

The Evaluation of Differences on Geriatric Syndromes between Active and Sedentary Elderly

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Abstract: Purpose: The purpose of the present study was to investigate the differences between diseases, geriatric syndrome and medication use among sedentary and active community-dwelling elderly in Tehran. Method: In this cross-sectional study, 465 community-dwelling elderly men aged 60-95 living independently in Tehran city, Iran participated voluntarily. After the evaluation of PA (physical activity) levels, subjects were divided into two (active elderly and sedentary elderly) groups. Then age-related geriatric syndromes and diseases were measured by questionnaires and functional tests. Data analysis was performed using SPSS (Statistical Package for the Social Sciences) statistical software version 21 and p -value of <0.05 was considered to be statistically significant. Achievements of the study: The result of T -test showed that compared with sedentary participants, highly active individuals had better life expectancy and lower risk of fall and sarcopenia ($p < 0.01$). In relation to comorbidities, the number of diseases in physically active individuals was the same as men in sedentary group ($p > 0.05$). It can be stated that higher PA level plays an effective role in the improvement of many age-related disorders and successful aging.

Keywords: Aging, exercise, geriatric syndrome, CVD (cardiovascular disease), sarcopenia.

1. Introduction

Aging is generally associated with a decrease in body functional and physiological capacity, an increased risk of various syndromes, diseases, and premature death [1]. Numerous studies have shown that aging is associated with the incidence of elderly syndrome, including sarcopenia, falls, dementia, as well as various diseases such as CVD (cardiovascular disease), osteoarthritis, renal failure, and metabolic diseases [2-4]. In this regard, it has been reported that at least 80% of the elderly have a chronic disease [5]. Also, McPhee et al. [6] in 2016 reported that the incidence of chronic diseases in post-retirement age has increased so that 30% of older people over 75 years old are affected by musculoskeletal disorders, 32% by CVD and 13% by metabolic diseases.

CVD is the leading cause of premature mortality worldwide [7] and it has been reported that about 40%

of deaths in Iran are attributed to CVDs [5, 8]. In addition, cardiovascular risk factors such as hypertension and dyslipidemia are prevalent, especially among Iranian elderly, which places Iran among the countries with the highest rates of CVDs [8]. Metabolic diseases, especially type 2 diabetes, are another chronic and prevalent disease in the elderly, which in 2016 was introduced as the seventh leading cause of death in the world [9]. Also, the growth rate of the diabetic population in developing countries, including Iran, has been faster than in developed countries [10] and over one-third of older people in Iran have diabetes and three-quarters of them have pre-diabetes [11]. In addition to the above diseases, osteoarthritis is the most common degenerative joints diseases as well as the major causes of disability and mortality in the elderly [12]. According to the Community Oriented Program for the Control of Rheumatic Diseases in 2005, the prevalence of osteoarthritis in the city of Tehran was 16.9%, with the majority of those aged over 60 years [13].

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As mentioned above, in addition to diseases, aging is associated with various disorders called a geriatric syndrome; sarcopenia is one of the musculoskeletal disorders, known as a gradual loss of strength and muscle mass[14]. In a 2016 study, Hashemi et al. [15] reported the prevalence of sarcopenia in seniors over 60 years of age ranging from 10% to 36.7% in different regions of Iran. In addition, the sarcopenia-induced decrease in strength and balance results in decreased mobility, increased risk of falls, bone fractures, disability and sedentary lifestyle[14]. Falling is another factor that has been taken into consideration in recent years due to numerous complications such as fractures and deaths. Recent studies suggest that falls in the elderly are due to factors such as muscle weakness, balance disorder, gait, and postural control[2].

Naturally, the increase in diseases and disorders is associated with increased use of various medications, which leads to numerous complications. It is estimated that more than half of the elderly take more than two medications, and this in many cases leads to drug interactions and its complications[16]. In addition, the side effects of the drugs are much higher in the elderly than in the younger.

In recent years, due to the prevalence of diseases and disorders associated with aging as well as the numerous side effects of medication use, the identification of interventions for the treatment of geriatric syndrome has attracted much attention. Meanwhile, the role of PA (physical activity) and exercise for improving geriatric syndrome has been proven[17, 18]. Huisinigh-Scheetz et al. [19] in 2018 report that seniors who have higher levels of PA and less sedentary behaviors (watching television, sitting longer, and the like) are less likely to develop a frailty, falls, and their side effects and significantly have higher mobility than inactive people. It has also been shown that the incidence and mortality rate of CVD, diabetes, cancer and stroke is up to two times higher in inactive elderly than in those with high levels of

PA[20]. In addition, the results of recent research show that leisure-time exercise was associated with the prevention and control of cardiovascular, metabolic, hypertensive, osteoarthritis, and reduced drug consumption, as well as a 28% reduction in mortality risk in the elderly[12, 21, 22].

Successful aging plays an important role in improving community health and reducing economic costs. The role of PA as a safe and cost-effective strategy for the prevention, control and improvement of diseases, indicators of the geriatric syndrome and achieving successful aging has been studied in several studies [18, 20, 23, 24]. However, to our knowledge, no research has examined the differences between diseases, indicators of the geriatric syndrome, drug use, and other parameters related to elderly health in Iran. Hence, regarding the previous literature, benefits of PA, and generally healthy lifestyle in preventing and controlling diseases and aging-related syndromes, we hypothesized that factors such as drug use, chronic disease, and geriatric syndrome would be more among inactive persons than people with high levels of PA; therefore the purpose of the present study was to investigate the differences between diseases, geriatric syndrome and medication use among sedentary and active community-dwelling elderly in Tehran.

2. Materials and Methods

2.1 Participants and Procedure

In this cross-sectional study, 465 community-dwelling elderly men aged 60-95 living independently in Tehran city, Iran participated voluntarily. After the evaluation of PA levels, 152 men were excluded due to the exclusion criteria. Finally, a total of 283 older men took part in the study. The analysis was computed on G*power; the power was determined to be 0.80 with a sample of 430 and an effect size of 0.15. Through PASE questionnaire, participants were divided into a sedentary elderly group (SE) ($n = 103$, 71.492 ± 8.03 years old), and into a high active elderly group (AE) ($n = 180$, 69.28 ± 7.25 years old). Inclusion

criteria were: (1) age 60 or older; (2) able to walk independently and (3) could read, speak, and understand. Exclusion criteria were Alzheimer's disease or cognitive impairments which could prevent them from performing interviews or functional tests. All participants were informed about study purpose and signed an informed consent.

3. Measures

3.1 Sociodemographic, Comorbidities, Anthropometric Characteristic

Investigators and a trained research team constituted by exercise physiologists collected data. The date of birth was recorded as age. Marital status was categorized as single, married, widowed or divorced. Level of education was classified as: illiterate, primary school, middle school or diploma, bachelor, master or PhD. To assess comorbidity, we asked participants whether they had the following chronic diseases diagnosed by a health specialist: hypertension, diabetes, CVDs, elevated LDL (low-density lipoprotein) cholesterol and elevated triglycerides, arthritis, kidney and liver disorders. They were demanded to answer "Yes" or "No" for each comorbidity.

Weight and height were measured using an OMRON digital scale and measuring tape respectively. Weight was recorded in light clothing and height was measured without shoes.

BMI (Body mass index) was calculated from the ratio between body weight in kilograms and height in meters squared. WHR (Waist-hip ratio) was calculated by dividing WC (in cm) by hip circumference (cm). Hip circumference was measured at the greatest protrusion of the buttocks and waist circumference was measured at the midpoint between the top of the iliac crest and the lower margin of the last palpable rib.

3.2 Assessment of PA

PASE (Physical Activity Scale for the Elderly) was used to quantify participants' ordinary PA. It is a brief

questionnaire specifically designed to assess PA of elderly population undertaken over a one-week period. PA of participants was estimated in three domains of occupation, household and leisure by assessing duration, frequency and intensity. The higher total PASE score indicates higher levels of PA. In this study, PASE scores were categorized as sedentary (<40), high PA (>100). The validity and reliability of the questionnaire in the Iranian population have been confirmed with Cronbach alpha 0.97% [25].

3.3 Assessment of Nutritional Status

Mini Nutritional Assessment short-form (MNA-SF) was used to assess nutritional status in the elderly. It is a well-known screening test including simple measurements and questions that has been translated and validated in many languages as well as Farsi. In this study, scores more than 12 points suggest well-nourished subjects, 8-11 points the risk of malnutrition and less than 7 points malnutrition [26].

3.4 Assessment of Fall Risk

SPPB (Short Physical Performance Battery) is a reliable and valid test to screen the risk of falls in the elderly. It included three tests, tandem tests, five timed chair stands, and a gait speed which assess static and dynamic balance, the strength of lower limbs and coordination respectively. Each test is scored between 0-4 which implies a total SPPB score ranged from 0 to 12, with higher scores indicating better performance [2, 27].

3.5 Assessment of Sarcopenia

The TUG (Timed Up and Go test) is a simple test used to assess a person's mobility and requires both static and dynamic balance [28]. The TUG test was used to assess participants' sarcopenia risk. A cut-off point of 7.5 s, with 88.9% sensitivity, 31.4% specificity was considered for risk of sarcopenia [28].

3.6 Assessment of Hope

The State Hope Scale was used to measure the

respondent's level of hope. It was divided into two subscales: (1) agency, (2) pathways of hope. Of the 12 items, 4 items belonged to the Agency subscale and other 4 items for the Pathways subscale. The remaining 4 items are deviant expressions. Each item is answered using a 5-point Likert-type. The scale has demonstrated good reliability and validity with Cronbach alpha 0.79% [29].

3.7 Statistical Analysis

Normality of distribution was tested by the Kolmogorov-Smirnov test. Subjects' characteristics were presented as means, standard deviation for continuous data and frequencies and percentage for categorical data. Pearson and Spearman correlation coefficient tests were used to determine the relationship between variables. Independent *T*-test and Mann-Whitney *U* were used to compare the means. Data analysis was performed using SPSS (Statistical Package for the Social Sciences) statistical software version 21. Statistical tests were two-tailed, and a *p*-value of <0.05 was considered to be statistically significant.

4. Result

In total, 283 older adults, with a mean age of 70.08 ± 7.61 years, participated in the study, of whom 165 (58.30%) aged 60-70. Nearly all participants were married 259 (91.84%). The majority of the sample had hypertension (113, 40.65%) followed by arthritis (84, 30.22%), CVDs (77, 27.70%), diabetes (69, 24.82%), kidney (23, 8.27%) and liver (13, 4.68%). Furthermore, 36.69% of participants used medication to control blood pressure and approximately one-third of consumed lipid-lowering drugs and 21.58% reported taking glucose-lowering medications. The demographic characteristics of the subjects are presented in Table 1.

The associations between PA with the presences of different diseases, geriatric syndromes and medication use in sedentary and active groups are presented in

Table 2. Pearson correlation analysis in sedentary and active groups showed that there was no significant correlation between the amount of PA with comorbidities, medications and chronic diseases ($p > 0.05$). Also, there was no significant correlation between PA with age, education, and geriatrics syndromes (fall risk, sarcopenia, malnutrition) in both groups. As expected, BMI was positively correlated with PASE score ($r = -0.197$, $p < 0.01$) in both groups. Also, in active group, there was a significant positive correlation between the hope score and the PASE score ($r = 0.155$, $p < 0.05$).

Pearson correlation analysis in sedentary group showed that there was no significant correlation between the amount of PA with comorbidities, medications and chronic diseases. However, a significant negative correlation was found between age with hope score ($r = 0.220$, $p < 0.05$), and SPPB test ($r = 0.343$, $p < 0.01$) in sedentary group. As expected, in sedentary group, BMI was positively correlated with the MNA score ($r = 0.262$, $p < 0.01$), and PASE score ($r = 0.208$, $p < 0.05$). Also there was a significant positive correlation between the MNA score and the hope score ($r = 0.434$, $p < 0.01$) while there was a negative correlation between MNA score and number of diseases. ($r = -0.199$, $p < 0.01$). Furthermore, there was a positive significant correlation between hope scores with comorbidities in sedentary group ($r = 0.780$, $p < 0.01$) (Table 3).

The result of *T*-test showed that there were significant differences in age, education and BMI in groups ($p < 0.05$). Sedentary group had higher age and lower level of education in average. Also, individual's BMI was above the recommended level, especially in the sedentary group. There was no significant difference in WHR ratio and MNA scores. Compared with sedentary participants, highly active individuals had better hope score and lower risk of falling ($p < 0.01$). In relation to comorbidities, the number of diseases in physically active individuals was the same as men in sedentary group ($p > 0.05$) (Table 4).

Analysis showed that there was no significant difference between sedentary groups and highly active group in each of chronic diseases and medication

usage (Table5). However, there was a significant difference in groups in terms of sarcopenia risk (p<0.01) (Table5).

Table 1 Descriptive statistics and demographic, medical history variables across all samples.

Variables		Mean \pm SD	N (%)
Age(years)	60-70		165 (58.30%)
	71-80	70.08 \pm 7.61	88 (31.10%)
	81-90		30 (10.60%)
Height (cm)		168.45 \pm 6.22	
Weight (kg)		75.87 \pm 12.51	
BMI (kg/m ²)		26.68 \pm 3.83	
Education	Not literate		22 (8.06%)
	Primary school		106 (38.8%)
	Middle school/diploma		67 (24.54%)
	Bachelor		71 (26.01%)
	Master/PHD		7 (2.56%)
Marriage	Single		18 (6.38%)
	Married		259 (91.84%)
	Widow/divorced		5 (1.77%)
Prescribed medications	Glucose lowering drugs		60 (21.58%)
	Lipid lowering drugs		78 (28.06%)
	Hypertension drugs		102 (36.69%)
Diseases	Hypertension		113 (40.65%)
	Cardiovascular		77 (27.70%)
	Arthritis		84 (30.22%)
	T2DM		69 (24.82%)
	Kidney		23 (8.27%)
	Hepatic		13 (4.68%)

T2DM = Type 2 Diabetes mellitus.

Table 2 Bivariate correlation between participants' comorbidities, medication, geriatric syndromes with PA levels.

	Sedentary group (N=103) (PA levels)		Active group (N=180) (PA levels)	
	r	ρ	r	ρ
Age	-0.032	0.748	0.019	0.804
Edu. status	0.106	0.295	-0.025	0.748
BMI	-0.208	0.037*	-0.197	0.008**
MNA score	0.011	0.915	-0.023	0.760
Hope score	-0.041	0.403	0.155	0.038*
SPPB score	-0.004	0.972	0.087	0.249
Tug score	-0.005	0.961	-0.054	0.475
Comorbidities	-0.187	0.063	-0.031	0.685
Hypertension	-0.177	0.080	0.023	0.763
T2DM	-0.055	0.586	0.015	0.837
CVD	-0.065	0.526	-0.039	0.608
Hepatic disease	0.002	0.984	-0.013	0.861
Kidney disease	-0.179	0.077	-0.073	0.331
Arthritis	-0.119	0.241	-0.053	0.479
Hypertension .M	-0.124	0.222	0.042	0.578
Lipid Lowering .M	-0.143	0.159	-0.052	0.486
Diabetes. M	-0.107	0.290	-0.003	0.971

M.= Medicine, T2DM= Type 2 Diabetes mellitus.

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 3 The correlation between variables in sedentary elderly group.

		Hypertension	T2DM	CVD	Hepatic disease	Kidney disease	Arthritis	Hypertension. M	Lipid lowering. M	T2DM. M	Tug score	PA
Hypertension	R	1	0.206*	0.230*	0.079	0.028	0.209*	0.940**	0.359**	0.206*	0.041	-0.177
	P		0.041	0.022	0.437	0.780	0.038	0.000	0.019	0.041	0.503	0.080
T2DM	R		1	0.079	0.020	-0.066	0.018	0.201*	0.164	0.848**	0.078	-0.055
	P			0.435	0.846	0.519	0.859	0.047	0.105	0.000	0.201	0.586
CVD	R			1	-0.125	0.180	0.120	0.276**	0.295**	0.100	0.034	-0.065
	P				0.218	0.075	0.235	0.006	0.003	0.325	0.578	0.526
Hepatic disease	R				1	-0.045	-0.004	0.091	0.107	0.038	-0.067	0.002
	P					0.659	0.971	0.372	0.292	0.712	0.273	0.984
Kidney disease	R					1	0.173	0.044	0.066	-0.045	0.039	-0.179
	P						0.087	0.663	0.514	0.659	0.523	0.077
Arthritis	R						1	0.169	-0.031	0.038	0.138*	-0.119
	P							0.094	0.760	0.712	0.023	0.241
Hypertension. M	R							1	0.368**	0.242*	0.064	-0.124
	P								0.000	0.016	0.295	0.222
Lipid lowering. M	R								1	0.148	0.063	-0.143
	P									0.145	0.305	0.159
T2DM. M	R									1	0.069	-0.107
	P										0.261	0.290
Tug score	R										1	-0.253**
	P											0.000
PA	R											1
	P											

M.= Medicine, T2DM= Type 2 diabetes mellitus.

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 4 The difference of variables between active and sedentary group.

Variables	PA ≤ 40 (103) (SE)	PA ≥ 100 (180) (AE)	p value
Age(years)	71.49 ± 8.04	69.28 ± 7.25	0.022*
Edu(years)	8.61 ± 5.62	10.15 ± 4.58	0.022*
BMI(kg/m ²)	27.40 ± 3.75	26.28 ± 3.82	0.018*
WHR (ratio)	0.942 ± 0.065	0.925 ± 0.075	0.062
MNA score	11.79 ± 2.03	11.68 ± 2.06	0.670
Hope score	37.69 ± 5.95	41.59 ± 6.20	0.000**
SPPB score	9.44 ± 2.45	10.85 ± 1.34	0.000**
Tug score	11.83 ± 3.16	10.00 ± 3.13	0.000**
Comorbidities(N)	1.84 ± 1.43	1.70 ± 1.34	0.417

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 5 The difference of diseases and medications between sedentary and active elderly.

	Hypertension	T2DM	CVD	Hepatic disease	Kidney disease	Arthritis	Hypertension. M	Lipid lowering. M	T2DM. M
Mann-Whitney U	8338	8,384	8,085	8,634	8,556	8,292.5	8,210.5	7,578.5	8,494.5
Sig. (2-tailed)	0.339	0.321	0.119	0.335	0.320	0.266	0.225	0.010**	0.424

M.= Medicine, T2DM=Type 2 diabetes mellitus.

** Correlation is significant at the 0.01 level (2-tailed).

5. Discussion

According to the literature, sedentary behaviors (activities with an energy cost of less than 1.5METs such as sitting and lying down) are associated with an increased risk of various diseases including type II diabetes, CVD and mortality in the long run[22]. In addition, the condition for sedentary behaviors increases with increasing age and retirement. It has also been reported that older people spend about 60 percent of their awake time in the sitting position[22]. On the other hand, despite the prevalence of geriatric syndrome and its effects on decreasing the quality of life in the elderly and the positive role of PA in the prevention and control of these indicators, so far a study investigating the difference between the indicators of the geriatric syndrome in sedentary (SE) and active elderly (AE) has not been conducted in Iran.

In this study 103 (36%) of subjects had low level of PA (sedentary or inactive). Researchers consider factors such as impaired mobility, various diseases, reduced motivation, life expectancy and poor nutritional status to be the most important causes of sedentary lifestyle[30]. It has also been well established that sedentary behaviors play an effective role in preventing successful aging[31]. On the other hand, with the spread of technology and easy access to devices such as television and computers, inactive behaviors have become more prevalent among the elderly[32].

Tam-Seto et al. [33] in 2016 reported that enjoyment was a factor that impacted decisions on engaging in sedentary activities in the areas of leisure, housework and occupation. Previous studies have shown that enjoyment has a strong influence on attendance in both structured exercise classes as well as general activity groups. Enjoyment also influences adherence to activities and has been noted to increase with higher levels of activity[33].

Also, the results of a longitudinal study showed that PA and exercise is a safe strategy to develop social

relationships and prevent cognitive decline (as an effective factor in sedentary lifestyle) in the elderly[34]. In addition, higher PA levels prevent the prevalence of sedentary behaviors and related complications in the elderly by improving mental and physical factors[32].

In the present study, mean BMI in AE group was significantly lower than SE group ($p < 0.018$). Also, there was a difference in waist-to-hip ratio between the two groups but it was not statistically significant ($p < 0.062$). Several studies support our findings in this regard[35, 36]. It is well proven that inactivity in the elderly along with gaining weight and BMI leads to increased inflammatory factors, obesity-related cardiovascular, metabolic diseases risk and ultimately mortality[37]. Chronic stress is one of the important factors in the development of obesity that is exacerbated with age and PA and exercise prevent overweight and obesity by modifying obesity-related stressors and improving physiological responses[38]. Regarding the non-significant difference in the WHR among the two groups, it can be concluded that altering the pattern of fat distribution due to an increase in age plays an essential role in this insignificant statistics. Normally, by reaching old age, subcutaneous fat decreases and visceral fat increases, which is associated with a change in the pattern of fat distribution in the elderly's body, which provides the condition for cardiovascular and metabolic diseases[39].

In the present study, life expectancy level in AE group was significantly higher than SE group ($p < 0.000$). Due to the increased risk of various diseases and decreased physical function, healthy aging is of great importance in increasing the life expectancy of the elderly. It is well established that diseases, deterioration in PA and disruption of daily living are significantly lower in elderly with higher levels of PA, and this has an important role in increasing their life expectancy[40]. On the other hand, the study of Calvin et al. [41] in 2010 reported that the

benefits of PA to increase life expectancy in the elderly depend on their activity level. In fact, a considerable level of PA is needed to increase the life expectancy in addition to the many benefits mentioned above. In addition, PA can lead to increased life expectancy by improving psychological function and preventing depression in old age[42].

In the present study, mean level of education in AE group was significantly higher than SE group ($p < 0.022$). Several studies are in line with our results in this regard[43, 44]. One of the effects of education on increasing the amount of PA is related to increasing health awareness and improving personality traits. In fact, people who have completed higher academic education have a healthier lifestyle (regular exercise, healthy diet and reduced risk behaviors such as smoking and drinking) for reasons such as raising awareness and improving social relationships[43] which throughout the long period is associated with a decrease in age-related diseases and a healthier life.

In the present study, the risk of falls in the AE group was significantly lower than that of the SE group ($p < 0.000$) and it has been well documented that exercise and PA can reduce the risk of falls by improving muscle function and preventing age-related musculoskeletal disorders such as osteoarthritis and sarcopenia[45]. More importantly, the decrease in strength, coordination, and neuromuscular functions of the body plays a fundamental role in imbalances and falls in the elderly[46], and PA and exercise, especially balance exercises, can be effective for reduced risk of falls among the elderly by improving neurophysiological functions and muscle coordination[45].

The prevalence of sarcopenia in the AE group was significantly lower than the SE group ($p < 0.000$). Recent research indicates that factors such as changes in body composition (increased fat mass and decreased muscle mass), oxidative stress, impaired mitochondrial function, activation of inflammatory

pathways, impaired endocrine function, increased catabolic factors, and decreased synthesis Proteins are involved in the pathogenesis of sarcopenia in the elderly[47]. It has been well established that aerobic exercise such as running, swimming and cycling plays an important role in the prevention of sarcopenia in the elderly by improving mitochondrial function and metabolism and reducing catabolic genes expression[48]. On the other hand, increased sedentary behaviors such as computer and television use have been shown to play a key role in reducing muscle mass and the incidence of sarcopenia in the elderly[49]. The study by Lee et al.[50] in 2018 reported that an increase in total levels of PA in the elderly, even if not exercise, plays a role in the prevention of sarcopenia by preventing a decrease in muscle mass and strength and catabolic pathways.

Regarding there was no significant difference between the two groups in terms of disease indices and medication consumption it can be stated that probably many elderly have started exercising under the supervision of doctors after diagnosis with noncommunicable diseases such as CVD and diabetes for the purpose of controlling and treating it. Of the limitations of this study can be mentioned to the lack of measuring the history of the disease with the level of PA. But the remarkable point of this study is that people with different pathologies in addition to control and treat of their diseases through the exercise can also benefit from higher levels of PA to prevent indicators of geriatric syndromes such as falls and sarcopenia.

These results suggest that older individuals with a well-nourished diet maybe have more life expectancy and suffer much less from chronic diseases. This also implies that hope and mind health can decrease the likelihood of different diseases.

There was no significant difference in nutritional status between the two groups. Some studies in this matter have shown that the elderly who are physically inactive are more likely to have nutritional problems

including malnutrition[51]. However, it should be noted that nutritional status in the elderly is generally influenced by factors such as income, insurance, specific geographical diet, etc.[52]for which according to the almost same participants' conditions of this study, the non-significant difference is considered normal.

6. Limitations

This study was limited to the elderly living in Tehran and this reduces the generalizability of the results. Also, due to the lack of examination of the history of diseases such as the duration of the disease, it is not possible to establish cause and effect relationship. On the other hand, examining the history of the disease, detailed type of PA over a longer period of time could provide us more accurate information about the impact of different types of PA and their duration and intensity.

7. Conclusion

According to the results of this study, it can be stated that higher PA level plays an effective role in the improvement of many age-related disorders and successful aging. As a result, applying strategies with the focus of experts in physiology such as holding sports classes in the elderly associations and providing appropriate facilities for the elderly in the city can lead to prevention of inactivity, increased PA and health status of the elderly, as well as reduced health and care costs in longterm.

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Declaration of Interest

The authors declare that there is no conflict of interest.

References

- [1] Liguori, I., Russo, G., Curcio, F., Bulli, G., Aran, L., Della-Morte, D., et al. 2018. "Oxidative Stress, Aging, and Diseases." *Clin Interv Aging*13:757-72.
- [2] Kim, J. C., Chon, J., Kim, H. S., Lee, J. H., Yoo, S. D., Kim, D. H., et al. 2017. "The Association between Fall History and Physical Performance Tests in the Community-Dwelling Elderly: A Cross-Sectional Analysis." *Ann Rehabil Med*41(2):239-47.
- [3] Paneni, F., Diaz Canestro, C., Libby, P., Luscher, T. F., and Camici, G. G. 2017. "The Aging Cardiovascular System: Understanding It at the Cellular and Clinical Levels." *J Am Coll Cardiol*69(15):1952-67.
- [4] Makizako, H. 2019. "Frailty and Sarcopenia as a Geriatric Syndrome in Community-Dwelling Older Adults." *Int J Environ Res Public Health*16(20).
- [5] Shamsi, A., Ebadi, A., and Mousavi, S. Q. 2017. "Trend of Risk Factors Changes for Cardiovascular Diseases in the Elderly Population in Iran." *Galen Medical Journal*6(3):240-8.
- [6] McPhee, J. S., French, D. P., Jackson, D., Nazroo, J., Pendleton, N., and Degens, H. 2016. "Physical Activity in Older Age: Perspectives for Healthy Ageing and Frailty." *Biogerontology*17(3):567-80.
- [7] WHO. 2017. "Cardiovascular Diseases (CVDs)." [https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-\(cvds\)](https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)).
- [8] Sarrafzadegan, N., and Mohammadifard, N. 2019. "Cardiovascular Disease in Iran in the Last 40 Years: Prevalence, Mortality, Morbidity, Challenges and Strategies for Cardiovascular Prevention." *Arch Iran Med*. 22(4):204-10.
- [9] WHO. 2018. <https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death>.
- [10] Hosseini Nejjad, Z., Molavi Vardanjani, H., Abolhasani, F., Hadipour, M., and Sheikhzadeh, K. 2013. "Relative Effect of Socio-Economic Status on the Health-Related Quality of Life in Type 2 Diabetic Patients in Iran." *Diabetes Metab Syndr*7(4):187-90.
- [11] Taheri Tanjani, P., Moradinazar, M., Esmail Mottlagh, M., and Najafi, F. 2015. "The Prevalence of Diabetes Mellitus (DM) Type II among Iranian Elderly Population and Its Association with Other Age-Related Diseases, 2012." *Arch Gerontol Geriatr*60(3):373-9.
- [12] Rahmati, M., Nalesso, G., Mobasheri, A., and Mozafari, M. 2017. "Aging and Osteoarthritis: Central Role of the Extracellular Matrix." *Ageing Res Rev*. 40:20-30.
- [13] Davatchi, F., Sandoughi, M., Moghimi, N., Jamshidi, A. R., Tehrani Banihashemi, A., Zakeri, Z., et al. 2016. "Epidemiology of Rheumatic Diseases in Iran from Analysis of Four COPCORD Studies." *Int J Rheum Dis*. 19(11):1056-62.

- [14] Larsson, L., Degens, H., Li, M., Salviati, L., Lee, Y. I., Thompson, W., et al. 2019. "Sarcopenia: Aging-Related Loss of Muscle Mass and Function." *Physiol Rev*. 99(1):427-511.
- [15] Hashemi, R., Shafiee, G., Motlagh, A. D., Pasalar, P., Esmailzadeh, A., Siassi, F., et al. 2016. "Sarcopenia and Its Associated Factors in Iranian Older Individuals: Results of SARIR Study." *Arch Gerontol Geriatr*66:18-22.
- [16] Ayan, M., Pothineni, N. V., Siraj, A., and Mehta, J. L. 2016. "Cardiac Drug Therapy-Considerations in the Elderly." *J Geriatr Cardiol*13(12):992-7.
- [17] Haider, S., Grabovac, I., and Dorner, T. E. 2019. "Effects of Physical Activity Interventions in Frail and Prefrail Community-Dwelling People on Frailty Status, Muscle Strength, Physical Performance and Muscle Mass—A Narrative Review." *Wiener Klinische Wochenschrift*131(11-12):244-54.
- [18] Tartibian, B., Kushkestantani, M., Ebrahimpour Nosrani, S., and Parvani, M. 2019. "Relationship between the Level of Physical Activity and Nutritional Status with Fatigue in Elderly Residents of Rest Homes in Tehran." *New Approaches in Sport Sciences*1(2):155-68.
- [19] Huisingh-Scheetz, M., Wroblewski, K., Kocherginsky, M., Huang, E., Dale, W., Waite, L., et al. 2018. "The Relationship between Physical Activity and Frailty Among U.S. Older Adults Based on Hourly Accelerometry Data." *J Gerontol A Biol Sci Med Sci*73(5):622-9.
- [20] Gopinath, B., Kifley, A., Flood, V. M., and Mitchell, P. 2018. "Physical Activity as a Determinant of Successful Aging over Ten Years." *Sci Rep*8(1):10522.
- [21] Cacciatore, F., Mazzella, F., Viati, L., Longobardi, G., Magliocca, A., Basile, C., et al. 2013. "Physical Activity Is Inversely Related to Drug Consumption in Elderly Patients with Cardiovascular Events." *European Review of Aging and Physical Activity*10(2):151.
- [22] Kim, Y., and Lee, E. 2019. "The Association between Elderly People's Sedentary Behaviors and Their Health-Related Quality of Life: Focusing on Comparing the Young-Old and the Old-Old." *Health Qual Life Outcomes*17(1):131.
- [23] Roh, J., Rhee, J., Chaudhari, V., and Rosenzweig, A. 2016. "The Role of Exercise in Cardiac Aging: From Physiology to Molecular Mechanisms." *CircRes*118(2):279-95.
- [24] Montero-Fernandez, N., and Serra-Rexach, J. 2013. "Role of Exercise on Sarcopenia in the Elderly." *Eur J Phys Rehabil Med*49(1):131-43.
- [25] Ishaghi, R. M. S., Asgarian, R., and Sohrabi, A. 2011. "Effect of Faith-Based Education on Physical Activity on the Elderly." *J Iranian Journal of Medical Education*10(5):1281-8.
- [26] Ghazi, L., Fereshtehnejad, S.-M., Abbasi Fard, S., Sadeghi, M., Shahidi, G., and Löök, J. 2015. "Mini Nutritional Assessment (MNA) Is Rather a Reliable and Valid Instrument to Assess Nutritional Status in Iranian Healthy Adults and Elderly with a Chronic Disease." *Ecology of Food and Nutrition*54:1-16.
- [27] Veronese, N., Bolzetta, F., Toffanello, E. D., Zambon, S., De Rui, M., Perissinotto, E., et al. 2014. "Association between Short Physical Performance Battery and Falls in Older People: The Progetto Veneto Anziani Study." *Rejuvenation Research*17(3):276-84.
- [28] Filippin, L. I., Miraglia, F., Teixeira, V. N. D. O., and Boniatti, M. M. 2017. "Timed Up and Go Test as a Sarcopenia Screening Tool in Home-Dwelling Elderly Persons." *Revista Brasileira de Geriatria e Gerontologia*20(4):556-61.
- [29] Babolan, A. Z., Ghasempour, A., and Hassanzade, S. 2011. "The Role of Forgiveness and Psychological Hardiness in Prediction of Hope." *Knowl Res Appl Psychol*12:12-9.
- [30] Yeom, H. A., Fleury, J., and Keller, C. 2008. "Risk Factors for Mobility Limitation in Community-Dwelling Older Adults: A Social Ecological Perspective." *Geriatr Nurs*29(2):133-40.
- [31] Thorp, A. A., Owen, N., Neuhaus, M., and Dunstan, D. W. 2011. "Sedentary Behaviors and Subsequent Health Outcomes in Adults a Systematic Review of Longitudinal Studies, 1996-2011." *Am J Prev Med*41(2):207-15.
- [32] Harvey, J. A., Chastin, S. F., and Skelton, D. A. 2013. "Prevalence of Sedentary Behavior in Older Adults: A Systematic Review." *Int J Environ Res Public Health*10(12):6645-61.
- [33] Tam-Seto, L., Weir, P., and Dogra, S. 2016. "Factors Influencing Sedentary Behaviour in Older Adults: An Ecological Approach." *AIMS Public Health*3(3):555-72.
- [34] Robitaille, A., Muniz, G., Lindwall, M., Piccinin, A. M., Hoffman, L., Johansson, B., et al. 2014. "Physical Activity and Cognitive Functioning in the Oldest Old: Within- and Between-Person Cognitive Activity and Psychosocial Mediators." *Eur J Ageing*11(4):333-47.
- [35] Santos, D. A., Silva, A. M., Baptista, F., Santos, R., Gobbo, L. A., Mota, J., et al. 2012. "Are Cardiorespiratory Fitness and Moderate-to-Vigorous Physical Activity Independently Associated to Overweight, Obesity, and Abdominal Obesity in Elderly?" *Am J Hum Biol*24(1):28-34.
- [36] Cardenas Fuentes, G., Bawaked, R. A., Martinez Gonzalez, M. A., Corella, D., Subirana Cachinero, I., Salas-Salvado, J., et al. 2018. "Association of Physical Activity with Body Mass Index, Waist Circumference and Incidence of Obesity in Older Adults." *Eur J Public Health*28(1):1-6.

- Health*28(5):944-50.
- [37] Starr, K. N. P., and Bales, C. W. 2015. "Excessive Body Weight in Older Adults." *Clinics in Geriatric Medicine*31(3):311-26.
- [38] Chaput, J. P., Klingenberg, L., Rosenkilde, M., Gilbert, J. A., Tremblay, A., and Sjodin, A. 2011. "Physical Activity Plays an Important Role in Body Weight Regulation." *J Obes*.
- [39] Santanasto, A. J., Goodpaster, B. H., Kritchevsky, S. B., Miljkovic, I., Satterfield, S., Schwartz, A. V., et al. 2017. "Body Composition Remodeling and Mortality: The Health Aging and Body Composition Study." *J Gerontol A Biol Sci Med Sci*72(4):513-9.
- [40] Leskinen, T., Stenholm, S., Aalto, V., Head, J., Kivimaki, M., and Vahtera, J. 2018. "Physical Activity Level as a Predictor of Healthy and Chronic Disease-Free Life Expectancy between Ages 50 and 75." *Age Ageing*47(3):423-9.
- [41] Hirsch, C. H., Diehr, P., Newman, A. B., Gerrior, S. A., Pratt, C., Lebowitz, M. D., et al. 2010. "Physical Activity and Years of Healthy Life in Older Adults: Results from the Cardiovascular Health Study." *J Aging Phys Act*18(3):313-34.
- [42] Joshi, S., Mooney, S. J., Kennedy, G. J., Benjamin, E. O., Ompad, D., Rundle, A. G., et al. 2016. "Beyond METs: Types of Physical Activity and Depression among Older Adults." *Age Ageing*45(1):103-9.
- [43] Kaplan, R. M., Spittel, M. L., and Zeno, T. L. 2014. "Educational Attainment and Life Expectancy." *Policy Insights from the Behavioral and Brain Sciences*1(1):189-94.
- [44] Montez, J. K., Hummer, R. A., and Hayward, M. D. 2012. "Educational Attainment and Adult Mortality in the United States: A Systematic Analysis of Functional Form." *Demography*49(1):315-36.
- [45] Low, S. T., and Balaraman, T. 2017. "Physical Activity Level and Fall Risk among Community-Dwelling Older Adults." *J Phys Ther Sci*29(7):1121-4.
- [46] Liu, Y., Chan, J. S., and Yan, J. H. 2014. "Neuropsychological Mechanisms of Falls in Older Adults." *Front Aging Neurosci*6:64.
- [47] Cruz-Jentoft, A. J., Bahat, G., Bauer, J., Boirie, Y., Bruyère, O., Cederholm, T., et al. 2019. "Sarcopenia: Revised European Consensus on Definition and Diagnosis." *Age and Ageing*48(1):16-31.
- [48] Yoo, S.-Z., No, M.-H., Heo, J.-W., Park, D.-H., Kang, J.-H., Kim, S. H., et al. 2018. "Role of Exercise in Age-Related Sarcopenia." *Journal of Exercise Rehabilitation*14(4):551.
- [49] Marzetti, E., Calvani, R., Tosato, M., Cesari, M., Di Bari, M., Cherubini, A., et al. 2017. "Sarcopenia: An Overview." *Aging Clinical and Experimental Research*29(1):11-7.
- [50] Lee, S.-Y., Tung, H.-H., Liu, C.-Y., and Chen, L.-K. 2018. "Physical Activity and Sarcopenia in the Geriatric Population: A Systematic Review." *Journal of the American Medical Directors Association*19(5):378-83.
- [51] Al-Zeidane, S., Al-Bayyari, N., and Ismail, Y. 2017. "Effect of Physical Activity and Gender on Malnutrition Risk among a Group of Elderly Jordanians." *Pak J Nutr*16(9):708-13.
- [52] Fávoro-Moreira, N. C., Krausch-Hofmann, S., Matthys, C., Vereecken, C., Vanhauwaert, E., Declercq, A., et al. 2016. "Risk Factors for Malnutrition in Older Adults: A Systematic Review of the Literature Based on Longitudinal Data." *Adv Nutr*7(3):507-22.