 1992;11(4):257-61.
- 21- Dumith SC, Gigante DP, Domingues MR. Stages of change for physical activity in adults from Southern Brazil: A population-based survey. *Int J Behav Nutr Phys Act*. 2007;4:25.
- 22- Nigg CR, Courneya KS. Transtheoretical model: Examining adolescent exercise behavior. *J Adolesc Health*. 1998;22(3):214-24.
- 23- Emdadi Sh, Nilsaze M, Hosseini B, Sohrabi F. Application of the Trans-Theoretical Model (TTM) to exercise behavior among female college students. *J Res Health Sci*. 2007;7(2):25-30.
- 24- Marshall SJ, Biddle SJ. The transtheoretical model of behavior change: A meta-analysis of applications to physical activity and exercise. *Ann Behav Med*. 2001;23(4):229-46.
- 25- Saffari M, Shojaeizadeh D, Ghofranipour F, Heydarnia AR, Pakpour Hajiagha A. Health education and promotion theories, models and methods. Tehran: Sobhan; 2010. pp. 53-64. [Persian]
- 26- Lovell GP, El Ansari W, Parker JK. Perceived exercise benefits and barriers of non-exercising female university students in the United Kingdom. *Int J Environ Res Public Health*. 2010;7(3):784-98.
- 27- Mattson M. Toward a reconceptualization of communication cues to action in the health belief model: HIV test counseling. *Commun Monogr*. 1999;66(3):240-65.
- 28- Legler J, Meissner HI, Coyne C, Breen N, Chollette V, Rimer BK. The effectiveness of interventions to promote mammography among women with historically lower rates of screening. *Cancer Epidemiol Biomarkers Prev*. 2002;11(1):59-71.
- 29- Glanz K, Rimer BK, Lewis FM. Health behavior and health education: Theory, research, and practice. San Francisco CA: Jossey-Bass; 2002.
- 30- Macintosh D. Socio-economic, educational, and status characteristics of Ontario interschool athletes. *Can J Appl Sport Sci*. 1982;7(4):272-83.
- 31- Leslie E, Owen N, Salmon J, Bauman A, Sallis JF, Lo SK. Insufficiently active Australian college students: Perceived personal, social, and environmental influences. *Prev Med*. 1999;28(1):20-7.
- 32- Boreham C, Riddoch C. The physical activity, fitness and health of children. *J Sports Sci*. 2001;19(12):915-29.
- 33- Juniper KC, Oman RF, Hamm RM, Kerby DS. The relationships among constructs in the health belief model and the transtheoretical model among African-American college women for physical activity. *Am J Health Promot*. 2004;18(5):354-7.
- 34- Mohebi S, Sharifirad G, Feizi A, Botlani S, Hozori M, Azadbakht L. Can health promotion model constructs predict nutritional behavior among diabetic patients? *J Res Med Sci*. 2013;18(4):346-59.
- 35- Schwarzer R, Fuchs R. Self-efficacy and health behaviours. In: Conner M. Predicting health behaviour: Research and practice with social cognition models. Conner M, Norman P, editors. Maidenhead: Open

University Press; 1996. pp. 163-96.

36- Berry T, Naylor PJ, Wharf-Higgins J. Stages of change in adolescents: An examination of self-efficacy, decisional balance, and reasons for relapse. *J Adolesc Health*. 2005;37(6):452-9.

37- Kim YH. Korean adolescents' exercise behavior and its relationship with psychological variables based on stages of change model. *J Adolesc Health*. 2004;34(6):523-30.

38- Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychol Rev*. 1977;84(2):191-215.