Original Article

Self-reported Factors Associated with Engagement in Moderate to Vigorous Physical Activity among Elderly People: A Population-based Study

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Abstract

Background: Physical activity (PA) typically decreases with aging, especially of moderate to vigorous level, and this change affects health outcomes of older adults. Age-related decline is not evenly distributed across elderly population and is attributed to psychosocial, physical, and environmental determinants. **Methods:** We selected a sample of 1000 elderly people from urban parts of Shiraz in Southern Iran with a two-stage random sampling procedure. Self-reported PA data and correlates of moderate to vigorous activity were collected by interview with the respondents from selected households. Bivariate associations were examined using Chi-square test. Log-binomial regression was used to weigh variables associated with more than light PA. **Results:** Some demographic variables (older age, female sex, lower education level, retirement, and single or widowed status), health problems (lower extremity pain and hypertension), and psychosocial factors (lack of motivation, fear of injury, unsafe roads, and daily life problems) were potential correlates of inadequate PA with bivariate analysis. In log-binomial regression model, lack of motivation (adjusted prevalence ratio [APR] = 2.11, 95% confidence interval [CI]: 1.25–3.56), daily life problems (APR = 1.82, 95% CI: 1.26–2.62), lower educational level (APR = 1.64, 95% CI: 1.08–2.49), unsafe roads (APR = 1.59, 95% CI: 1.02–2.49), and knee pain (APR = 1.68, 95% CI: 1.09–2.58) were associated with lower engagement in moderate to vigorous PA among Iranian older adults. **Conclusions:** Psychosocial attributes considerably influence PA behaviors in older adults. Lower extremity joint pain is a key medical concern. Interventions to promote PA among older adults should be multilevel and particularly targeting personal psychosocial factors.

Keywords: *Moderate to vigorous, older adults, physical activity, self-report*

Introduction

Physical activity (PA) has been consistently and positively associated with a range of health benefits for individuals of all ages. There is a body of evidence showing that people, who are more physically active, have better health outcomes including lower rates of all causes of mortality.[1-3]

Tracking of PA through childhood to adulthood shows substantial drifts between different levels over time.[4] However, PA generally tends to decrease during aging. Many factors have been linked to the age-related decline in PA including personal, social, and environmental features. Part of this decline is due to decreased functional fitness; elderly period is usually associated with decreased muscle mass and strength, agility, flexibility, and maximal aerobic capacity.[5] On the other hand, the prevalence of incapacitating chronic diseases is increased in this phase of life. Retirement, lacking energy, and listlessness may lead to sedentary lifestyle which make older people more susceptible to chronic diseases that can further affect physical function, and this could lead to a vicious cycle that amplifies negative consequences.[3,6]

Demographic, sociocultural, and environmental factors may contribute to declined PA levels among older adults. Higher age, female gender, single or widowed status, higher body mass index (BMI), lower income, lower educational level, and urban residence are demographic factors that have been reported to be associated with low PA in elders.[7-14] Related personal, sociocultural, and environmental factors include psychosocial stress, time constraint, lack of motivation, lack of family and social

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support, fear of falling and injury, poor weather, unsafe roads, and unavailability of PA-related facilities.[15-20]

Poor health is an important issue with regard to PA of elderly people. Chronic health conditions can be paradoxically both promoter and barrier to PA of older adults.[16] However, most studies show that these factors preclude PA. Diabetes mellitus, high blood pressure, osteoarthritis, low visual acuity, and depression are among the most frequently reported chronic medical conditions.[10,12,21-23]

One view may be that age-related decline in physical activities is a natural process that inevitably occurs sooner or later. Nevertheless, it cannot be denied that some elderly people try to maintain high levels of PA in spite of aforementioned barrier factors. This group may be a minority population in many societies that health systems wish they become a majority.

Older people are a highly heterogeneous population with a spectrum of barrier and facilitator factors associated with PA. The aim of this study was to assess self-reported factors associated with moderate to vigorous PA, as an important health-promoting component of elderly people's lifestyle, in a sample of Iranian older adults.

Methods

Study design and participants

This is a population-based cross-sectional study carried out in urban community of Shiraz, a large city in Southern Iran, during September and October 2015. The sample size was estimated by assuming a 50% prevalence of inadequate moderate to vigorous PA, with a precision of 4%, a confidence level of 95%, and a design effect of 1.5 to account for the cluster design. The ultimate sample was established to be 1000 individuals. A two-stage cluster random sampling was used to select 1000 participants. Shiraz city consists of ten town areas according to municipal divisions. In the first stage, 3–6 clusters were considered from each town area proportional to size. Then, clusters were numbered, and 17 of them were selected by simple random sampling. The second stage involved systematically sampling sixty households for interview in each cluster (main street), and the first household of the cluster was selected randomly. One eligible participant was selected in each household to take part in the survey.

The study team consisted of five interviewers, who were trained by an experienced study coordinator in group sessions.

Participants were assured of confidentiality and privacy. Verbal consent was obtained from each participant after being informed about the aim of the study.

The data collection form included information about participants' demographics and PA levels and self-reported barrier and facilitator factors associated with their physical activities. They were completed by an interviewer for each participant. This study was approved by the School of Medicine Ethics Committee at Shiraz University of Medical Sciences.

Study instrument

The primary outcome was adequacy of moderate to vigorous PA among study population. Data on PA were assessed as the total number of minutes spent weekly doing moderate to vigorous physical activities, and this measure was calculated for every activity separately. Total weekly moderate to vigorous PA was the sum of all activities reported by the participants. Example questions are "How much time do you spend on running activity in a typical day?"and "How frequently do you engage in running activity in a week?" According to the guidelines provided by the World Health Organization and American College of Sports Medicine, physical activities are categorized into three levels based on their intensity. They include light activities (such as casual walking and light housework), moderate activities (such as brisk walking and recreational swimming), and vigorous activities (such as running and heavy gardening). It is recommended that all older adults engage in at least 150 min/week of moderate intensity or 75 min of vigorous intensity physical activities or an equivalent combination of these.[24,25] In the present study, adequate moderate to vigorous PA was considered as 150 min of moderate activity or 75 min of vigorous activity per week.

The format of questions on barrier and motivator factors of PA was in such a way that respondents answered yes or no. Example question is "Which of the following items is a barrier to your regular PA?"

With regard to medical barriers, the participants were asked whether they suffered from any chronic condition mentioned in the form. An example question is "Do you suffer from a chronic knee pain?" The participants answered yes or no. Suggested variables were extracted from previous related studies.

Statistical analysis

The outcome variable and all the independent variables were then dichotomized for statistical analysis. In addition to descriptive statistics, Chi-square test was used to assess bivariate association between adequacy of PA level and study variables, including demographics and self-reported barrier and facilitator factors. The independent variables with a level of significance of $P < 0.10$ in the bivariate analysis were included in final regression model. It has been recommended to use prevalence ratios instead of odds ratios in cross-sectional studies with binary outcomes when the outcome is not rare. Therefore, we estimated prevalence ratios of self-reported factors using log-binomial regression analysis, the preferred method which yields less

biased estimates with higher power and smaller standard errors.[26-28] We also used Cox regression analysis as an alternative method and got similar results.

Data were statistically analyzed using SPSS software, version 23 (SPSS IBM, New York, USA). The significance level was set at 0.05 for all statistical tests.

Results

Participants were elderly community dwellers living in urban areas in Shiraz, aged 60–80 years (mean = 68.5, standard deviation = 6.3). Only 13 people refused to participate in the study (response rate: 98.7%). Nearly 52.4% of study population were male. Almost 69.9% were married, 24.8% were widowed, and 5.3% were single or divorced. The majority (79.7%) of participants were retired, unable to work, or housewives and 20.3% still worked. Many of participants (68%) were illiterate or primary school educated and just 14% were college graduates. With regard to smoking status, 18.8% were current smokers (defined as having smoked in the past month), 13.2% were ex-smokers (defined as no smoking for at least 1 month), and 68% were never smokers. About 43.9% of participants were overweight or obese. Only 10.5% of study population had adequate moderate to vigorous PA (defined as at least 150 min moderate PA or equivalent amounts of vigorous activity per week). There was no statistically significant association between outcome variable and BMI ($P = 0.12$) and smoking status ($P = 0.89$). Other demographic factors including sex, age, educational level, job, and marital status were associated with outcome, especially educational attainment ($P < 0.001$) [Table 1].

Bivariate analysis between activity level and medical factors has been presented in Table 2. Lower extremity pain was significantly associated with moderate to vigorous PA ($P < 0.001$). Visual impairment ($P = 0.14$), history of diabetes mellitus ($P = 0.08$), chronic lung disease ($P = 0.36$), angina pectoris ($P = 1$), and history of mental disorders ($P = 0.4$) were not significantly associated with PA levels.

Among psychosocial and environmental features, daily life problems ($P < 0.001$), lack of motivation ($P = 0.001$), fear of falling ($P = 0.006$), fear of injury ($P = 0.01$), unsafe roads ($P = 0.04$), and positive effect on mood ($P = 0.005$) were the most related factors [Table 3].

Many of demographics, except educational level, had no significant association with outcome in final regression model. Significant factors that predicted inadequate moderate to vigorous PA levels among Iranian older people in log-binomial regression analysis were lack of motivation ($P = 0.005$) and daily life problems ($P = 0.001$). Educational level ($P = 0.019$) and chronic knee pain ($P = 0.018$) were the most important demographic factor and medical barrier, respectively [Table 4].

Discussion

Our study demonstrates that a significant proportion of Iranian older adults (about 90%) do not engage in

Table 1: Demographic and physical activity level characteristics of a sample of 1000 Iranian elderly people

Variable	Adequate PA, *n* (%)	Inadequate PA, *n* (%)	All, *n* (%)	*P*
Sex				
Male	70 (13.4)	454 (86.6)	524 (52.4)	0.002*
Female	35 (7.4)	441 (92.6)	476 (47.6)	
Age (years)				
60-70	73 (12.5)	511 (87.5)	584 (58.4)	0.02*
71-80	32 (7.7)	384 (92.3)	416 (41.6)	
Education				
< High school	49 (7.2)	632 (92.8)	681 (68.1)	<0.001*
High school or higher	56 (17.6)	263 (82.4)	319 (31.9)	
Job status				
Working	32 (15.8)	171 (84.2)	203 (20.3)	0.01*
Retired or housewife	73 (9.2)	724 (90.8)	797 (79.7)	
Marital status				
Married	83 (11.9)	616 (88.1)	699 (69.9)	0.03*
Single, divorced, widowed	22 (7.3)	279 (92.7)	301 (30.1)	
BMI				
<25	52 (9.2)	515 (90.8)	567 (56.7)	0.12
≥25	53 (12.2)	380 (87.8)	433 (43.3)	
Smoking status				
Current smoker	20 (10.6)	168 (89.4)	188 (18.8)	0.89
Nonsmoker or ex-smoker	85 (10.5)	727 (89.5)	812 (81.2)	

*Statistically significant. BMI=Body mass index, PA=Physical activity

Table 2: Bivariate associations of physical activity level with medical barriers

Variable	Adequate PA, *n* (%)	Inadequate PA, *n* (%)	*P*
Knee pain			
Yes	37 (6.4)	543 (93.6)	<0.001*
No	68 (16.2)	352 (83.8)	
Ankle pain			
Yes	12 (4.3)	265 (95.7)	<0.001*
No	93 (12.9)	630 (87.1)	
Hip pain			
Yes	6 (3.4)	168 (96.6)	<0.001*
No	99 (12)	727 (88)	
Low back pain			
Yes	31 (7.2)	398 (92.8)	0.003*
No	74 (13)	497 (87)	
Visual impairment			
Yes	23 (8.1)	262 (91.9)	0.14
No	82 (11.5)	633 (88.5)	
Diabetes mellitus			
Yes	9 (6.3)	134 (93.7)	0.08
No	96 (11.2)	761 (88.8)	
Hypertension			
Yes	24 (6.5)	343 (93.5)	0.002*
No	81 (12.8)	552 (87.2)	
Chronic lung disease			
Yes	3 (5.6)	51 (94.4)	0.36
No	102 (10.8)	844 (89.2)	
Angina pectoris			
Yes	14 (10.2)	123 (89.8)	1
No	91 (10.5)	772 (89.5)	
Mental disorders			
Yes	4 (6.3)	60 (93.8)	0.40
No	101 (10.8)	835 (89.2)	

*Statistically significant. PA=Physical activity

Table 3: Bivariate associations of physical activity level with psychosocial and environmental factors

Variable	Adequate PA, *n* (%)	Inadequate PA, *n* (%)	*P*
Lack of motivation			
Yes	16 (4.7)	323 (95.3)	0.001*
No	89 (13.5)	572 (86.5)	
Social phobia			
Yes	49 (9.2)	481 (90.8)	0.18
No	56 (11.9)	414 (88.1)	
Fear of falling			
Yes	49 (8.2)	545 (91.8)	0.006*
No	56 (13.8)	350 (86.2)	
Daily life problems			
Yes	71 (8.5)	765 (91.5)	<0.001*
No	34 (20.7)	130 (79.3)	
Weight reduction			
Yes	0	19 (100)	0.25
No	105 (10.7)	875 (89.3)	
Physician advice			
Yes	2 (11.1)	16 (88.9)	1
No	103 (10.5)	878 (89.5)	
Family support			
Yes	8 (20)	32 (80)	0.06
No	97 (10.1)	862 (89.9)	
Peer support			
Yes	10 (16.9)	49 (83.1)	0.12
No	95 (10.6)	845 (89.9)	
Fear of injury			
Yes	55 (8.6)	586 (91.4)	0.01*
No	50 (13.9)	309 (86.1)	
Bad climate			
Yes	57 (10.3)	497 (89.7)	0.84
No	48 (10.8)	398 (89.2)	
Unsafe roads			
Yes	51 (8.7)	535 (91.3)	0.04*
No	54 (13)	360 (87)	
Lack of facilities			
Yes	47 (8.6)	499 (91.4)	0.04*
No	58 (12.8)	396 (87.2)	
Physical fitness			
Yes	97 (10.2)	857 (89.8)	0.14
No	8 (17.4)	38 (82.6)	
Positive effect on mood			
Yes	6 (35.3)	11 (64.7)	0.005*
No	99 (10.1)	884 (89.9)	
Being independent			
Yes	15 (16.1)	78 (83.9)	0.07
No	90 (9.9)	817 (90.1)	
Community-based PA programs			
Yes	12 (12.9)	81 (87.1)	0.48
No	93 (10.3)	814 (89.7)	

*Statistically significant. PA=Physical activity

adequate moderate to vigorous PA. Numerous studies have shown that less than half of older adults have adequate PA levels.[29] A report from South Korea shows that 80% of elders aged 60–70 years and 90% of elders aged 70 and over do not engage in moderate PA.[12] Another study reported that <20% of USA adults older than 64 years engage in the recommended amount of PA.[30] Other reports from Australia and Brazil showed that 50% and 80% of older adults have adequate PA, respectively.[9,10] Diverse reported levels of PA among older people of different countries are probably due to different study methods, reference guidelines used, the age range considered, and actual differences related to sociocultural factors.[31]

In the present study, the highest prevalence of adequate moderate to vigorous PA was among the higher educated participants (17.6%) which comprised about one third of the whole study population, and the lowest prevalence was among lower educated participants (7.2%). PA of elders aged 71–80 was lower than those aged 60–70, and female participants had lower PA levels than male participants. This is similar to the previous studies that

Table 4: Adjusted prevalence ratios of statistically significant factors associated with inadequate moderate to vigorous physical activity among Iranian elderly people

Characteristic	Inadequate PA, % (*n*/*N*)	Adjusted PR (95% CI)	*P*
Education			
High school or higher	82.4 (263/319)	1 (reference)	0.019*
< High school	92.8 (632/681)	1.64 (1.08-2.49)	
Knee pain			
No	83.8 (352/420)	1 (reference)	0.018*
Yes	93.6 (543/580)	1.68 (1.09-2.58)	
Lack of motivation			
No	86.5 (572/661)	1 (reference)	0.005*
Yes	95.3 (323/339)	2.11 (1.25-3.56)	
Daily life problems			
No	79.3 (130/164)	1 (reference)	0.001*
Yes	91.5 (765/836)	1.82 (1.26-2.62)	
Unsafe roads			
No	87 (350/414)	1 (reference)	0.04*
Yes	91.3 (535/586)	1.59 (1.02-2.49)	

*Statistically significant. PA=Physical activity, CI=Confidence interval

reported decreased PA with age and lower levels in women compared with men.[9-12]

We found no association between BMI and moderate to vigorous PA levels in older adults, a result similar to the study carried out by Vagetti *et al*. among Brazilian older women.[10] In contrast, findings of the study by Jenkins and Fultz showed an association between BMI and PA of older adults.[8]

Working Iranian elderly people had higher PA level than retired people and housewives. Findings of other studies suggest that effect of retirement on PA level of older adults is not consistent and depends on some other factors.[32] Retirement from a manual work, for example, may result in loss of job-related physical activities, yet it can also increase leisure time PA.[33]

In the present study, the most important health-related barriers to PA were lower extremity joint pain and high blood pressure. In most previous studies, overall health has been assessed.[10-12,16-19,34] Few studies have specifically focused on health-related barrier factors associated with activity of older adults including diabetes mellitus,[21] knee pain,[22] and low vision.[23] Vagetti *et al*. suggested that high blood pressure may have a positive association with higher level of PA in older adults, but this finding has not been supported by other studies.[10]

PA may be viewed as a voluntary behavior which can be affected by physical, psychosocial, and environmental determinants. The ultimate outcome may be determined by the weights of different factors and interactions between them.

In our study, we used log-binomial regression model to determine the most important factors associated with more than light PA among this target group. Our findings suggest that psychosocial attributes are important determinants of engagement in moderate to vigorous physical activities among Iranian elderly population. Some other studies have also reported psychosocial attributes as important factors that influence elderly people's PA.[12,19] Indeed, factors such as lack of interest, unwillingness, time constraints, and daily life problems may be interrelated and actually reflect the same thing that is lack of motivation. It may be explained by the assumption that obtaining this level of activity is more difficult than light activities and requires more motivation.

As some other studies, we found educational attainment as a notable demographic factor related to PA levels in older adults.[12,35] This factor may influence people's self-efficacy and indirectly affects motivation to perform different tasks such as regular PA.[36,37]

It seems that older adult's PA is a multifactorial behavior with a wide range of interrelated factors playing a role in determining individual activity levels.

Hence, it is not surprising that studies of PA levels of older adults from different parts of the world identified different factors as notable determinants; considering this issue from a global perspective, PA behaviors of elderly people may seem to be fairly unpredictable. Therefore, it may be prudent to identify the most important related factors in every society and prioritize interventions accordingly.

Maintaining an optimal PA level by some of older adults shows that sedentary lifestyle is not an inevitable outcome of aging at least for young elders.

One important limitation of our study is that, due to the cross-sectional design, temporality of exposures and outcome cannot be determined. Another limitation is that we measured self-reported PA levels. Some studies have shown that self-reported measures can be both higher and lower than directly measured PA by pedometer.[38,39] Similarly, self-reported medical conditions could not be documented with medical procedures.

We did not evaluate people more than 80 years of age because PA decline tends to be most dramatic in the oldest old, and moderate to vigorous level of activity is probably rare in this age group.[40]

Conclusions

Psychosocial attributes considerably influence PA behaviors in older adults. Lower extremity joint pain is a key medical concern. Interventions to promote PA of older adults should be multilevel and particularly targeting personal psychosocial factors.

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Conflicts of interest

There are no conflicts of interest.

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