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Relationship between the Level of Physical Activity and Nutritional Status with Fatigue in Elderly Residents of Rest Homes in Tehran

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Abstract
Purpose: Aging is a complex process of physiological and social changes that leads to disease, disability, and the lower experience of happiness. On the other hand, fatigue is one of the most important indicators of aging syndrome. This study aimed to investigate the relationship between the level of physical activity and fatigue in elderly residents of rest homes in Tehran. **Method:** This was a descriptive correlational study in which 20 rest homes located in Tehran province constituted the study population. By visiting rest homes, the eligible subjects were chosen. Physical activity was measured by the Physical Activity Scale for the Elderly (PASE). The FACIT Fatigue Scale is a short, 13-item, easy to administer tool that measures an individual's level of fatigue during their usual daily activities over the past week. Nutritional status was evaluated by mini nutritional assessment (MNA). **Results:** The results of statistical analysis indicated a significant and positive correlation between PASE and FACIT scores ($r=0.48$, $p<0.01$) while, there was a significant negative correlation between FACIT score and age ($r=-0.23$, $p<0.01$). Also, there was a significant positive correlation between MNA and FACIT ($r=0.40$, $p<0.01$). In addition, a significant positive correlation was found between MNA and PASE score ($r=0.31$, $p<0.01$). **Conclusions:** The findings of this study indicate that holding sports classes under the supervision of exercise physiologists is an essential matter to increase health and prevent age-related complications in elderly residents of Tehran rest homes.
Keywords: Geriatric syndrome, Exercise, Tehran, Health, Aging

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INTRODUCTION

Aging is a complex process of physiological and social changes that leads to disease, disability, the lower experience of happiness (Khazaee-Pool, Sadeghi, Majlessi & Rahimi Foroushani, 2015), a gradual decrease in functional ability, individual changes, and mortality (Sadrollahi, Hosseinian, Alavi, Khalili & Esalatmanesh, 2016). In recent years, social and economic changes, as well as the development of various sciences have greatly reduced the age-related deaths which is the most important cause of an increase in the elderly population worldwide (Oh, Kim, Martins & Kim, 2006). Iran is one of the developing countries that its elderly population has been increasing rapidly due to the significant decline in fertility and higher life expectancy (Noroozian, 2012). In addition, it is expected that the population of people aged 65 and older will increase from 5.7% in 2011 to 9.7% in 2030 and 25.2% in 2060 (Noroozian, 2012). On the other hand, the “geriatric syndrome" phrase is used to diagnose the clinical conditions of the elderly, which shows independent signs of diseases. The most common conditions experienced by the elderly are fatigue, frailty, falls, delirium, urinary incontinence, and syncope, which are classified as subsets of the aging syndrome. Studies have shown that different individuals display different kinds of symptoms (Inouye, Studenski, Tinetti & Kuchel, 2007).

Fatigue is one of the most important indicators of the aging syndrome, which is often found in the elderly and it can affect negatively functional ability, family life, and social relationships (Washburn, Smith, Jette & Janney, 1993). Fatigue is estimated to be 10% to 25% in the general population, but reaches 50% in the elderly population (Wick & LaFleur, 2007). It has been well documented that fatigue is more prevalent in elderly who are less active, such as those living in rest homes, which can be due to the physical inability of these individuals (Soyuer & Şenol, 2011). On the other terms, fatigue is one of the predicting factors for unfavorable conditions, especially among the elderly. it is one of the clinical indicators of frailty and disability (Fried et al., 2001) that manifests as impaired strength, endurance, balance, vulnerability to trauma, and various cell and molecular stresses in an individual (Fried, Ferrucci, Darer, Williamson & Anderson, 2004).

Also, it is considered as one of the predicting factors for movement disorders (Avlund, Damsgaard, Sakari-Rantala, Laukkanen & Schroll, 2002) and mortality (Avlund, Schultz-Larsen & Davidsen, 1998) in the elderly. In addition, it has been reported that fatigue is a hallmark of various diseases, such as cancer and MS, meanwhile, it accounts for secondary agents in many other diseases. As a result, elderly people with chronic diseases have a greater risk of experiencing fatigue (Egerton, Chastin, Stensvold & Helbostad, 2016). In the other word, malnutrition, which is characterized by an imbalance in energy consumption, causes changes in shape, body composition, as well as a decline in physical and mental performance (Al-Rasheed et al., 2018).

Studies have shown that malnutrition affects about 24 percent of the home-dwelling elderly and 51 percent of the elderly in the rehabilitation centers (Alzahrani & Alamri, 2017). Another term, malnutrition in turn reduces body mass and increases fat mass (Al-Rasheed et al., 2018). Nutritional status also is closely associated with physical efficiency with aging (Alipanah et al., 2009). The benefits of physical activity and exercise in improving physical function, quality of life and prevention of various diseases have been established in many studies (Kushkestani, Parvani, Ebrahimpour Nosrani & Bathaeezadeh, 2020). According to world health organization reports, exercise is a safe and cost-effective solution to prevent loss of functional capacity in the elderly (Tartibian, Kushkestani & Ebrahimpour Nosrani, 2019; WHO, 2007). Also, recently the important role of exercise in the prevention, control and treatment of frailty, chronic diseases, and age-related negative changes have been shown in numerous studies (Cvecka et al., 2015). Furthermore, the effects of exercise in the elderly include the increase of independency, self-care, self-esteem, quality of life, life expectancy and reduction of mortality.

Providing an appropriate and low-cost approach to control and prevent complications such as chronic diseases, movement disorders, lower physical and mental capacity, as well as extreme fatigue is necessary. Therefore, regarding the benefits of exercise and physical activity in prevention, control and reduction of age-related complications, we assumed that the higher level of physical activity in elderly residents of rest home would be associated with lower

experience of fatigue. We also hypothesized that malnutrition would be associated with fatigue levels in the elderly residents of the rest homes. Therefore, the purpose of this study was to better understand the relationship between fatigue and physical activity levels in elderly living in rest homes. Meanwhile, the ultimate purpose of this study was to use the results for holding sports classes and providing an appropriate diet to prevent and control the aging complications such as fatigue among the elderly living in the rest homes of Tehran.

METHOD

Subjects

This was a descriptive correlational study conducted from October to December in 2018 at 10 rest homes located in Tehran province. The sample size using the Cochran formula was set to 131 with confidence level of 95%, p = 0.05. However, 121 individuals qualified following inclusion and exclusion criteria. By visiting rest homes, the eligible subjects were chosen. The inclusion criteria were: age above 65 years and live in rest home for more than 3 months. The exclusion criteria included: suffering dementia and Alzheimer; having severe hearing, speech and vision deficit; BMI lower than 17 kg/m2, unable to interview and infection diseases. Consent forms were taken, then the subjects were interviewed to collect the data.

Anthropometric measurement

The height of subjects was measured to the nearest 0.1 cm by wall-sticker tape meter while subjects were standing as straight as possible with their back against the wall and with shoes removed. Subjects' weight was measured by OMRON digital scanner with 0.01 g sensitivity and light clothing and no shoes. BMI was calculated as weight (kg)/height squared (m^2). Waist and hip circumferences were measured to the nearest millimeter using a tape meter. Waist-hip ratio (WHR) was calculated as waist circumference (cm) at the narrowest point divided by hip circumference (cm) at the maximum point.

Physical activity

Physical activity was measured by the Physical Activity Scale for the Elderly (PASE) (Washburn, Smith, Jette & Janney, 1993). The PASE is a validated 12-item questionnaire that has been designed to measure the amount of physical activity undertaken by individuals over the age of

65. Six items assess leisure activities (e.g., walking, sports), 6 items assess household activities (e.g. housework, gardening), and 1 item assesses paid or volunteer employment. It uses frequency, duration, and intensity level of activity over the previous week to assign a score, ranging from 0 to 793, with higher scores indicating greater physical activity. The Persian version of PASE was found to have high internal validity (Cronbach's alpha 0.97).

Fatigue

The FACIT Fatigue Scale is a short, 13-item, easy to administer tool that measures an individual's level of fatigue during their usual daily activities over the past week. The level of fatigue is measured on a four-point Likert scale (4 = not at all fatigued to 0 = very much fatigued) with higher scores indicating less fatigue. The Persian version of FACIT Fatigue Scale was found to have high internal validity (Cronbach's alpha = 0.891) (Ghaneh Ezzabadi, Maghsoudi & Beigomi, 2015).

Malnutrition

The risk of malnutrition in elderly people was measured by Mini Nutritional Assessment (MNA); a reliable screening test which consists of 18 items divided into 6 screening questions and 12 assessment questions. In current study, screening questions were used to distinguish subjects who are malnourished (<7 points) or at the risk of malnutrition (8-11 points) or well nourished (>12 points). MNA has been translated and validated in Persian and is being used in several countries (Ghazi et al., 2015).

Statistical analysis

The collected data were analyzed in SPSS 21 at the significant level of $P<0.05$. We used Kolmogorov-Smirnov test, for normality of data distribution. Descriptive analysis for socio-demographic variables was performed using frequencies (n), percentage (%) and mean±Sd. Independent t-test was used to compare between different groups. The Pearson correlation coefficient test was used to determine the relationship between variables. Following controlling variables (demographic), hierarchical regression was used to determine the predictability of FACIT regarding PASE and MNA score. Levene's test was used to check the equality of variances. Then 1-way ANCOVA

was used to determine difference between FACIT score in three physical activity groups. Also, Bonferroni test was performed to determine differences between physical activity groups.

RESULTS

The characteristics of the elderly are summarized in Table 1. The mean age of subjects was 72.30±10 and had a mean BMI of 26.92±6.58, which is considered overweight. As presented in table 2, weight ($P<0.05$), height ($P<0.05$), education ($P<0.05$), MNA ($P<0.01$) and PASE ($p<0.01$) scores in the low level of fatigue (LLF) group were significantly more than the high level of fatigue (HLF) group whilst, age ($P<0.05$) was significantly lower in the LLF group.

The results of Pearson correlation coefficient indicated a significant and positive correlation between FACIT with MNA ($r=0.406$, $p<0.01$) and PASE ($r=0.481$, $p<0.01$) scores. Also, there was a significant and positive correlation between weight and FACIT ($r=0.279$, $p<0.01$) score while a negative significant correlation was found between age and FACIT score ($r=-0.233$, $P<0.01$). In addition, there was a significant and positive correlation between PASE and MNA score($r=0.310$, $p<0.01$). However, there was a negative correlation between age and PASE score ($r=-0.256$, $p<0.01$).

In addition, there was a significant positive correlation between MNA score and BMI. The results of the correlation between age, BMI, PASE, MNA and FACIT score are presented in Table 3. We used hierarchical regression analysis to control the intervening variables, such as age and education. Table 4 showed that about 17% of the alterations in FACIT scores ($\Delta R^2=0.177$, $p<.001$) results from PASE scores. The elderlies were divided into low (N=39), moderate (N=42) and high (N=40) PASE score groups to compare FACIT scores precisely. The results of ANCOVA test showed that there was a significant difference in FACIT score between the three physical activity levels ($F=15.811$, $p<0.01$).

Then we used Bonferroni test, to discern the differences between diverse PASE score groups. There was a significant difference in the FACIT score between all physical activity groups (low, moderate and high) ($P<0.05$) (Figure 1).

Table 1: Basic characteristics of subjects

Variables	Mean±SD	Edu. level	N (%)
Age (yrs)	72.30±10.23		
Height (cm)	155.53±10.78		
Weight (kg)	63.01±14.21		
BMI (kg/m2)	26.92±6.58		
WHR	0.90±0.07		
HR (bpm)	76.99±16.37		
SBP (mmHg)	134.41±24.37		
DBP (mmHg)	82.75±14.60		
Education		Not literate	30 (24.79%)
		Primary school	31 (25.61%)
		Middle school/ diploma	42 (34.71%)
		Bachelor	13 (10.74%)
		Master/PhD	5 (4.13%)

BMI: Body mass index, WHR: Waist-hip ratio, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HR: Heart rate

Table 2: Characteristics differences between low and high level of fatigue groups

variables	Fatigue ≥ 30 (LLF group) N (73)	Fatigue < 30 (HLF group) N (48)	P
Age (years)	72.36	76.15	0.022*
Weight (kg)	64.79	58.79	0.017*
Height (cm)	157.16	151.46	0.003*
WHR (cm)	0.899	0.904	0.713
BMI (kg/m^2)	27.53	25.97	0.198
MNA	73	48	0.000**
PASE	51.10	18.17	0.000**

LLF; Low Level of Fatigue, HLF; High Level of Fatigue, WHR; Waist-to-Hip ratio, BMI; Body mass index, MNA; Mini Nutritional Assessment, PASE; Physical Activity for Elderly * $p<0.05$, **$p<0.01$.

Table 3: The correlation between different variables of the subjects

		Age	Weight	BMI	MNA	PASE	FACIT	Education
Age	P		**0.007****	0.059	0.280	**0.003****	**0.010****	**0.049***
	R	1	-0.243	-0.172	-0.099	-0.256	-0.233	-0.179
weight	P			**0.001****	**0.001****	0.114	**0.002****	0.420
	R		1	0.586	0.368	0.145	0.279	0.074
BMI	P				**0.001****	0.393	0.336	**0.014***
	R			1	0.358	0.078	0.088	-0.223
MNA	P					**0.001****	**0.001****	0.518
	R				1	0.310	0.406	0.059
PASE	P						**0.001****	**0.002****
	R					1	0.481	0.284
FACIT	P							**0.001****
	R						1	0.370
Education	P							1
	R							

* Correlation is significant at the 0.005 level (2-tailed).

** Correlation is significant at the 0.001 level (2-tailed).

Table 4: Hierarchical Regression for variables predicting prolonged fatigue

Model	R	R^2	Adjusted R^2	ΔR^2	ΔF	sig
1	0.406[a]	0.165	0.151	0.111	15.687	0.001**
2	0.585[b]	0.343	0.326	0.177	31.584	0.001**

a predictors (constant), age, education

b predictors (constant), age, education, physical activity

Dependent Variable: Fatigue

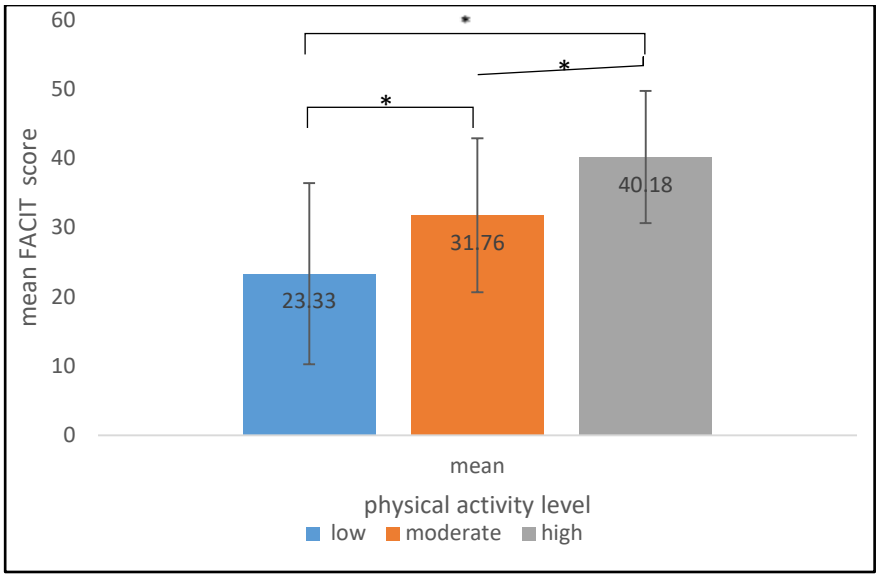

Figure 1: FACIT scores in different PASE groups

DISCUSSION

In the present study, there was a negative and significant correlation between age and FACIT score (fatigue) in elderly living in rest homes. In fact, with an increase in age, the level of fatigue increases too. Also, in the HLF group the mean age was significantly higher than the LLF group. Our findings are consistent with Åkerstedt, Discacciati, Miley-Åkerstedt & Westerlund (2018). It has been well established that the negative changes such as the decrease of physical and mental function (Fried et al., 2001), disability, fatigue, and many other symptoms tend to increase with age which is known as a geriatric syndrome (Inouye, Studenski, Tinetti & Kuchel, 2007). However, the cause of many of these symptoms is still unknown. It has also been well demonstrated that elderly resident of nursing homes are more likely to develop physical and mental dysfunction and fatigue due to less mobility than elderly living homes (Soyuer & Şenol, 2011; Engberg, Segerstedt, Waller, Wennberg & Eliasson, 2017).

In the present study, a positive and strong correlation was found between the PASE (level of physical activity) and FACIT score in elderly living in rest homes. In addition, in the HLF group, the mean PASE score was significantly higher than the LLF group. Our findings

are in line with the Soyuer and Şenol in 2011, and Egerton, Chastin, Stensvold and Helbostad in 2016. Regarding the lifestyle of the elderly who live in the rest home, it can be argued that the decline in physical function and serious disability is due to the lower levels of physical activity which is one of the most important signs of fatigue in these individuals. Also, it has been observed that the elderly residents of rest homes have lower physical activity levels than other elderly people. In addition, most of them would prefer to do their daily tasks the same as walking, family gathering and shopping rather than do the exercise (Stewart et al., 2001). Goggin & Marrow (2001) reported that 89 percent of Americans ages 65 and older are aware of exercise benefits however, 69 percent of them do not have enough participation in physical activities. In the present study, a positive and strong correlation was found between MNA (malnutrition status) with and FACIT score in elderly living in rest homes ($P<0.000$). In addition, in the HLF group, the mean MNA score was significantly lower than the LLF group ($P<0.000$). In a simple term, malnutrition is associated with a poor diet or deficiency of micronutrient which results in reduced levels of physical activity and more fatigue. Thus, physiologically, undernutrition causes depletion of body fat stores, muscle deterioration, and symptoms such as fatigue or tiredness (Furman, 2006). Many factors including malnutrition play an important role in increasing fatigue levels in elderly. Bonnefoy et al. (2015) showed that malnutrition increases the development of sarcopenia and osteoporosis, which eventually induced frailty in the elderly. The study of Roland et al. (2008) also demonstrated that decreased protein absorption and subsequently malnutrition were associated with weight loss and bone mass reduction, which eventually lead to decreased muscle mass and development of sarcopenia and frailty (Rolland et al., 2008). In addition, Valentini, Federici, Cianfarani, Tarantino and Bertoli (2018) reported in a cross-sectional study that malnourished people experienced higher levels of fatigue, while those with good nutritional status showed very low levels of fatigue. In the present study, a positive and strong correlation was found between MNA (malnutrition status) and PASE score in elderly living in rest homes. Our finding is relevant to the result of Singh et al. found the relationship between physical activity and nutritional status. Several reports indicated that

malnutrition is more prevalent in elderly living in the nursing home than the elderly living at the home. It seems, aging and malnutrition are associated with a decrease in the health and physical function of the elderly, which gradually leads to an increase in dependency in daily tasks, decreased quality of life, and ultimately a decline in physical activity levels (Papparotto, Bidoli & Palese, 2013).

CONCLUSIONS

The findings of this study indicate that holding sports classes under the supervision of exercise physiologists is an essential matter to increase health and prevent the age-related complications in elderly residents of Tehran rest homes.

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