Research Article

HEALTHY AGING RESEARCH

OPEN

Study of Cardiovascular Factors, Quality of Life and Body Composition in Physically Active and Sedentary Women

Rafati Fard Mohammad[a], Hatamzadeh Nasser[b]*, Fattahi Mojtaba[c], Akhlagh Mohamadi Zahra[d], Sadeghi Masoumeh[a]

Objectives: The purpose of this study was to investigate cardiovascular factors, quality of life (physical health, psychological health, social relationships and the living environment health) and body composition in physically active and sedentary elderly women.

Methods: In this quasi-experimental, applied research, the study population included 724 elderly women aged 65-75 years old at a day rehabilitation center affiliated to the Welfare Organization of Shiraz. A total of 173 women assigned to two groups [active (n: 75) and sedentary (n: 98) participated voluntarily in this study.Inclusion criteria were regular participation in the sports program of the center for at least three years for the active group and lack of performing exercise of any type for sedentary group. Quality of life was investigated through the WHO Quality of Life Questionnaire, body mass index (BMI) calculated by the formula body weight (kg) divided by the square of the body height (m), and homocysteine level by hematologic measurements.Data were analyzed using independent t-test and Pearson correlation coefficient. The significance level (P) was considered <0.05.

Results: There was a significant difference in the values of physical health (P≤0.001), psychological health (P≤0.001), social relationships (P≤0.001), life environment health (P≤0.001), quality of life (P≤0.001), homocysteine level (P≤0.001) and BMI (P≤0.001) between the two groups. Homocysteine level and BMI were significantly, inversely correlated with quality of life in active women(P≤0.05), but homocysteine level and BMI were insignificantly and inversely correlated with quality of life in sedentary women(P>0.05).

Keywords: Quality of life, body mass index, homocysteine, elderly

Introduction

The needs of old age represent one of the most important social issues of the current century, which can increase the longevity of human and therefore the elderly population, as one of the good achievements of the century [1]. Hence, one of the major issues in the world population is aging and its consequences. Currently, Iran is also experiencing the age transitional structure from youth to aging [2]. Although the aging process in a community is considered to be a positive outcome of development, it will become a major challenge if no appropriate planning for monitoring the elderly's health is done [3]. Medically, aging refers to the ages over 65 (in developing countries over the age of 60) years [4]. In 2006, the United Nations estimated the total number of elderly people to be 700 million that is projected to double in the next 40 years, while 52% of the total elderly population live in Asian countries and 40% in advanced countries [5]. Common disabilities in the elderly are due to a variety of factors, one of the most important of which is physical inactivity [6]. Schnabel et al. in a study in Britain found people with a sedentary lifestyle, who spend much of their everyday lives inactive, or engage in activities that are done mainly in sedentary positions or consume low energy (such as watching TV), had more risk factors for cardiovascular disease and other diseases such as diabetes regardless of the level of physical activity and physical fitness [7]. Cardiovascular disease is an important cause of mortality and morbidity in the elderly and imposes a significant financial burden on health care systems [8]. As the age increases, physiological changes in body composition occurs, including increased body mass index (BMI) and waist to hip ratio (WHR) [9], cardiovascular system changes such as high systolic and diastolic blood pressure [7]. Changes in physical functioning and body metabolism such as insulin resistance, dyslipidemia and lipid oxidation, impaired concentrations of low-density lipoprotein (LDL) and high density lipoprotein (HDL) [10,11], mental stress, and

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

[a]Cardiac Rehabilitation Research Center, Cardiovascular Research Institute, Isfahan University of Medical Sciences, Isfahan, Iran bDepartment of Health Education & Health Promotion, Faculty of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran CHealth Promotion, healthcare services department, Shahid Sadoughi university of medical sciences, Yazd, Iran and dOfficer in Iranian Social Security Organization, Ahvaz, Iran

**Corresponding Author. Address: Department of Health Education & Health Promotion, Faculty of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. Tel: +98-9166059892. Email address: dalahoo_nh@yahoo.com (Hatamzadeh Nasser)*

Mohammad RF, et al. Healthy Aging Research (2019) 8:5

Received 23 January 2019; Accepted 04 April 2019

Published online 11 April 2019

DOI: 10.12715/har.2019.8.5

decline in the quality of life [1], alterations in inflammatory and coagulation factors, as well as increased levels of homocysteine [12]. Serum homocysteine level is one of the most important predictors of cardiovascular disease with increasing age. Many factors, such as genetic mutations, changes in the endocrine system of the body, obesity and environmental factors, can contribute to the development of hypercholesterolemia [13]. The relationship between total homocysteine levels and atherosclerosis is even stronger than the association between atherosclerosis and cholesterol, so reducing homocysteine levels reduces heart attacks and myocardial infarction. Increased homocysteine level is independentlyly associated with the risk of developing cardiovascular disease, and hyperhomocysteinemia leads to venous thrombosis, and several cardiovascular problems [12, 14]. In addition, hyperhomocysteinemia can play a role as an independent risk factor in the development of other diseases, such as Alzheimer's disease and cognitive impairments, in the aging. These factors can have a highly adverse effect on the quality of life of the elderly [15,16]. Because with increasing age, physical dysfunction is exacerbated and its adverse effect on the ability to maintain independence increases the need for help. Loss of muscle mass also leads to reduced muscle strength and functioning, accompanied by a decline in quality of life [17]. Exercise is one of the ways to prevent disorders in old age, such as cardiovascular disease, by improving physical fitness and reducing mental and psychological disorders. Exercise and physical activity delay aging. Elderly people who exercise are more healthy and have more vitality. Participation in exercise programs also increases tendency to live an independent life and assume social responsibilities in the elderly [3,18]. Exercise is associated with the improvement of quality of life by reducing body fat percentage (BFP) and obesity, increasing muscle strength, improving balance, reducing chance of falling, improving mental health, and reducing muscle pain [19]. In this regard, quality of life is considered an essential indicator, and it is of particular importance to pay attention to quality of life since it involves several dimensions such as physiological aspects, functioning and well-being [20]. Several age-related physiological problems that occur in the elderly will affect their quality of life. Given the specific requirements of the aging period, it is also essential to pay attention to quality of life in the elderly that is neglected in most cases [21]. Paying attention to quality of life and modification of lifestyle can greatly increase the efficiency and independence of the elderly. High quality of life in old age includes well-being, working better during the day and living an independent life. One of the factors that is likely to contribute significantly to improving the quality of life in the elderly is regular and continuous physical activity [17,19,22]. Regular physical activity's positive impacts on body composition in the elderly help achieve the health of the elderly population, so that the appropriate indicators of the body composition can lead to cardiovascular health, and consequently improved quality of life. Therefore, having an appropriate body composition is important to many people, especially elderly women. Promotion and maintenance of health require awareness of the state of body composition and the identification of effective factors on it [22]. Body composition changes due to the age-related decrease in muscle mass play an important role in weakness and frailty. The importance of body composition and its relationship with health cannot be ignored. Most elderly people are suffering from critical illnesses and mortality from diseases such as high blood pressure, diabetes, cardiovascular disease and orthopedic diseases. Therefore, it is essential to assess body composition in order to determine the optimum level of physical fitness and health [23]. One of the most important tools for assessing body composition is BMI. BMI is widely used to evaluate overweight and obesity. However, the relationship between BMI and BFP in body mass is influenced by age, gender and ethnicity. People across the world are classified into normal weight, overweight and obesity according to BMI. Compared with the methods to calculate BFP, BMI is less expensive and more convenient and can easily serve the health-related goals of the aging population [24]. Unfortunately, most developing countries in the world have not yet understood the economic and health-related complexities of the aging, and with increasing the number of elderly people, their problems have also grown so that no suitable and accessible solutions have yet been achieved for them [25]. The major difference between developing countries and developed countries is that developed countries are fully prepared to face the challenges of an increasing number of elderly people, while most developing countries are even un aware of the phenomenon and the associated health, social and economic consequences [1]. Given the above-mentioned, the importance of planning for understanding the quality of life of this subpopulation of the community, this study comparatively investigated cardiovascular factors, quality of life and body composition in physically active and sedentary elderly women.

Materials and methods

The study population of this descriptive-comparative (causal-prospective) study consisted of 724 women aged 65-75 years at a day rehabilitation affiliated to the Welfare Organization of Shiraz. Study participants were selected from the study population if they volunteered to participate in the study after a call-out in the center. Inclusion criteria were regular and continuous participation in the sports program of the center for at least three years for physically active elderly and lack of participating in the exercise program and any other regular sports program (for less than 20 min/week) for sedentary group. The sports program includes three days of various sports activities (tensile exercises and morning exercise programs, walking, motor skills enhancement, cardiorespiratory endurance activities, balance and movement exercises, water workouts). Study participants were informed that they could withdraw from the study if they did not wish to fill out the questionnaire. In order to do this research, the Study participants who volunteered to participate in the study were enrolled after undergoing several screening stages. Then, a consent form was distributed among them, and with the researcher's guidance and a doctor's assistance, they filled out a checklists of medical history and physical activity readiness so that underlying information could be collected. After completing the medical history checklist and assigning a checklist to each participant, the initial assessment including medical records review, physical examinations, and hematologic profile review was performed People with a blood pressure over 160/90 mmHg and a triglyceride level over 400 mg%, as well as diabetes, liver disease, cardiovascular disease, severe osteoporosis and arthrosis, renal disease, or medical problems and orthopedic disorders were excluded. Selected Study participants did not take any medication that could affect homocysteine levels, such as hypoglycemic drugs including statin, antiepileptic drugs, and estrogen-like hormones. They were not also smokers. In a secondary assessment of the elderly, they participated in a cumulative exercise test using treadmill. Individuals with abnormal cardiovascular responses were excluded. Samples (n: 173) were selected from the study population in the day rehabilitation center of Shiraz. The Study participants were divided into two groups: active (n: 75) and samples (n: 98). After selecting the samples, the study participants

and the purpose of the study, the procedure and the applications were explained for them (**Table 1**).

The instruments used in this research were a demographic information checklist, and the questionnaire World Health Organization Quality of Life (WHOQOL). This information was collected by the original researcher. The questionnaire (WHOQOL) is a 26-item instrument consisting of four domains: Physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items) and rated on a 5-point Likert scale (1-5).

BMI was also calculated by the formula body weight (kg) divided by the square of the body height (m). Then, 5 ml of blood was taken from each participant. After blood sampling, the test tube was kept as fixed until the blood clotted. The serum was then isolated at room temperature using centrifugation and stored at -70° C (158° F). Homocysteine level was measured by ELISA using a homocysteine laboratory kit (Germany). Data analysis was performed using the SPSS version 18. The normal distribution of data was investigated by the Kolmogorov-Smirnov test. The independent t-test was used to compare the quality of life, BMI and homocysteine levels between the two groups. Pearson correlation coefficient was also used to investigate the relationship of subscales of the WHOQOL and homocysteine with BMI in the physically active and sedentary women. The significance level of the test was considered as $p<0.05$.

Ethical considerations in this study include obtaining approval of the Ethics Committee (at shiraz University of Medical Sciences, code: 95906 on 6 August 2014 for the study protocol before beginning the study and informed consent from the participants, and assuring the participants that every efforts would be made to keep their information confidential.

Results

The comparison between the two groups is presented in **Table 2**. The results of this study showed that there was a significant difference between homocysteine (P=0.001), physical health (P=0.001), psychological health (P=0.001), social relationships (P=0.001) living environment health (P=0.001), quality of life (P=0.001) and BMI (P=0.031) between the two groups. There was also a significant, negative correlation between BMI and quality of life subscales in active group, that is, by decreasing the BMI, the quality of life in active elderly women improved. There was also a negative, insignificant correlation between BMI and quality of life subscales in sedentary group. This suggests that with reducing the BMI, the lifestyle in these individuals also improves yet insignificantly. There was a positive, significant correlation between homocysteine and BMI in active group and positive, insignificant correlation between the two variables in sedentary group (**Table 3**).

Table 1

The demographic characteristics of participants.

Group Variable	Active M(± SD)	Sedentary M(± SD)	p-value
Age (year)	68/23 (± 7/2)	75/43 (± 5/5)	0.08
Height (cm)	161/35 (± 9/1)	158/74 (± 7/4)	0.39
Weight (kg)	65/87 (± 7/9)	73/93 (± 10/3)	0.06

Table 2

Comparison of the mean values of variables between physically active and sedentary elderly women

Group Variable	Active M(±SD)	Sedentary M(±SD)	Significance level
Physical health	14/23 (± 7/2)	10/15 (± 6/7)	0.001
Psychological health	15/45 (± 9/1)	10/45 (± 8/1)	0.001
Social relationships	14/59 (± 6/2)	8/20 (± 8/5)	0.001
Living environment health	14/11 (± 25/1)	10/45 (± 15/3)	0.001
Quality of life and general health	8/79 (± 14/3)	6/24 (± 16/8)	0.001
Body mass index	26/27 (± 10/3)	28/82 (± 11/7)	0.001
Homocysteine	15/46 (± 11/3)	19/68 (± 14/4)	0.001

Table 3

Relationship of body mass index with the subscales of Quality of Life Questionnaire and homocysteine level.

Group Variable	BMI	Correlation coefficient	Significance level
Physical health	Sedentary	-0.182	0.425
	Active	-0.238	0.023
Psychological health	Sedentary	-0.259	0.079
	Active	-0.367	0.003
Social relationships	Sedentary	-0.126	0.54
	Active	-0.489	0.0001
Living environment health	Sedentary	-0.064	0.67
	Active	-0.499	0.0001
Quality of life and general health	Sedentary	-0.127	0.287
	Active	-0.246	0.007
Homocysteine	Sedentary	-0.436	0.052
	Active	-0.254	0.001

Discussion

The present study was conducted to compare the quality of life and BMI between physically active and sedentary elderly women. The results of the study showed that active elderly women had higher physical health than sedentary elderly women. The results of this study were consistent with Sadrollahi et al., Giuli et al. and Ghasemzadeh et al. (2013), which showed that decreased BMI could promote all subscales of quality of life [3,26,27], but not consistent with the findings of Fabrie et al. and Trif et al. [28,29]. One of the issues that could contribute substantially to improving the quality of life of the elderly is regular and continuous physical activity. Regular physical activity and good physical fitness can promote health and help prevent or treat illnesses. Regular physical activity and acceptable physical fitness not only prevent diseases, but also promote the quality of life and health. Having a physically fit body helps one feel well and enjoy life more [30]. Participating in regular physical activities may promote physical fitness and help prevent or treat illnesses in older women. The results of the study showed elderly women had higher levels of psychological health than elderly women with comparatively lower physical activity. The results of our study were consistent with the studies of Jelly et al. and Lotfi et al. [31,32], but not consistent with the studies of Trif et al. and Bart et al. [29,33]. In recent years, psychology and psychotherapy have drawn much attention. One of the approaches psychologists offer to prevent and treat psychological problems is physical activity as it assists in mental health and improving quality of life. According to research findings, there is a close association between exercise and improvement of mental conditions and mental disorders. Given the participation of active elderly women in exercises and the existence of a close association between exercise and improvement of mental conditions

and mental disorders, these participants attained better scores on the psychological health subscale [34]. The active participation of older women in exercises is likely to have reduced mental stress, and these people are more likely to have a better quality of life than their sedentary peers. The results of our research showed active elderly women had higher social relationships than elderly women with compatatively lower physical activity. The results of this study were consistent with the studies of Ghasemzadeh et al. and Kouzechian et al. [26,35] but were not consistent with the study of Azin et al. [36]. Aging has unique physical, mental and social characteristics. It seems that elderly people, on the one hand, should be given attention and support for their age, declined functional ability and, on the other hand, because they are the most vulnerable subpopulation in society, and their needs in terms of physical, social and mental health should be taken into account. Several studies have shown physical activity accelerates socialization [37]. Given that numerous studies have proven physical activity accelerates socialization, and that the participation of physically active elderly women in physical activity programs and communication with peers is likely to be higher than that in sedentary elderly women, they are less likely to feel alone and secluded than sedentary elderly women, therefore, they will have better social relationships and quality of life than sedentary elderly women [19,22]. The results of the current study indicated physically active elderly women had a higher living environment health than sedentary elderly women. The results of this study were consistent with the studies of Jelly et al. and Lotfi et al. [31,32] but inconsistent with the results of Ghasemzadeh et al. and Fabrie et al. [28,38]. It is essential to adopt appropriate policies to improve the physical, mental and social status of the elderly. It is important, from health perspective, to direct attention to the life and physical activity of the elderly and the health of their living environment [39]. Daily activities ensure some of self-care responsibilities. Physical activity in the elderly helps them move and independently maintain their health, but physical inactivity can increase their need for caregivers and aids. Once the status of the elderly's motor activity is examined, their critical aspects of movement restrictions will be known [35]. Regarding the participation of elderly women in physical activity, thry are likely to make more attempts, take more steps, and be more independent in order to maintain their health than sedentary elderly women, and therefore they will have a better life environment and better quality of life than comparatively less physically active women [40]. The results of our study showed active elderly women had a higher quality of life than sedentary elderly women. The results of this study were consistent with the studies of Herman et al. Bergamen et al. and Ghaseminejad et al. [6,21,40], but werr in disagreement with the results of Fabrie et al. [28]. Quality of life has a broad concept and includes dimensions of life. The development of any chronic disease has a great impact on the quality of life of people, especially the elderly. The most important issue that affects the physical and mental needs of the elderly is how to care for them [39]. Many studies have shown elderly people who live alone are more predisopsed to developing physical and mental diseases [32].

Because of the participation of elderly women in physical activity programs, these people are more likely to do daily routines easily and to have higher levels of general health, and therefore have a better quality of life than comparatively less physically active elderly women. The results of the current study showed active elderly women had lower BMI than sedentary elderly women. The results of this study were consistent with the studies of Kendall et al. and Khazri et al. [37,39], but not consistent with Andreas et al. [40]. The body composition is important from health and social perspectives, including its relationship to physical fitness. Although the body composition is largely dependent on genetic factors, environmental factors, diet and exercise can also influence the levels of adipose and muscle mass [41]. BMI increases with age. In general, the measurement of body composition is one of the valid methods for assessing the health and well-being of individuals, so that many scholars have emphasized the relationship between physical fitness and well-being [3,18,36], because of the participation of active elderly women in physical activity program, exercise might preserve the net mass, reduce fat storage and stimulate protein synthesis in them, and therefore they are likely to have a lower BMI than elderly women with low physical activity. The results of this study showed homocysteine level was significantly lower in physically active elderly women than in elderly women with low physical activity. There was also a significant and positive correlation between homocysteine levels and BMI in physically active and sedentary elderly women. Although the main mechanism for the association of obesity with hypercholesterolemia is not known, some studies have highlighted the role of underlying factors. Obesity, and particularly abdominal obesity, have a positive correlation with insulin resistance, and the lack of insulin function in the body can increase homocysteine production [14,16]. Exercise increases beta-adrenergic receptor density on the cell surface of the adipose tissue and consequently their susceptibility to the lipolysis process. It seems that the main trigger of this process is the distribution of catecholamines and the reduction of insulin due to aerobic activity and increased lipid oxidation that can reduce the homocysteine level [14]. Studies have shown there is a positive correlation between BMI and low plasma concentrations of folate that can increase the development of hypercholesterolemia [12]. The results of this study are consistent with the cohort study of Park et al. which showed there was a positive and significant correlation between BMI and homocysteine [15]. Regular exercise reduces the plasma level of homocysteine and therefore helps prevent cardiovascular disease. This factor may help reduce homocysteine in several ways, including: improving the body composition, increasing the intestinal absorption of vitamins, and increasing the activity of the enzymes involved [11,15,16]. Because the aging period is one of the most sensitive stages of human life that can easily be affected by various factors and damaged, it is necessary to pay attention to and planning for the quality of life of this subpopulation of the community. Since aging is growing rapidly in our society, physical activity and exercise, which are one of the most efficient and accessible means that can promote the physical and mental health of the elderly population, should be taken into account and planned for.

Conclusion

According to the results of our study, It can be concluded that physical activity can improve cardiovascular factors such as homocysteine, quality of life, and BMI in the elderly; thus, to improve the quality of life and BMI in the elderly, they are recommended to participate in physical activity programs. Among the limitations of this study we can mention lack of control over the nutrition, consumed by participants, which could have affected their calorie intake and BMI.

Acknowledgement

We are grateful to all the elders who assisted us in conducting this study.

References

1. Dadashpoor A, Mohammadi R. Investigating effect of a period of water exercise on sleep quality in male elders. SSU J 2013;2:300-310.
2. Najafgholizadeh HF, Rahmaninia B, Mirzaei B. Comparison of some cardiovascular risk factors between active and sedentary elderly men. J Qazvin Univ Med Sci 2017;21:21-28.
3. Giuli C, Papa R, Bevilacqua R, et al. Correlates of perceived health related quality of life in obese, overweight and normal weight older adults: an observational study. BMC Public Health 2014;14:35.
4. https://isaconf.confex.com/isaconf/forum2016/webprogram/Paper81223.html
5. Ali Pour Fardin SH, Amina F, Akbar B, et al. Quality of life Tehran region. Iran J Ageing 2008;3:75-83.
6. Bergamin M, Ermolao A, Tolomio S, et al. Water-versus land-based exercise in elderly subjects: Effects on physical performance and body composition. Clin Interv Aging 2013;8:1109-1117.
7. Schnabel RB, Yin X, Gona P, et al. 50 year trends in atrial fibrillation prevalence, incidence, risk factors, and mortality in the framingham heart study: A cohort study. Lancet. 2015;386:154-162.
8. Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycemia in type 2 diabetes, 2015: A patient-centered approach: Update to a position statement of the american diabetes association and the european association for the study of diabetes. Diabetes care 2015;38:140-149.
9. Slentz CA, Houmard JA, Johnson JL, et al. Inactivity, exercise training and detraining, and plasma lipoproteins. STRRIDE: A randomized, controlled study of exercise intensity and amount. J Appl Physiol 2007;103:432-442.
10. Petersen AM, Pedersen BK. The anti-inflammatory effect of exercise. J Appl Physiol 2005;98:1154-1162.
11. Duncan GE, Perri MG, Anton SD, et al. Effects of exercise on emerging and traditional cardiovascular risk factors. Prev Med 2004;39:94-902.
12. Antunes HKM, De Mello MT, Lemos VA, et al. Aerobic physical exercise improved the cognitive function of elderly males but did not modify their blood homocysteine levels. Dement Geriatr Cogn Dis Extra 2015;5:13-24.
13. Shi Z, Guan Y, Huo YR, et al. Elevated total homocysteine levels in acute ischemic stroke are associated with long-term mortality. Stroke 2015;2419-2425.
14. Ade S, Mota MP. Effects of physical activity and training programs on plasma homocysteine levels: a systematic review. Amino acids. 2014;46:1795-1804.
15. Park SB, Georgiades A. Changes in body composition predict homocysteine changes and hyperhomocysteinemia in Korea. J Korean Med Sci 2013;28:1015-1020.
16. Sütken E, et al. Lipid profile and levels of homocysteine, leptin, fibrinogen and C-reactive protein in hyperthyroid patients before and after treatment. Dicle Tip Dergisi 2010;37:1-7.
17. Rafiq BM, Mehdi MAH. The effect of exercise on quality of life in elderly women, members of the city daily Jahandidegan1386. Iran J Ageing 2007;2:196-204.
18. Hayes LD, Grace FM, Sculthorpe N, et al. The effects of a formal exercise training programme on salivary hormone concentrations and body composition in previously sedentary aging men. Springerplus. 2013;2:18.
19. Souto Barreto P, Denormandie P, Lepage B, et al. Effects of a long-term exercise programme on functional ability in people with dementia living in nursing homes: Research protocol of the LEDEN study, a cluster randomised controlled trial. Contemp Clin Trials 2016;47:289-295.
20. Masoudi R. The effect of family centered empowerment model on the quality of life in elderly people. J Qazvin Univ Med Sci 2010;14.
21. Kantyka J, Herman D, Rozcniok R, et al. Effects of aqua aerobics on body composition, body mass, lipid profile, and blood count in middle-aged sedentary women. Human Mov 2015;16:9-14.
22. Nemlek D, Simon A. Effect of 3-months home-based exercise program on changes of cognitive functioning in older adults living in old people's home. Acta Facultatis Educationis Physicae Universitatis Comenianae 2016;56:16-29.
23. Jewel MSAAH, Rahimi NM, Khiodaii M. Study of body mass index (BMI), waist to hip ratio (WHR) and percent body fat (PBF%) in veterans of Khorasan Razavi province. 2012;4:34-40.
24. Kanehisa H, T Fukunaga. Association between body mass index and muscularity in healthy older Japanese women and men. J Physiol Anthropol 2013;32:4.
25. Madah SB. The status of social and leisure time activities in the elderly residing in Iran and Sweden. Sllmand. 2008;3:597-606.
26. Sadrollahi A, Hosseinian M, Alavi NM, et al. Physical activity patterns in the elderly Kashan population. Iran Red Crescent Med J 2016;18:e25008.
27. Ghassemzadeh R, Nasseh H, Arastoo AA, et al. Quality of life in elderly diabetic: Comparison between home and nursing home. Acta Med Iran 2013;51:254-259.
28. Fabre C, Massé-Biron J, Chamari K, et al. Evaluation of quality of life in elderly healthy subjects after aerobic and/or mental training. Archives Geron Geriat 1999;28: 9-22.
29. Trief PM, Wade MJ, Pine D, et al. A comparison of health-related quality of life of elderly and younger insulin-treated adults with diabetes. Age Ageing. 2003;32:613-618.
30. Keshavarzi S, Ahmadi SM, Lankarani KB. The impact of depression and malnutrition on health-related quality of life among the elderly Iranians. Glob J Health Sci 2015;7: 161-170.
31. Alentorn-Geli E, Leal-Blanquet J, Guirro P, et al. Comparison of quality of life between elderly patients undergoing TKA. Orthopedics 2013;36:415-419.
32. Navid L, Yaghub H, Saeid R, et al. Comparative investigation of quality of life of athlete and non-athlete older adults. Fiziceskoe vospitanie studentov. 2012;3:127-129.
33. Barrett C, Smerdely P. A comparison of community-based resistance exercise and flexibility exercise for seniors. Aust J Physiother 2002;48:215-219.
34. Kooshiar H, Moshtagh M, Sardar MA, et al. Fatigue and quality of life of women with multiple sclerosis: a randomized controlled clinical trial. J Sports Med Phys Fitness 2015;55:668-674.
35. Kozehchian H NR, Fattahi FM, Mashatan M, et al. The Comparison of health-related quality of life in active and nonactive older adults in Tehran. Int J Sport Stud 2013;3: 52-58.
36. Salmand BY. Compare the quality of life in elderly athletes and non athletes in Tabriz. Salmand Iran J Ageing 2013;8:74-82.
37. Kendall KL, Fairman CM. Women and exercise in aging. J Sport Heal Sci 2014;3: 170-178.
38. Abdoli B, Shaqayegh M, Shamsipour P. Comparison of the quality of life for healthy active and sedentary eldery and with osteoarthritis. Annal Bio Res 2012;3:2337-2342.
39. Khezry A, Hammayattalab R. The Effect of body mass index on reaction time and response time of the active and inactive eldery. 2014;6:1-21.

40. Andreas AG, CT, Helen D. Body mass index, physical activity and dietary habits between young Greek athletes and non-athletes. Euro Psycho J 2012;4:3-15.

41. Martínez PYO, López JAH, Meza EIA, et al. Effect of 3- Month Water-Exercise Program on Body Composition in Elderly Women. Int J Morphol 2014;32:1248-1253.