

Original research article

**PHYSICAL ACTIVITY OF ELDERLY WOMEN
IN TERMS OF AGE***

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**Saša Pantelić¹, Nebojša Randelović¹, Zoran Milanović¹,
Nebojša Trajković¹, Goran Sporiš², Radmila Kostić¹**

¹University of Niš, Faculty of Sport and Physical Education, Niš, Serbia

²University of Zagreb, Faculty of Kinesiology, Zagreb, Croatia

Abstract. *The aim of this study was to analyze an age-related decline in the physical activity level of older women. The research was conducted on a sample of 694 female participants (mean age 69.23±7.81 years, body mass 69.74±12.44 kg, body height 165.17±23.12cm, BMI 69.74±12.44 kg/m²- Mean±SD). For the age-group comparisons we subdivided the sample into young-old group (354 participants aged 60-69 years) and old-old group (340 participants aged 70-80 years). In this research, the long form of the IPAQ questionnaire for self-evaluation was used containing four types of Physical Activity: work-related, transportation, housework/gardening and leisure-time activities. The three levels of physical activity suggested for classifying the populations are low, moderate, and high. The results show that moderate physical activity is dominant and accounts for almost half the energy consumed regardless of one's age category. If we consider the type of physical activity, the results indicate that there is a significant difference ($p<0.05$) between young-old and old-old participants in the Total walking MET and Total vigorous MET. Among elderly women, the value of MET in total physical activity, as well as in moderate and vigorous activity, significantly reduces. Our research has shown that, overall, the young-old group is more physically active than the old-old group.*

Key words: *IPAQ questionnaire, older adult, female, aging, physical activity.*

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Corresponding author: Zoran Milanović, Ph.D. student

Čarnojevićeva 10a, 18000 Niš, Serbia

Phone: +381 (0) 18 510900; Fax: +381 (0) 18 242482 • E-mail: zoooro_85@yahoo.com

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INTRODUCTION

Physical activity is defined as any bodily movement produced by the skeletal muscles that results in energy expenditure (Caspersen, Powell, & Christenson, 1985). Physical inactivity is considered to be one of the most important public health problems of modern society (American College of Sports Medicine-ACSM, 2009; Pedisic, Jurakic, Rakovac, Hodak, & Dizdar, 2011). Generally, it is known that physical inactivity is connected with different kinds of chronic diseases, such as: coronary artery disease, stroke, hypertension, colon cancer, breast cancer, Type 2 diabetes, and osteoporosis (Katzmarzyk, Gledhill, & Shephard, 2000). In addition, the level of physical activity is often used as a parameter for monitoring and evaluating public health and is almost always associated with one's health status (ACSM, 2009). This monitoring is especially important for older people aged over 60 because of the prevention of many diseases, inactivity and a reduction in mortality rates. It was confirmed that older people are less physically active compared to the other population (Tomioka, Iwamoto, Saeki, & Okamoto, 2011; Milanović, Pantelić, Sporiš, Trajković, & Aleksandrović, 2012), which can be a problem if it is connected with one's health status since the number of older adults continues to increase.

Studies on physical activity have largely been carried out on athletes, children and older people. More recently, the amount of scientific information on physical activity in older adults has grown rapidly. According to numerous studies, regular physical activity, including aerobic activity and muscle-strengthening activity, is essential for healthy aging as well as for the social adaptation of older adults (Nelson et al., 2007).

The benefits of physical activity for older adults are extensive: regular physical activity reduces the risk of cardiovascular disease, cancer (Nelson et al., 2007) and dementia (Doody et al., 2001). Older adults can remain independent and reduce their chances of falling (American Geriatric Society, 2001), which is of great importance for older adults. As many as 250,000 deaths per year in the U.S. are attributed to a lack of regular activity (McGinnis & Foege, 1993). This number is comparable to the deaths whose causes are diseases such as high blood pressure and obesity. Aging is characterized by functional limitations and in order to maintain the functional independence in older adults, the role of physical activity is crucial (Cousins, 2003).

Older adults are generally less physically active than young adults, as indicated by self-report and interview, body motion sensors, and more direct approaches to determining daily caloric expenditure (DiPietro, Williamson, Caspersen, & Eaker, 1993; Westerterp, 2000). Although the total time spent per day in exercise and lifestyle physical activities by some active older adults may approach that of younger normally active adults (Bassett, Schneider, & Huntington, 2004; Shephard, 1997), the types of physical activities most popular among older adults are consistently of lower intensity (walking, gardening, golf, low-impact aerobic activities) (Rafferty, Reeves, McGee, & Pivarnik, 2002; Schoenborn, Adams, Barnes, Vickerie, & Schiller, 2004) compared with those of younger adults (running, higher-impact aerobic activities) (Schoenborn et al., 2004).

Another important issue that remains unsolved is chronological age and its importance in the relationship between physical activity and physical, social, and mental functions (Miller, Taler, Davidson, & Messier, 2012). According to the moderator model proposed by Stones and Kozma (1988), the benefits of physical activity on cognitive performance should increase with increasing age. However, inconsistent results have been reported in the literature. Some argue that the positive impact of physical activity is

stronger in the early 60's (Bunce & Murden, 2006), while others have stated that it is more important in the period between the age of 66 and 70 (Colcombe & Kramer, 2003) or after the age of 70 (Renaud, Bherer, & Maquestiaux, 2010).

In Serbia there are almost 1.7 million people aged 60 and 1.25 million over 65. The low birth rate and extended life expectancy will lead to an increase in the number of older people in the population. Therefore, the aim of this study was to analyse the age-related decline in physical activity level in older women. We used cross-sectional data of a large sample, taken from the general population of women aged from 60 to 80. We hypothesized that greater differences would be determined in the physical activity level between older women aged 70-80 compared with younger old women aged 60-69.

THE METHOD

The sample of participants

The research was conducted on a sample of 694 female participants. For the age-group comparisons the sample was subdivided into a young-old group (354 participants aged 60-69) and old-old group (340 participants aged 70-80). All of the participants were from South-East Serbia, one of the five Serbian statistical regions. Their general descriptive parameters are presented in Table 1. The criteria for selecting the participants were: age, between 60 and 80, being a physically independent person - able to walk 20 feet without assistance or rest, lack of cognitive impairment and dementia, achieved 24 points for the educated and 18 points for the unqualified participants in a mini mental state evaluation. Participants who were in the recovery phase of an acute illness, and the deaf and blind were excluded. The research did not include participants with cardiovascular system disorders because of the potential risks during the functional fitness tests.

Participation in the study was voluntary and the participants were able to back out at any time. The protocol of the study was approved by the Ethics Committee of the Faculty of Sport and Physical Education, University of Niš and in accordance with the revised Declaration of Helsinki. All of the participants were informed about specific instructions for filling out the questionnaires as well as the advantages which this research could contribute to their age group. Testing for all the participants was conducted from October till December 2011. All of the participants were mentally and physically healthy to participate in this research according to a mini mental state evaluation (McDowell & Newell, 1996). A standard interview was conducted with potential participants individually or in small groups, in their houses or in active centers for older individuals. After that, data collection could start. Persons who could not fill in their questionnaire by themselves were given help from skilled persons for the purpose of this research.

The procedures

In this research, the long form of the International Physical Activity Questionnaire (IPAQ) for self-evaluation was used, which contained four types of PA: work-related, transportation, housework/gardening and leisure-time activities. In addition, the questionnaire contains questions about sitting and sedentary habits. Self-evaluation of physical activity was conducted on a Serbian version of IPAQ questionnaire (the usual 7-day, long self-administered version). The Serbian version of the IPAQ long form

questionnaire was prepared by the authors (S.P. and M.A.) of this research and approved by the Study Group for implementation. The IPAQ questionnaire was translated from English by two independent experts who were familiar with this kind of questionnaire. Then the correctness of the questionnaire was checked and potential differences in the translation were removed so the final version of the IPAQ questionnaire was prepared. The Serbian version of the IPAQ questionnaire was then translated into English by a third independent person so the quality of the translation could be verified. It was only after that phase that the final version of the IPAQ questionnaire could be defined.

In each of the four domains of testing, the participants recorded the number of days and time spent during each day separately for vigorous and moderate intensity activities and also the time spent walking. Then, the calculation for each item was conducted separately (vigorous activity, moderate activity and walking) according to the official IPAQ instruction so the PA period of the participants could be determined. Moreover, the Metabolic Equivalent Task (MET) was calculated for each domain separately (work-related, transportation, housework/gardening and leisure-time activity). The overall weekly PA level (MET-min/week) was calculated by a separate collection of MET values for each item. For the calculation of MET values, the following coefficients were used: vigorous PA=8.0 METs, moderate PA=4.0 METs and walking PA=3.3 METs. These values are in agreement with official IPAQ guidelines (IPAQ, 2005) and the *Compendium of physical activities: an update of activity codes and MET intensities* (Ainsworth et al., 2000).

Vigorous activities are defined as activities in which the participants breathe more deeply than usual. These can be activities such as lifting heavy things, digging, heavy construction work or climbing stairs. Moderate physical activities are those in which a person breathes a little harder than usual and may include activities such as carrying light loads. Walking is not considered a moderate physical activity. Vigorous and moderate activities are those which last for at least ten minutes continuously.

For the calculation of a categorical indicator, the total time spent in physical activity during a typical week, the number of days as well as the intensity of the physical activity are taken into account. The three levels of physical activity suggested for classifying populations are low, moderate, and high. The criteria for these levels are shown below:

High. A person reaching any of the following criteria is classified as belonging to this category: Vigorous-intensity activity during at least 3 days and achieving a minimum of at least 1,500 MET-minutes/week OR 7 or several days of any combination of the walking, moderate- or vigorous intensity activities, achieving a minimum of at least 3,000 MET-minutes per week.

Moderate. A person not meeting the criteria for the 'high' category, but meeting any of the following criteria is classified as belonging to this category: three or more days of vigorous-intensity activity of at least 20 minutes per day OR 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day OR 5 or several days of any combination of walking, moderate- or vigorous intensity activities, achieving a minimum of at least 600 MET-minutes per week.

Low. A person not meeting any of the above mentioned criteria falls into this category.

Statistical analyses

The Statistical Package for Social Sciences SPSS (v18.0, SPSS Inc., Chicago, IL) was used for the statistical analysis. Descriptive statistics were calculated for all the experi-

mental data. The Kolmogorov-Smirnov test was used to establish if the data were normally distributed. The differences in the physical activity level between young elderly and old elderly women were determined using a one-way univariate analysis of variance (ANOVA). The statistical significance was set at $p < 0.05$.

Table 1. Basic descriptive parameters (Mean $\pm$ SD).

	60-69 <i>n</i> =354	70-80 <i>n</i> =340	Total <i>n</i> =694
Age (years)	63.75 $\pm$ 2.89	73.93 $\pm$ 2.94	69.23 $\pm$ 7.81
Body height (cm)	164.67 $\pm$ 6.48	166.48 $\pm$ 37.35	165.17 $\pm$ 23.12
Body mass (kg)	70.64 $\pm$ 12.81	68.84 $\pm$ 11.74	69.74 $\pm$ 12.44
BMI (kg/m ²)	26.10 $\pm$ 4.94	25.46 $\pm$ 4.48	25.83 $\pm$ 4.73
Percentage of body fat (%)	40.23 $\pm$ 4.78*	41.85 $\pm$ 4.99	40.87 $\pm$ 4.93

BMI-body mass index

RESULTS

The Kolmogorov-Smirnov test has shown that the data were normally distributed. There was no significant difference between the age groups of women in terms of body height and body mass, but the percentage of body fat increased significantly in old elderly compared to young elderly (41.85 $\pm$ 4.99 vs. 40.23 $\pm$ 4.78). The average values of BMI (table 1) showed that women were overweight (BMI > 25), regardless of their age (60-69 or 70-80).

Table 2 shows that women are physically active if their total PA is taken into account. From the viewpoint of energy consumption estimated by the IPAQ questionnaire, moderate physical activity is dominant compared to walking and heavy physical activity, and accounts for almost half the energy consumed regardless of the age category. If the type of physical activity is considered, the results indicate that there is a significant difference ($p < 0.05$) between the young-old and old-old in Total walking MET and Total vigorous MET. Among elderly women the value of MET in total physical activity, as well as in moderate and vigorous activity significantly reduces. The results show that women have a lower rate of decrease in physical activity in the area of total transportation, housework and leisure time.

Table 2. Difference (p) in IPAQ parameters between age categories of 60-69 and 70-80.

	60-69 <i>n</i> =354	70-80 <i>n</i> =340	<i>p</i>
Total work-related (MET)	640.40 $\pm$ 2110.20	186.74 $\pm$ 965.63	*.00
Total transportation (MET)	624.73 $\pm$ 1086.92	556.11 $\pm$ 1540.05	.50
Total housework (MET)	2341.98 $\pm$ 2669.64	1998.57 $\pm$ 2813.38	.13
Total leisure-time (MET)	911.56 $\pm$ 2485.20	590.70 $\pm$ 1447.71	.06
Total walking (MET)	1200.37 $\pm$ 2075.23	895.25 $\pm$ 1995.18	.06
Total moderate (MET)	3161.78 $\pm$ 3767.97	2346.77 $\pm$ 3341.84	*.01
Total vigorous (MET)	280.02 $\pm$ 1240.66	100.31 $\pm$ 575.91	*.03
Total Physical Activity (MET)	4327.81 $\pm$ 4922.84	3160.56 $\pm$ 4430.99	*.00

MET- Metabolic Equivalent Task, *statistically significant differences $p < 0.05$

DISCUSSION

The results in Table 2 show that the highest physical activity is in total housework in both groups (2341.9 and 1998.5 MET minutes / per week). Due to the above-mentioned criteria for determining the level of physical activity it can be said that the younger participants were involved in moderate physical activity, except for total housework where they were involved in high physical activity (more than 1500 and less than 3000-MET minutes / per week).

The older age group predominantly showed a low level of physical activity i.e., less than 600 MET-minutes/per week (except for total housework where they were involved in high physical activity i.e. more than 1500 and less than 3000 MET-minutes/per week).

Concerning the Total physical activity it can be concluded that most of the participants were involved in moderate physical activity (3161.7 in younger and 2346.7 in the older group) which was significantly higher in the younger group ($p=0.00$).

According to research (Rütten & Abu-Omar, 2004), which included 15 EU countries, physical activity ranged from 693 MET-minutes/per week (Northern Ireland) to 2336 MET-minutes/per week (Netherlands). In another study, which used the IPAQ questionnaires within the EUPASS project, telephone interviews were used for collecting data (Rutten, et al., 2003; Rütten & Abu-Omar, 2004). The results of physical activity ranged from 1653 MET-minutes/per week (United Kingdom) to 5070 MET-minutes/per week (Germany).

Comparing the results of our study with the above mentioned studies, it can be concluded that the participants who were involved in this study were involved in sufficient physical activities which is in agreement with the European context. The results for the two examined groups show better physical activity in the mentioned domains among the younger group (60-69) compared to the older group (70-80 years), but no statistically significant difference exists in physical activities related to transportation, housework/gardening and leisure-time physical activities. Our research has shown that, overall, the younger group is more physically active than the older group.

There are a number of advantages of the current study, including a large study population of older people, a large number of study participants aged 60-80 and a current topic. In addition, specific study limitations have been noted. First of all, this study represents an indirect estimation of the physical activity level using the IPAQ questionnaire. Therefore, future studies should rely on direct methods for measuring the physical activity level with the help of a pedometer or accelerometer. In addition, in this study we have dealt with the estimation of physical activity in specific domains and intensity, but we have not taken into consideration the type of physical activity. Therefore, future studies should deal with the influence of various physical activities on the maintenance of the functional fitness of elderly people.

CONCLUSION

In this study it has been concluded that the reduction of the level of physical activity and functional fitness can equally be found for women due to the process of aging. Moreover, it has been determined that aging causes the increase of the body fat percentage, the reduction in the level of physical activity in different domains. In addition, working abilities and physical fitness face the multiplying reduction in older elderly compared to younger. Even though the process of aging is natural and inevitable, the adequate level of

physical activity could slow down the loss of functional and physical abilities and maintain the healthy way of life of elderly people.

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FIZIČKA AKTIVNOST STARIJIH ŽENA U ODNOSU NA NJIHOVU STAROSNO DOBA

Saša Pantelić, Nebojša Randelović, Zoran Milanović,
Nebojša Trajković, Goran Sporiš, Radmila Kostić

Cilj ovog rada bio je da se analizira starosno-povezano opadanje fizičke aktivnosti kod starijih žena. Istraživanje je sprovedeno na uzorku od 694 učesnica (prosečne starosti 69.23 ± 7.81 godina, telesne mase 69.74 ± 12.44 kg, telesne visine 165.17 ± 23.12 cm, BMI 29.74 ± 12.44 kg/m² - Sred.vred. $\pm$ SD). Za poređenja grupa po starosti, uzorak ispitanica je podeljen na sub-uzorak mlađe-starije grupe (354 ispitanica starosti 60-69 godina) i stare-starije grupe (340 ispitanica starosti 70-80 godina). U ovom istraživanju je korišćen IPAQ upitnik za samoevaluaciju koji je sadržao četiri tipa fizičke aktivnosti: vezanu za posao, transport, kućne poslove/vrtarstvo i dokolicu. Tri nivoa fizičke aktivnosti preporučene za klasifikaciju populacije su: nizak, umeren i visok. Rezultati ukazuju da je umeren nivo fizičke aktivnosti dominantan i da mu se pripisuje gotovo polovina utrošene energije bez obzira na starosnu kategoriju. Ukoliko se uzme u obzir tip fizičke aktivnosti, rezultati ukazuju da postoji statistički značajna razlika ($p < 0.05$) između mlađe-starije i stare-starije grupe ispitanika u varijablama Total walking MET i Total vigorous MET. Među starijim ženama vrednost MET in total physical activity, kao i umerena i visoka aktivnost značajno opada. Naše istraživanje je ukazalo da, sveukupno, mlađe-starija grupa jeste fizički aktivnija u odnosu na i stare-stariju grupu ispitanika.

Ključne reči: IPAQ upitnik, stariji odrasli, žene, starenje, fizička aktivnost.