

**Original Article****Physical activity in the elderly with fall experience over the past year: Results from Amirkola Health and Ageing Project**Mehdi Safarpour<sup>1</sup> Seyed Reza Hosseini<sup>2</sup> Akbar Fotouhi<sup>3\*</sup> Hojjat Zeraati<sup>4</sup> Masume Mohamadzade<sup>5</sup> Ali Bijani<sup>6</sup>

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**Abstract**

**Background and purpose:** Nowadays, immobility is known to be the fourth risk factor for mortality. The aim of the present study was to investigate the relationship between fall experience over the previous year and levels of physical activity in the elderly.

**Materials and Methods:** The study was performed with 1616 participants of 60≤ years. The relationship between physical activities in the elderly with age, sex, educational level, body mass index, comorbidities, and fall experience over the previous year was evaluated. Physical activity in the elderly was evaluated using the physical activity scale for the elderly.

**Results:** In the multiple regression model, the age ( $\beta$ : -1.6, 95% CI: -2.0- -1.1), sex, female ( $\beta$ : 11.0, 95% CI: 4.3-17.6), and comorbidities ( $\beta$ : -6.8, 95% CI: -13.5 - -0.1) had a significant relationship with the physical activity score. On the contrary, there was no significant difference between the score of physical activity and both groups with and without the experience of fall over the previous year ( $\beta$ : 0.09, 95% CI: - 8.0 - 8.2).

**Conclusion:** Increasing age with comorbidity resulted in a decrease in the average physical activity score in the studied elderly population. However, the experience of fall had no relationship with it. Providing the conditions alongside the training required to carry out physical activities, especially in the elderly people with the disease, was suggested.

**Keywords:** Physical Activity; Older Adult; Falling

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## 1. Introduction

Nowadays, for the first time in the history, most people can live up to 60 years and above. The aging population of the world will grow from 900 million people to about two billion over the period of 2015 to 2050; that is 12 to 22% (1). Aging causes gradual changes in the organs, which leads to decreased performance, weakness, disease, and the occurrence of some problems in the daily activities of this group (2, 3). The most important causes of disability in the elderly are sensory disorders, chronic pain, depression, diabetes, dementia, osteoarthritis, and fall (1). Among the unintentional causes of injuries, fall has a prominent role (4). Fall is one of the main causes of injury in the elderly (65 years and above), and every year, about one-third of the elderly experience it (5). The fall may lead to creating dependency in activities, loss of individual freedom, depression, and immobility (4, 6). A fall can cause fear of falling even if it does not cause injury to an individual (7). This is a deterrent factor to physical activity and can limit the daily activities of the elderly person (8). Some studies have reported that the elderly who experienced a fall in the previous year had lower levels of physical activity than those who did not have this experience (9). Regular physical activity was then seen to be necessary for having a healthy old age. Elderly people can take advantage of the regular physical activities which will continue throughout their lives (10). These activities can be considered as a preventative or therapeutic agent in some diseases, such as arthritis, osteoporosis, and high blood pressure (11). On the other hand, inactivity in the elderly is considered as a key risk factor for some non-communicable diseases, such as

cardiovascular disease, cancer, and diabetes (12, 13). Some studies have identified physical inactivity as a risk factor for fall in the elderly (14). Nowadays, immobility is also known to be the fourth risk factor for mortality. According to the general guidelines of physical activities for health published by WHO, each elderly person should perform at least 150 minutes of moderate aerobic physical activity or 75 minutes vigorous aerobic physical activity weekly (15). In many countries, people are less engaged in physical activities. In general, 23% of adults were found to be not active enough (16). American elderly were also documented to have the lowest physical activity among all age groups (17). The results of studies carried out in Iran also indicated a low level of physical activity in the elderly (18, 19). Considering the importance of the effect of fall experience on the prediction of physical activity in the elderly, this study aimed to investigate the relationship between fall experience over the previous year and the levels of physical activity in the elderly.

## 2. Materials and Methods

The present cross-sectional population-based study was conducted within the framework of the Amirkola Health and Ageing Project (AHAP). It was the first comprehensive cohort study of the health of older people ever conducted in Iran. The aim of this project was to investigate the health status of older people in Amirkola in the northern part of Iran. The basic information was collected during April 2011 through July 2012 (20). The population aged 60 years and above living in Amirkola (target population) were 2234 people (1158 males, 1076 females) based on the latest census data of two health centers in this city. The AHAP was

informed through posters distributed throughout the city and talks in mosques. After informing and inviting the target group to participate in the study, 72.3% of the eligible people were found to be willing to cooperate in this study. The age of 60 and above, staying in Amirkola city at the time of the study, and willingness to attend the study were the criteria for participating in the study. Data were then collected via questionnaire, examinations, and venipuncture. A large number of tests were done during the visit to the study centre. The interviewers initially visited older people in their homes to complete parts of the study questionnaire, and then, the next day, the older person came to the Social Determinants of Health (SDH) Research Centre of the University of Babol in Amirkola to complete questionnaires and examinations, such as The Physical Activity Scale for the Elderly (PASE) (21), and the Berg balance test. They also had fasting blood samples taken for biochemical and hormonal tests and bone density scanning. Meanwhile, the relationship between physical activities in the elderly (as a dependent variable) with age, sex, educational level, body mass index, comorbidities, and history of fall in the previous year (as independent variables) were evaluated. The applied questionnaire consisted of several main sections. In the first part, demographic information (age, sex, education level), and then disease status were recorded. In the first stage, during an interview with each elderly, the following question was asked: Have you ever had a fall experience in the last 12 months? If so, how many times? The next section is related to physical activity evaluation in a person using the PASE. It is used as a simple and practical tool for evaluating physical

activity in epidemiological studies. The questionnaire had three sections: the first section is related to leisure time, the second section is related to the activity at home, and the third section was related to the job. Higher scores meant more physical activity. The mean and standard deviation were used to describe the physical activity score, and the frequency was used to describe the qualitative variables. Also, crude and adjusted  $\beta$  with 95% confidence interval (CI) were reported using linear regression to examine the relationship between physical activity and independent variables. The research project of the original study on the health of elderly people in Amirkola was approved during the thirty-second session of the ethics committee in the research committee of Babol University of Medical Sciences on 2010/10/12. Also, the thesis project entitled "Investigating the incidence and risk factors and the predictive model of the fall in the elderly of Amirkola city, a population-based study" with the code IR.TUMS.VCR.REC.1395.54 was approved by the ethics committee of Tehran University of Medical Sciences.

### 3. Results

Of the 1616 participants in the study, 883 (54.7%) were male and 733 (45.3%) were female. The mean and standard deviation of participants were  $69.3 \pm 7.4$  year, in men, and  $69.9 \pm 7.6$  and  $68.6 \pm 7.0$  in women, respectively. The median, the first quartile, and the third quartile of age were also 68, 63, and 75, respectively. The median age was 69 years for men and 67 years for women ( $p < 0.001$ ). The age group of 60-69 years old had the highest frequency (59.3%) among the age groups. In total, 288 (17.8%) reported that they had experienced fall during the past twelve

months in different frequencies. 125 (43.4%) of the participants had experienced it once, 53 (18.4%) twice, and 110 (38.1%) three times or more. Of the 288 fall cases, 164 were women and 124 were men. In other words, 14.0% of the men and 22.3% of the women reported fall experience over the past year (OR: 1.7, 95% CI: 1.3-2.2). According to Table 1, the physical activity score in women was 11% higher than that of men. Moreover,

the people with lower comorbidities had a higher score in physical activity. Age also had an inverse relationship with physical activity score. Although physical activity had an increase with increasing BMI, this rise was not significant. On the contrary, there was no significant difference between the average physical activity score of people who experienced a fall over the previous year and those with no fall experience.

**Table 1.** The score of physical activity and value of  $\beta$  by different predictor

Variables	Frequency (%)	Mean $\pm$ SD score of physical activity	Unadjusted $\beta$ : 95% confidence interval		standardized $\beta$ ( Adjusted)
			Crude	Adjusted	
<b>Sex</b>					
Female	733 (45.3)	111.5 $\pm$ 55.1	10.9: 4.8 – 17.1	11.0: 4.3 -17.6	0.08
Male	883 (54.7)	100.5 $\pm$ 66.6			
<b>Fall history</b>					
Negative	1328 (82.2)	105.5 $\pm$ 61.3			
Positive	288 (17.8)	105.2 $\pm$ 63.5	-0.3: -8.3 -7.7	0.09: -8.0 – 8.2	0.001
<b>Number of Comorbidities</b>					
<3	508(31.4)	101.3 $\pm$ 59.8			
3 $\leq$	1108 (68.6)	107.5 $\pm$ 62.54	-6.2: -11.3- -1.0	-6.8: -13.5 – -0.1	-0.05
<b>BMI</b>			0.4: -0.2 - 1.1	-0.2: -0.9 – 0.4	-0.01
Low weight (<18.5)	495 (30.6)	106.8 $\pm$ 63.7			
Normal (18.5-24.9)	29 (1.8)	89.7 $\pm$ 52.2			
Over weight (25<)	1092(67.6)	108.7 $\pm$ 60.9			
<b>Education</b>			1.3: 0.5 – 2.1	0.2: -0.6 – 1.0	0.01
Illiterate	1045 (64.6)	100.5 $\pm$ 59.4			
Primary to high school	526 (32.6)	115.4 $\pm$ 65.3			
University	45 (2.8)	107.3 $\pm$ 58.2			
<b>Age groups</b>			-1.9: -2.3 - - 1.5	-1.6: -2.0 - -1.1	-0.19
60-69	959 (59.4)	116.1 $\pm$ 63.1			
70-79	523 (32.3)	95.3 $\pm$ 57.0			
80 $\leq$	134 (8.3)	69.1 $\pm$ 47.2			

#### **4. Discussion**

The findings of the present study showed no association between having experienced fall over the previous year and physical activity in the elderly. However, according to some studies, fall is considered as the main cause of trauma (22), disability, and motor impairment in the elderly (23). The loss of self-confidence, fear of falling again, and the inability to perform daily affairs are the common complications of fall (24), which can ultimately lead to the social isolation of an elderly person (25). In this regard, some studies (26,27) reported a relationship between the lower levels of physical activity and the history of fall, which were contrary to the results of the present study. In order to justify the observed difference in the physical activity score among elderly people with fall experience and elderly without falling, it can be said that only the fall experience cannot be a limiting factor of physical activity. This is due to other factors affected by the fall, such as the consequences and the result of the fall and the severity of possible injuries, which can lead to fear of falling again, and may ultimately reduce the level of physical activity in the elderly. Equality or non-significant differences between the restrictive conditions of physical activity can be other reasons for this. Another factor justifying this issue can be the lack of proper measurement of the physical activity of the two groups due to its over reporting in people with a history of fall or under reporting of this issue in people without a history of fall. It was also evident that misclassification due to the lack of correct reporting of the fall history reduced the power of the study, which could then lead to diminishing and loss of the

relationship between the effect of a fall history and the physical activity score in the studied population. In the present study, it was found that the average physical activity score in women was significantly higher than in men. However, some studies reported that the level of physical activity in men was higher than in women, which was contrary to the results of the current study (18,19,28,29). Given that most elderly women are housewives, this could be due to more reporting of physical activity performed at home by women or due to factors, such as inability and inadequacy of health in men to carry out activities and more attention of women to health in comparison with men (15). The results of this study showed a decrease of about 1.5 units of physical activity per one year increase in the age of participants, and in both sexes, the downward trend of the physical activity score was evident with increasing the age. Two other studies (9, 28) reported an inverse relationship between age and mean score of physical activity, which was in line with the results of the present study. However, in the study of Sadrullahi and Nelson (18, 30), although the mean score of physical performance decreased with any increase in age, this decrease was not significant. Physiological and anatomical changes along with decreased elderly performance due to musculoskeletal system weakness and increasing disease-related disabilities, such as chronic disease, were also found to play an important role in this regard. In the present study, although the elderly with elementary education to high school had the highest score of activities, this difference was not significant, which was consistent with the results of other studies (28, 31). In contrast, other studies (18, 32) reported that individuals with higher levels

of education had higher physical activity. This difference in physical activity score between different levels of education may be attributed to the low number of samples in the classification of university education (reduction of study power), the lack of difference in the knowledge level of people regarding the benefits of physical activity, the equality of conditions for preventing such activities, and/or lack of motivational and facilitating factors at all levels of study in the studied population. In the univariate model, with increasing BMI, the average physical activity also increased, which seemed to be due to a high ratio of younger elderly who were physically more active and had higher BMI. In other words, age had an inverse relationship with BMI, and the elderly in the age group of 60-69 years had a higher average BMI compared with other age groups. Therefore, it seemed that the relationship between the physical activity score and the BMI was affected by age; and this increase was eliminated after adjusting for other variables in the final model. So, there was no relationship between BMI and physical activity. Salehi and Mora (28,33), in contrast to the present study, reported a negative relationship between these two variables. According to Kashan study which was consistent with our study, there was no relationship between these two variables (18). It seemed that physical activity in the elderly of the present study was influenced by other conditions, such as health status, and internal or environmental motivational factors, and the BMI was found to play not a determinative role. The comorbidities could also partly reflect the health of an individual. Some studies have reported that in the absence of chronic diseases, the level of physical activity was high (28).

Benjamin et al. carried out a study on the effective inhibitor and facilitating factors of physical activity in Arab elderly, and reported that the two main inhibitor factors in the individual dimension were lack of adequate time and their health conditions (29). As the age increased, disabling diseases were also found to be rising. Hence, diseases could have a negative impact on various aspects of a person's life, such as reducing quality of life, reducing senior's performance, and including daily activities. In the present study, it was found that there was an inverse significant relationship between the comorbidities in the elderly and the physical activity score of the elderly, which was consistent with the results of previous studies (9). The participation of 72% of the target group and population-based nature of the study were its strengths, which could also provide useful information on the care of the elderly. On the other hand, some of the limitations of this study were: failure to extract some barriers and facilitator factors, such as social support, fear of falling factor as a major motion inhibitor, and limiting factor in the elderly, and facilitating or inhibiting factors at individual, environmental, and social levels.

## 5. Conclusion

In this study, there was found no significant relationship between the history of fall and the physical activity score. The results revealed that increasing age and comorbidities caused a decrease in the average physical activity score in the elderly population. Therefore, considering the importance of physical activity in preserving and promoting health, it is suggested that, along with the necessary training, conditions for physical activities

should be provided, especially in the elderly with comorbidities.

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**Author's contribution:** Designing of the study and data collection were performed by Seyed Reza Hosseini, and Ali Bijani. Analysis and interpretation of the data were performed by Mehdi Safarpour, Akbar Fotouhi, Hojjat Zeraati, and Masume Mohamadzade. Drafting of the manuscript was also performed by Mehdi Safarpour, Akbar Fotouhi, and Masume Mohamadzade. All of the authors contributed in critical revision of the manuscript for important intellectual content. Akbar Fotouhi was study supervision.

**Conflicts of interest:** None declared

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