J. Appl. Environ. Biol. Sci., 5(10)83-90, 2015

ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Pattern of Objectively Measured Physical Activity in Elderly Individuals and Its Associated Characteristics

Fahime Zeinali[1], Shima Abdollahi[1], Kamal Azam[2], Nahal Habibi[3], Kurosh Djafarian[1]

[1]Department of Clinical Nutrition, School of Nutritional Sciences and Dietetics, Tehran University of Medical Science, Tehran, Iran.
[2]Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Science, Tehran, Iran.
[3]Department of Nutrition and Dietetics, Faculty of Medicine& Health Sciences, Universiti Putra Malaysia, Selangor, Malaysia.

Received: May 17, 2015
Accepted: August 23, 2015

ABSTRACT

Objective: In the old ages, non-communicable diseases are the most common causes of disability and death. Inactivity and sedentary lifestyle are the main reasons of such diseases. This study aimed to assess the physical activity pattern of the elderly. **Methods:** This cross-sectional study was carried out among 81 elderly individuals of Tehran, Iran between February 2014 and August 2014. To measure the physical activity, participants fastened Actigraph GT3X set on their waists for 7 days. The anthropometric and socio-demographic data were collected. Data were analyzed using the IBM SPSS Statistics 21. **Results:** Sedentary activities comprised the largest percentage of total activities (M±SD= 62.07±9.98). Age, gender, occupation, diseases, BMI, time on TV, and education were contributed to the pattern of physical activity. **Conclusion:** The percentage of sedentary activity was high among the subjects. Older individuals, women, obese ones, those with low levels of education, and homemaker and jobless ones were at higher risk.
KEYWORDS: accelerometer, aging, elderly, physical activity, sedentary, socio-demographic

INTRODUCTION

Improved living conditions, health care, decreased death rate and increased birth rate have led to aging phenomenon in societies in such a way that the World Health Organization (WHO) has named the current century as the century of the elderly. Majority of the health problems in some developed countries are related to this section of society [1]. According to the United Nations (UN) predictions, the aging population rate in the world will increase from 10.5% in 2007 to 21.8% in 2050 [2]. The number of the elderly in Iran follows the same trend as in the next 50 years they would comprise 20% of the society [3].

In the old ages, unlike childhood, non-communicable diseases are the most common cause of diseases, disability and death while they are preventable [4]. Sedentary lifestyle and physical inactivity are the major reasons behind these diseases [5]. Indeed, physical activity is a significant factor in preventing, managing and rehabilitating many chronic diseases [6]. Regular physical activity decreases the probability of coronary artery diseases, high blood pressure, diabetes, and cancer. It can also develop muscle and bone strength, decrease the risk of falls and subsequent fractions, facilitate weight loss and weight control, and improve quality of life [7].

Physical activity, which is one of the basic signs of health, usually declines by aging. This fact decreases the physical functionality which is a significant factor in the person's independence [8]. Studies indicate that 80% of Iranian population is physically inactive [9]. This proportion is 68% for the United States and 67.7% for Australia [10,11].

The WHO in 2010 stated that adults in all age groups should have at least 30 minutes per day or 150 minutes per week (in the form of bouts of 10 minutes) moderate to vigorous physical activity (MVPA) [12].

In many studies the amount of physical activity has been measured based on the questionnaire and self-reports, while this method suffers from over-reporting of the physical activity and under-reporting of inactivity time. In addition, light physical activity is the most common level of activity of the elderly while they have the most difficulty in remembering it correctly [8]. Furthermore, it has been seen that the amount of physical activity measured by accelerometer is less than self-reported physical activity [13]. Accelerometer is a portable device for visually assessing the level and pattern of physical activity [14].

***Corresponding Author:** Kurosh Djafarian, Department of Clinical Nutrition, School of Nutritional Sciences and Dietetics, Tehran University of Medical Sciences, Tehran, Iran, Tel: +989126654577.
Email: kdjafarian@tums.ac.ir

This study aimed to investigate the level of physical activity of the elderly objectively and determine its associated characteristics. To our knowledge, this is the first study that investigated pattern of objectively measured physical activity using accelerometer among elderly of Iran.

MATERIAL and METHODS

Study population and protocol

This cross-sectional study carried out on the elderly of region 5 of Tehran, Iran. All ninety individuals participated in this research were under the coverage of the health centers. These centers are directly administered by health administration and indirectly by Tehran municipal. All elderlies of a certain sector are under the coverage of its health center and use its services. First of all, 10 out of 30 health centers of the region 5 were randomly selected. Then, based on the population proportion of the elderlies in every health center, 90 sixty and older ones were randomly recruited and were examined based on the inclusion criteria namely willingness to participate in the study and the age of 60 and over. Not being able to move individually and suffering from acute and serious diseases were the criteria of not entering and using the accelerometer for less than 4daysor 10 hour/day was the exclusion criteria. Data were collected between February 2014 and August 2014.

Prior to the commencement of the study, ethical clearance was obtained from the University Research Ethics Committee of Tehran University of Medical Sciences. Before the data collection, written informed consents were obtained from the all participants.

Baseline and objective

Weight and height of the participants were measured by digital scale and Secastadiometer, respectively. The waist circumference was measured by an inelastic tape meter with precision of 0.5 centimeter. Body mass index (BMI) was calculated by dividing the weight in kilograms by square of the height in meters. The BMI less than 25kg/m^2 was considered as normal, between 25 kg/m^2 to 29.9 kg/m^{2}as overweight, and more than 30 kg/m^2 as obese [8]. The waist circumference less than 80cm in women and 90cm in men were classified as low risk, between 80cm to 87cm in women and 94cm to 101cm in men as moderate risk, and more than 88cm cm in women and 102cm in men as high risk (15).

The socio-demographic and general data which contained questions about age, gender, education, previous job, current job, watching TV time, diseases, smoking, income, possessing home, marital status, ethnic origin, and the people that he/she lives with were collected using questionnaire with the interview.

Measurement of physical activity was done through objective method using Actigraph model GT3X (Pensacola, Florida, USA). Using of this device has been validated for the elderly (16). The subjects were asked to fasten the Actigraph to their waists for 7 days and record their sleeping hours every day. The waking hours were taken into account for calculating physical activity. The days in which the subjects fastened the device more than 10 hours were selected. They were asked to detach the accelerometer in showers and other water activities and report all the times and days that they detached it to the researcher.

Physical activity at follow up

In this study, the physical activity is recorded using 15-second epochs. Waking time counts were divided by the total waking time in minutes and count per minute (cpm) was calculated for every individual in weekdays and weekends. The activity levels were determined according to Freedson's cut-off points as inactivity (cpm≤100), light activity (cpm 101-1951), moderate activity (cpm 1952-5724), and vigorous activity (cpm>5724) [16]. Due to the fact that vigorous activity in the elderly is little, moderate and vigorous activities were combined together [17].

The percentage of time in every activity level was calculated and used in analyses. The percentages for weekdays and weekends were compared for every individual. Average number of steps for every person per day was calculated as well. Also average sedentary and light physical activity bouts of 10 minutes and average moderate to vigorous physical activity bouts of 5 and 10 minutes were calculated.

Data Analysis

Data were analyzed using the IBM SPSS Statistics 21. Acti Life 4.4.0 (Pensacola, FL) was used for downloading data from accelerometers and transferring them to Excel. Initially, in order to examine the normal data distribution, the Kolmogorov-Smirnov test was used. To compare the mean of variables of physical activity, the Independent Sample T-test and Mann-Whitney test were used for normally distributed data and non-normally distributed ones, respectively. To compare the mean of quantitative variables of physical activity of multivariate quantitative variables, one-way ANOVA and Kruskal-Wallis test were used for normally distributed and non-

normally distributed data, respectively. Means of quantitative variables of physical activity for every person in weekdays and weekends were compared using Paired T-test and Wilcoxon test for normally distributed and non-normally distributed variables, respectively.

To estimate the correlation between physical activity and age, Pearson's Product-Moment Correlation and Spearman Correlation were used for normally distributed data and non-normally distributed ones, respectively. Finally, those variables that were significantly associated with the physical activity were entered to the multiple linear regression analysis. A p-value of less than 0.05 was considered as statistically significant.

RESULTS

Data of 9 participants were incomplete because they used accelerometers less than 4 days. Thus, their data were excluded. Finally, data of 81individuals were analyzed to assess the objectives. Thirty-one men (38.3 %) and 50 women (61.7%),aged 72.61±5.99 years and 70.96±7.03 years respectively, participated in this study. The average total activity of all the participants was 256.68 ± 80.88 counts per minutes. Also, the average number of steps taken in one day was 6198.4±2730.67. The total physical activity and the number of steps taken in one day by men was significantly more than those of women (p=0.001). Average percentage of moderate to vigorous physical activity of women (M±SD=1.47±1.41/w) was less than men (M±SD=2.17±1.85/w) (p<0.001). Additionally, sedentary bouts of 10 minutes in men were more than women but light activity bouts of 10 minutes in women were more than men. However, these differences were not statistically significant (p>0.05). Moderate to vigorous physical activity bouts of 5 minutes (p=0.001) and 10 minutes (p<0.001) in men were significantly more than women.

The mean of total physical activity for both men and women was more in weekdays than in weekends but this difference was not statistically significant. Similarly, sedentary percentage of both genders in the weekend and weekdays was not statistically significant. However, the percentage of light physical activity in the weekends was significantly more than weekdays for men (p=0.03). Moreover, men had more percentage of vigorous physical activity during weekdays than the weekends (p=0.001). In contrast, no significant difference was found in physical activity levels of the women between weekdays and weekends (Table1).

The participants' physical activity (count per minute) and the number of steps per day had decreased significantly with aging (p<0.001). Additionally, moderate to vigorous physical activity percentage (p=0.004), and moderate to vigorous physical activity bouts of 5 minutes (p=0.02) and 10 minutes (p=0.04) were negatively associated with aging in both genders (Table 2).

In this study, in terms of waist circumference, 33.3% were at low risk, 43.2% at moderate risk, and 23.5% at high risk. The subjects were in low risk category had significantly more physical activity (p<0.001). Also, activity in participants with normal BMI was significantly more than overweight and obese ones (P<0.001).

The results of this study showed that there was a significant positive relation between total physical activity (P=0.02) and steps (P=0.01) with education levels; as individuals with higher education had more physical activity than those with lower levels of education. In addition, sedentary percentage in participants with low levels of education was significantly more than others (P=0.04) and moderate to vigorous physical activity percentage in subjects with higher education was significantly more than those with lower levels of education (P=0.001).

In the current study, physical activity of working elderly individuals was significantly more than unemployed ones (P=0.01) and unemployed participants significantly had more sedentary percentage than working ones (P=0.02). The average total physical activity (P=0.03) and moderate to vigorous physical activity percentage (P<0.001) in participants who were employed in the past were significantly more than the others.

Additionally, 59.3% of participants watched TV less than 2 hours and 40.7% more than 2 hours. The total physical activity (P=0.002) and the number of steps (P=0.001) had significant negative relation with watching TV time. Meanwhile, the percentage of moderate to vigorous physical activity was significantly more in participants who reported less time on TV (P<0.001).

In this study, 55.6% of participants suffered from diseases. Disease was significantly associated with the physical activity, as those who suffered from diseases (P<0.001) had less activity compared to healthy participants. The moderate to vigorous physical activity percentage of the healthy individuals was significantly higher than others. While there was not a significant association between smoking and physical activity, the percentage of moderate to vigorous activity in smokers was significantly less than non-smokers (P=0.02) (Table3). In addition, there were no significant association between physical activity and income, marital status, ethnic origin, possessing home, and people who live with (P>0.05) (Table3).

The results of multiple linear regression showed that age, gender, occupation, diseases, BMI, time spent on TV, and education were contributed to the pattern of physical activity of the elderly (Table 4).

Table 1: Comparison of physical activity and the percentage of various levels of physical activity according to sex

Variables	Men (n=31)	Women (n=50)	Total (n=81)	p value
Physical activity in the week (cpm)	282.7±77.38	224.34±75.40	246.68±80.88	0.001[1]
Physical activity on weekdays (cpm)	287.59±85.60	228.29±73.45	250.44±882.82	0.002[1]
Physical activity on weekends (cpm)	271.94±79.79	217.21±84.87	241.65±86.38	0.02[1]
p value[3]	0.26	0.61	0.23	
Sedentary percentage in the week	62.16±9.79	62.02±10.19	62.07±9.98	0.70
Sedentary percentage on weekdays	62.69±9.53	61.78±10.11	62.12±9.85	0.64
Sedentary percentage on the weekend	60.64±11.68	62.15±12.10	61.47±11.83	0.95
P value[3]	0.27	0.93	0.52	
Percentage of light activity in the week	34.57±10.25	36.78±9.49	35.94±9.78	0.32
Percentage of light activity on the weekdays	33.53±9.54	36.89±9.49	35.64±9.59	0.14
Percentage of light activity on the weekend	36.82±12.17	36.83±11.58	36.83±11.74	0.10
P value[3]	0.03	0.70	0.09	
Percentage of moderate to vigorous activity in the week	3.3±1.95	1.47±1.41	2.17±1.85	<0.001[2]
Percentage of moderate to vigorous activity on weekdays	3.81±2.09	1.62±1.60	2.43±2.08	<0.001[2]
Percentage of moderate to vigorous activity on the weekend	2.54±1.75	1.35±1.39	1.88±1.66	0.01[2]
P value[4]	0.003	0.26	0.003	
The number of steps per day	7181.67±2739.91	5588.79±2566.50	6198.41±2730.67	0.01[1]
Sedentary bouts of 10 minutes per day	0.53±0.56	0.43±0.49	0.46±0.52	0.46
Light activity bouts of 10 minutes per day	4.98±4.39	6.54±4.38	5.94±4.42	0.12
MVPA bouts of 5 minutes per day	4.38±3.87	1.49±2.18	0.39±0.89	0.001[2]
MVPA bouts of 10 minutes per day	0.75±1.25	0.16±0.46	2.6±3.24	<0.001[2]

[1]: Independent samples T test; [2]: Mann-Whitney; [3]: Paird T-Test; [4]: Wilcoxon

Table2: Association of physical activity and the percentage of various levels of physical activity with age

Variables	Age					
	Men(n=31)		Women(n=50)		Total(n=81)	
	r	p	r	p	r	p
Physical activity in the week (cpm)	-0.51	0.003[1]	-0.46	0.001[1]	-0.40	<0.001[1]
The number of steps per day	-0.67	<0.001[1]	-0.41	0.003[1]	-0.44	<0.001[1]
Sedentary percentage in the week	0.04	0.82	0.23	0.11	0.14	0.22
Percentage of light activity in the week	-0.02	0.37	-0.18	0.21	-0.10	0.54
Percentage of moderate to vigorous activity in the week	-0.50	0.004[2]	-0.43	0.002[2]	-0.32	0.004[2]
Sedentary bouts of 10 minutes per day	0.22	0.24	-0.01	0.95	0.07	0.56
Light activity bouts of 10 minutes per day	0.08	0.66	-0.18	0.22	-0.12	0.27
MVPA bouts of 5 minutes per day	-0.58	0.001[2]	-0.28	0.05	-0.27	0.02[2]
MVPA bouts of 10 minutes per day	0.41	0.02[2]	-0.27	0.06	-0.23	0.04[2]

[1]: Pearson correlation; [2]: Spearman correlation

Table 3: Comparison of physical activity and the percentage of various levels of physical activity according to different characteristics

Variable	Total activity (cpm)	Steps per day	Sedentary percentage	Light activity percentage	MVPA percentage
Waist circumference					
-Low risk	303.73±75.11	7751.96±2525.9	60.74±10.57	35.56±11.34	3.69±1.92
-Moderate risk	225.94±55.66	5473.43±2066.6	61.83±8.24	36.63±7.98	1.57±1.13
-High risk	203.80±86.09	5326.21±3226.7	64.4±12.02	35.18±10.84	1.12±1.47
p value	0.001[1]	0.001[1]	0.47	0.85	<0.001[2]
BMI					
-Normal	293.12±73.86	7346.59±2459.1	59.90±10.26	36.78±11.01	3.32±1.95
-Overweight	219.58±64.25	5401.60±2579.1	63.73±9.22	35.14±8.42	1.52±1.27
-Obese	198.49±87.34	5434.03±3001.9	63.01±11.27	36.06±10.84	0.93±1.39
p value	0.001[1]	0.01[1]	0.26	0.79	0.001[2]
Education					
-Primary	207.23±88.83	4790.51±2836.75	66.22±10.42	33.16±9.51	1.36±1.71
-Secondary	252.47±68.33	6318.47±2190.44	59.82±8.90	38.15±8.94	2.03±1.44
-Tertiary	281.52±89.63	7707.42±3308.58	63.42±11.13	32.84±11.41	3.68±2.36
p value	0.02[1]	0.01[1]	0.04[1]	0.06	0.001[2]

Currently occupied:					
-No	236.68±77.76	6058.5±2755.43	63.21±9.62	34.92±9.35	2.06±1.82
-Yes	298.94±79.56	5930.22±2574.5	56.09±10.10	41.22±10.69	2.75±2
p value	0.01[3]	0.29	0.02[3]	0.03[3]	0.18
Former job					
-Unemployed/ homemaker	221.38±82.37	5499.55±2756.12	62.77±10.51	36.31±9.42	1.36±1.49
-Self-employed	247.72±89.39	5742.70±2730.1	63.74±9.21	34.08±9.16	2.21±1.69
-Employee	276.68±63.43	7356.25±2385.07	60.09±9.84	36.74±10.76	3.13±1.94
p value	0.03[1]	0.02[1]	0.41	0.64	<0.001[2]
Time on TV					
-<2 hours	268.86±79.33	7048.50±2719.76	61.49±8.83	35.54±8.94	2.98±1.86
->2 hours	214.41±72.80	4961.92±2261.9	61.47±11.56	37.97±19.7	0.99±1.03
p value	0.002[3]	0.001[3]	0.65	0.12	<0.001[4]
Chronic disease					
-No	296.93±74.39	8092.76±2634.04	60.56±9.17	35.92±9.69	3.49±1.92
-Yes	206.47±61.42	4682.93±1659.33	63.28±10.53	35.94±9.96	1.12±0.86
p value	<0.001[3]	<0.001[3]	0.23	0.99	<0.001[4]
Smoking					
-No	293.48±93.73	7332.25±2430.9	62.94±10.98	33.65±11.49	3.47±2.13
-Yes	241.32±76.45	6023.17±2601.8	61.72±9.8	36.49±9.51	1.99±1.74
p value	0.06	0.16	0.73	0.41	0.02[4]
Salary (monthly)					
-< 300$	228.33±87.01	5786.41±2987.4	63.11±9.7	35.05±9.55	1.83±1.87
-> 300$	260.63±73.81	6511.89±2506.1	61.28±10.22	36.61±10.0	2.43±1.82
p value	0.07	0.24	0.42	0.48	0.06
Home possession					
-Rental/mortgage	238.02±88.92	5823.27±3111.32	63.45±11.28	34.45±11.22	2.1±1.94
-Owner	249.91±78.24	6338.29±2589.72	61.56±9.50	36.49±9.23	2.20±1.84
p value	0.56	0.45	0.45	0.41	0.57
Marital status					
-Single/alone	226.80±64.96	5650.34±2430.88	62.15±11.20	35.90±11.24	1.89±1.46
-Married	251.57±84.05	6333.32±2800.38	62.05±9.75	35.94±9.49	2.24±1.94
p value	0.28	0.37	0.97	0.99	0.70
Household					
-Alone	219.87±111.81	5786.52±4531.91	64.02±10.77	34.56±9.60	1.41±1.99
-Spouse, spouse and children	251.57±84.05	6333.32±2800.38	62.05±9.75	35.94±9.49	2.24±1.94
-Children, other relatives	229.11±48.18	5604.95±1564.48	61.53±11.73	36.35±12.09	2.05±1.31
p value	0.54	0.67	0.91	0.95	0.67
Ethnic origin					
-Persian	242.86±83.52	6068.97±2747.60	61.53±10.68	36.31±10.81	2.21±1.97
-Other	250.79±78.82	6337.81±2741.21	62.66±9.27	35.54±8.66	2.13±1.74
p value	0.66	0.66	0.61	0.73	0.78

Data are reported in Mean±SD; [1]: One- Way ANOVA; [2]:Kruskal-Wallis; [3]: Independent samples T test; [4]: Mann-Whitney

Table 4: Results of multiple linear regression for prediction of variables of physical activity

	Model	Variable	R^2	Adjusted R^2	Beta	t	p
1	**Physical activity (cpm)**	**Age**	0.36	0.34	-0.30	-3.29	0.002
		Gender			-0.21	-2.11	0.03
		Currently occupied			0.19	2.22	0.03
		Disease			-0.36	-3.68	<0.001
		BMI			-0.28	-2.51	0.01
		Education			0.17	2.13	0.04
2	**The number of steps per day**	**Age**	0.33	0.31	-0.34	-3.8	<0.001
		Gender			-0.23	-2.15	0.03
		Disease			-0.42	-4.32	<0.001
		BMI			-0.19	-2.1	0.04
3	**Sedentary percentage**	**Currently occupied**	0.16	0.14	-0.31	-2.68	0.01
		Disease			0.34	2.31	0.02
4	**Percentage of light activity**	**Currently occupied**	0.14	0.11	0.32	2.8	0.01
5	**Percentage of MVPA**	**Age**	0.47	0.45	-0.34	-4.75	<0.001

		Gender			-0.36	-4.09	<0.001
		Time on TV			-0.18	-2.11	0.04
		Disease			-0.31	-3.95	<0.001
		BMI			-0.22	-2.51	0.01
6	**MVPA bouts of 10 minutes**	**Age**	0.28	0.26	-0.39	-3.86	<0.001
		Gender			-0.40	-3.21	0.002
7	**MVPA bouts of 5 minutes**	**Age**	0.41	0.38	-0.38	-4.7	<0.001
		Gender			-0.41	-4.16	<0.001
		Time on TV			-0.22	-2.32	0.02
		Disease			-0.19	-2.17	0.03
		Education			0.17	2.1	0.04

DISCUSSION

While in this study the percentage of sedentary activity in waking time was 62.07 ±9.98%, light physical activity 35.94 ± 9.78%, and moderate to vigorous physical activity 2.17 ± 1.85%, in the study of Arnardottiron the 73-98 year-old people these percentages were74.5% and 21.3% for sedentary and light physical activity, respectively; however, considering their older ages, this difference in percentage is justifiable [8]. Additionally, the percentage of inactivity in the USA and Australia were reported 68% and 67.7%, respectively [10,11].

In the current study, 22.2% of participants had 30 minutes daily moderate to vigorous physical activity (MVPA) which is the time that is advised by WHO [12]. Also, 49.1% of men and 10% of women reached this cut-off point. Similarly, in a study among Americans, objectively measurements showed that only 6% to 26 % of people who were over 60 could reach this recommendation [18].However, in a cross-sectional study by Harris et al. on the elderly over 65 in care homes only 2.5% of participants had the minimum moderate to vigorous physical activity of 150 minutes per week [15]. It seems that people who live in their own homes have more physical activity than those who live in care homes. The probable reason is in the care homes usually nurses carry out some routine activities or help them to do while in their own homes they have to do their daily activities personally.

In this study, physical activity, number of steps, percentage of MVPA and bouts of 5 and 10 minutes of MVPA were significantly more in men than women. In a study by Troiano et al. among American elderly, men had more activity than women [13]. Meanwhile, Harris et al. found that the male elderly took more steps than females every day [15]. Interestingly, other studies also reported that men were more active than women [19-23]. Results of our research were in line with previous study that showed that men had more bouts of MVPA than women [24].

The results showed that physical activity, steps, percentages of MVPA and bouts of 5 and 10 minutes of MVPA significantly decreased by aging in both genders. Similarly, Davis et al. reported that the average number of steps taken by the elderly is 37% less than younger adults and they have significantly less MVPA compared the younger people [25]. Harris et al.in a study on the elderly over 65 showed that the number of steps decreased by the age and the levels of physical activity of the older individuals were clearly less than recommended levels[15]. Different studies confirmed the fall in physical activity level as the people got older [20,26-29]. Similar to the previous studies, in the current study bouts of MVPA had negative relation with age and older participants were at lower levels [8,30].

Our results showed that physical activity, the number of steps and percentage of MVPA were negatively associated with BMI and waist circumference, as those with normal BMI and waist circumference had more physical activity. This negative association between physical activity and waist circumference or BMI was approved in a cohort study previously [8].

In this study, there was a significant positive relation between physical activity and educational level, as more educated people had more physical activity than less educated ones. Moreover, sedentary activity in less educated people was significantly more that educated ones. Results of a study by Sourion 18-84 year olds showed that there was a positive relation between education and physical activity [26]. Furthermore, Florindo et al. in a study on Brazilian adults found that education and physical activity in leisure time were positively associated [20]. Previous studies also reported similar association among different old men and women [28,29]. However, in the study by Motefaker et al. on the elderly, there was a negative relation between physical activity and education [27]. In that study, non-objective method (questionnaire) was used for measuring physical activity while in our study physical activity was assessed by objective method.

The results of the current study showed that physical activity of the working people was significantly more than unemployed ones. Moreover, sedentary percentage of the jobless participants was significantly more than working ones. The more physical activity of working people was probably due to their social activities that led to the decrease in their sedentary time. However, in a study in Peru the physical activity was negatively associated with job

[23]. This inconsistency can be due to the differences in the method of data collection of physical activity which was questionnaire in their study and their statistical population.

In this study, physical activity in the participants who spent more time on TV was significantly lower. Similarly, Bennett et al. in Boston found that daily watching TV resulted in a fall in the physical activity level [29]. There were no significant differences in physical activity between married and single subjects. It was consistent with the result of the study by Motefaker et al. who did not find any difference in physical activity between single and married individuals [27].

The average physical activity (cpm) and the number of steps of the participants who reported that suffered from diseases were significantly lower than healthy ones. In addition, the percentage of moderate to vigorous physical activity of the healthy participants was significantly higher. Harris et al. found that the diabetic elderly had fewer steps than healthy ones [15].

In this study age, gender, occupation, diseases, BMI, time spent on TV, and education were the predictors of the pattern of physical activity while in a study by Harris et al. age, general health, disability, diabetes, body mass index, and perceived exercise control were the predictors of the average steps per day among elderly over 65 in care homes [15].

One of the strength points of the current study was that the physical activity was measured through objective method by Actigraph GT3X which is a valid device for being used for the elderly [16]. The limitation of this study was not taking into account the water activities.

CONCLUSION

The results of this study indicated that the percentage of sedentary in the elderly participants was high. In this study, gender, age, BMI, levels of education, occupation, diseases, and time spent on TV were contributed to the pattern of physical activity of the old people. Considering the growing number of the elderly, it is recommended that they add regular sport to their daily programs and change their lifestyle in a way that can minimize the sedentary activities to prevent diseases and disabilities. Researchers, nurses, and other healthcare providers should give due attention to the above factors because of their subsequent effects on the enhancement of quality of lives of the elderly. Further studies about associated factors with the pattern of physical activity are necessary.

CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

ACKNOWLEDGMENTS

The authors acknowledge the financial support for this research that was provided by Tehran University of Medical Sciences. They are also grateful to all study participants.

REFERENCES

1 Greengross, S., E. Murphy,L. Quam, P. Rochon andR. Smith, 1997.Aging: a subject that must be at the top of world agendas.*BMJ*, 315(7115):1029-1030.
2 United Nations (2006) World Population Prospects, 2006. *Revision Population Database*.
3 Lang, T., T. Streeper, P. Cawthon, K. Baldwin, D.R. Taaffe andT.B. Harris, 2010. Sarcopenia: etiology, clinical consequences, intervention, and assessment.*Osteoporos Int*, 21 (4): 543-559.
4 Hatami, R.S., H. Eftekhar-Ardebil, F. Majlesi, M. Sayed-Nozadi and S.M.J. Parizadeh, 2004. Persian Textbook of Public Health. Tehran: Arjmand, pp: 43-44.
5 Ronda, G., P. VanAssema andJ. Brug, 2001.Stages ofchange, psychological factors and awareness of physical activity levels in the Netherlands. *Health Promot Int*, 16(4): 305-314.
6 Buchowski, M.S., S. Acra, K.M. Majchrzak, M. Sun andK.Y. Chen, 2004.Patterns of physical activity in free-living adults in the Southern United States.*EUR J CLIN NUTR*, 58 (5): 828-837.
7 U.S. Department of Health and Human Services, 1996. Physical activity and Health: A report of the surgeon general.*GA:U.S. Centers for disease Control and Prevention,National Center for Chronic Disease Prevention and Health Promotion*.Georgia.
8 Arnardottir , N.Y, A. Koster, D.R. Van Domelen, R.J. Brychta, P. Caserotti, G. Eiriksdottir,et al, 2013.Objective measurements of daily physical activity patterns and sedentary behaviour in older adults: Age, Gene/Environment Susceptibility-Reykjavik Study. *Age Ageing,* 42(2):222-229.
9 Sheikholeslam, R., A. Mohamad, K. Mohammad andS. Vaseghi, 2004. Non-communicable disease risk factors in Iran. *ASIA PAC J CLIN NUTR,*13(3): 100-110.

10 Martin, S.B., J.R. Morro, A.W. Jackson and A.L. Dunn, 2000.Variables related to meeting the CDC/ACSM physical activity guidelines.*Med Sci Sports Exerc,* 32(12): 2087-2092.
11 Burton, N.W. andG. Turrell, 2000.Occupation, hours worked, and leisure-time physical activity. *PREV MED*, 31(6):673-681.
12 World Health Organization, 2010. Global recommendations on physical activity for health.Geneva, Switzerland.
13 Troiano, R.P., D. Berrigan, K.W. Dodd, L.C. Masse, T. Tilert and M. McDowell, 2008. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*, 40(1):181-188.
14 Shephard, R.J, 2003.Limits to the measurement of habitual physical activity by questionnaires.*BRIT J SPORT MED,*37(3):197-206.
15 Harris, T.J., C.G. Owen, C.R. Victor, R. Adams andD.G. Cook, 2009. What factors are associated with physical activity in older people, assessed objectively by accelerometry? *BRIT J SPORT MED*, 43(6):442-450.
16 Freedson, P.S., E. Melanson andJ. Sirard, 1998. Calibration of the Computer Science and Applications, Inc. accelerometer.*Med Sci Sports Exerc,* 30(5):777-781.
17 Whitt, M., S. Kumanyika andS. Bellamy, 2003. Amount and bouts of physical activity in a sample of African-American women. *Med Sci Sports Exerc*, 35(11):1887-1893.
18Tucker,J.M., G.J. Welk andN.K. Beyler, 2011.Physical activity in US adults: compliance with the physical activity guidelines for Americans. *Am J Prev Med*, 40(4):454-461.
19 Zabihi, E., S.R. Jafarian, M. Farokhifar, F. Babaei, M.T. Salehi-Omrani andA. Bijani, 2010. Study on physical activities in Babol City.*JBUMS*, 71-76.
20 Florindo, A.A.,P.C. Hallal, E.C. Moura andD.C. Malta, 2009.Practice of physical activities and associated factors in adults, Brazil.*Rev. Saúde Públ.,* 43:65-73.
21 Santos, R., M.P. Santos, J.C. Ribeiro and J.Mota, 2009.Physical activity and other lifestyle behaviors in a Portuguese sample of adults: results from the Azorean Physical Activity and Health Study. *JPAH*, 6(6):750-759.
22 Salmon, J., N. Owen, A. Bauman, M.K.H. Schmitz and M. Booth, 2000.Leisure-time, occupational, and household physical activity among professional, skilled, and less-skilled workers and homemakers. *PREV MED*, 30(3):191-199.
23 Seclén-Palacín, J.A. andE.R. Jacoby, 2003.Socio-demographic and environmental factors associated with sports physical activity in the urban population of Peru. *Rev. Panam. Salud Públ,* 14(4):255-264.
24 Ortlieb, S., A. Dias, L. Gorzelniak, D. Nowak, S. Karrasch, A. Peters, et al, 2014. Exploring patterns of accelerometry-assessed physical activity in elderly people.*Int J Behav Nutr Phys Act,* 11:28-38.
25 Davis, M.G. andK.R. Fox, 2007.Physical activity patterns assessed by accelerometry in older people.*Eur J Appl Physiol*, 100(5):581-589.
26 Souri, H., 2003. Leisure time physical activity among adults and its association with medical services use in Ahwaz.*Sci J Hamdan Univ Med Sci,* 9(4):56-60.
27 Motefaker, M., S.M. Sadrbafghi, M. Rafiee, L. Bahadorzadeh, S.M. Namayandeh, M. Karimi, et al, 2007. SuicEpidemiology of physical activity: a population based study in Yazd cityide attempt and its relation to stressors and supportive systems: a study in Karaj city.*Tehran Univ Med J*, 65(4):77-81.
28 Hamer, M., M. Kivimaki and A. Steptoe, 2012. Longitudinal patterns in physical activity and sedentary behaviour from mid-life to early old age: a substudy of the Whitehall II cohort.*J Epidemiol Community Health*, 66(12):1110-1115.
29 Bennett, G.G., K.Y. Wolin, K. Viswanath, S. Askew, E. Puleo andK.M. Emmons, 2006.Television viewing and pedometer-determined physical activity among multiethnic residents of low-income housing.*Am J Public Health*, 96(9):1681-1685.
30 Orsini, N., R. Bellocco, M. Bottai, M. Hagströmer, M. Sjöström, M. Pagano, et al, 2008. Profile of physical activity behaviors among Swedish women aged 56–75 years. *Scand J Med Sci Sports*, 18(1):95-101.