

SECTION – EXERCISE SCIENCES

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PHYSICAL ACTIVITY AND FUNCTIONAL FITNESS AS WELL AS LEVEL OF DEPRESSION IN SENIORS

Edyta Mikołajczyk¹, Alicja Gałązka²

Authors' contribution:

- A. Study design/planning
- B. Data collection/entry
- C. Data analysis/statistics
- D. Data interpretation
- E. Preparation of manuscript
- F. Literature analysis/search
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¹ Department of Physiotherapy, University of Physical Education in Kraków, Poland

² Foundation for Occupational Rehabilitation of Handicapped Employees and Former Employees of Iron and Steel Works Plant, Skawina

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Abstract:

Aim. The aim of the study was to determine the level of motor activity, functional and motion fitness of seniors above the age of 60 as well as to examine the relationship between physical activity and the level of depression in this group of people.

Material and methods. The study covered a group of 50 participants above the age of 60. The Seven-day Physical Activity Recall, ADL, IADL and GDS scales, as well as the Tinetti test and the authors' specially designed questionnaire were used.

Results. Analysis of the results showed a relationship between age, education as well as chronic diseases and the level of undertaken physical activity. A significant relationship was found between the level of activity and functional and motion performance as well as the emotional state of the elderly. There was no relationship between gender, place of residence and self-assessment of health state and the level of physical activity. The most important motivating factor for performing physical activity in seems to be the improvement of well-being, and the most frequently indicated barrier, is state of health.

Conclusions. The level of physical activity is related to functional and locomotor fitness and the emotional state of the elderly. There is a correlation between age, education and the occurrence of chronic diseases and the level of physical activity. The most important motivating factor for undertaking activity seems to be the improvement of well-being, the most frequently indicated barrier is state of health.

Introduction

The World Health Organization (WHO) considers 60 to be the beginning of old age [1]. The data indicate that in 2015, 1 in 8 people in the world were 60 and above, which gives a total of 901 million older people [2]. Increasing life expectancy, while reducing the number of births, causes the rapid aging of societies. Aging is a biological process that begins when the body reaches its highest biological fitness, i.e. from about 25-30 years of age. This process individually differs and depends on genetic factors, mode and environment of life, as well as specific characteristics of an individual [1]. The progressing degeneration of all functional and anatomical systems

accompanies the aging process. As a result, together with age, gradual impairment of the functions of the motor and postural systems is observed, postural stability depending on their efficiency. The main manifestation of postural instability regards imbalances that result in falls. The problem of balance disorders affects 14% of the population aged 50-60. Over the next 10 years, the probability of falling will increase to about 22%, while in the group of people at the age of 80, this problem affects more than 33% [3].

For seniors, the so-called the phenomenon of co-existing diseases occurs, consisting in the occurrence of several chronic diseases simultaneously [4]. Fragility/frailty syndrome also applies to this group. This is de-

defined as the transition between fitness and disability. The syndrome is diagnosed when at least 3 of the following 5 conditions occur: fatigue, reduced movement speed, reduced physical activity, weakness or weight loss [5]. An important cause and consequence of disability among older people is depression. The occurrence of depressive symptoms may be associated with the presence of 1 or more chronic diseases, as well as disabilities, including days spent in bed and away from normal activities [6]. Depressive disorders, immediately following dementia, are the second most common psychopathological syndrome which occurs in the elderly. Along with dementia, falls, mobility disorders, urinary and stool incontinence, vision and hearing impairment, they belong to the so-called great geriatric problems. It is estimated that depression in people above the age of 60 ranges from 15 to 20%, and among older people who use medical assistance - up to 30% [7].

Physical activity plays a special role in inhibiting the aging process of the body as well as the occurrence of many diseases. It affects the biological, psychological and social sphere of man. Undertaking various types of activities facilitates contact with others and creates opportunities for mental relaxation. It also has applications in meeting the needs of an aesthetic nature, as well as shaping recreational habits. In addition, physical activity is to fulfil utilitarian tasks, directly related to the sphere of everyday activities, maintaining independence, as well as increasing the possibility of using all kinds of social, intellectual or cultural goods [8, 9, 10]. In studies covering populations of older people, it has been confirmed that physical activity and proper diet are the most important factors of successful aging. A low level of physical activity has impact on the reduction of functional fitness in the area of basic and complex activities of everyday life, worse mood, tendencies towards depression. In addition, it may cause the occurrence of a greater number of co-morbidities, as well as an increased number of systematically taken medications [11]. Seniors' physical activity should include endurance (aerobic), strength, stretching, balance and coordination exercises [12,13]. According to WHO recommendations, the minimum 'dose' of movement for a person above the age of 65 is 150 minutes of moderate exercise or 75 minutes of vigorous efforts per week, which can be increased to 300 minutes per week, if possible [14].

There are many different reasons why an elderly person will engage in physical activity. Both the motives and obstacles for their participation in physical activity can be divided into intrapersonal, interpersonal and social. Among the intrapersonal factors motivating the elderly to engage in physical activity, health care, improvement of physical fitness, desire to remain independent and reduction of pain are mentioned, as well as care for ap-

pearance and weight control. Interpersonal factors that are decisive in undertaking physical activity include medical recommendations, verbal encouragement from family and friends, events, other participants of the same age. Assessment of the exercise programme by a specialist, competences of the instructor, low or no costs, easy transportation and access, safety in the neighbourhood, are all social determinants. Intrapersonal personal barriers for participation in physical recreation include balance disorders, being overweight, shortness of breath, fear of increasing pain, lack of time, fatigue, lack of motivation or depression. The fear of falling, injury and the fear of exercising outside, especially in the evening, are other causes for not undertaking physical activity. Among social factors holding seniors back from starting exercise, costs, lack of access to sports facilities, inconvenient class time, limited information on risk factors, lack of sense of security in the neighbourhood, as well as problematic access to transportation may be enumerated [15, 16, 17, 18].

The superior objective of the study was to determine the level of physical activity, functional fitness within the scope of performing basic and complex daily activities and mobility of people over 60 years of age living in different environments, as well as to examine the relationship between physical activity and the level of depression in these people.

Answers to the following research questions were also sought out:

1. Is there a correlation between age, gender, place of residence, education, occurrence of chronic diseases and self-assessment of health status and the level of activity of people aged 60 and above?
2. What are the factors motivating and demotivating older people from taking up physical activity?
3. What forms of movement are most frequently undertaken by older people?

Materials and methods

The study covered a group of 50 participants above the age of 60, including 28 female and 22 male residents of Kraków and surrounding areas. The selection of respondents was purposeful, and the eligibility criteria for participation in the study were as follows:

age criterion – minimum age: 60

criterion of independent locomotion – people moving without aid of orthopaedic equipment

intellectual ability criterion – people capable of understanding and completing questionnaires.

Physical activity was assessed using the 7-day Physical Activity Recall (SDPAR) questionnaire, which consists of 10 questions about the number of hours of sleep and the duration of moderate, vigorous, and highly

vigorous intensity exercise during the previous week. Only activities lasting a minimum 10 of minutes without an interval are considered. The obtained results allow the subjects to be assigned to 1 of 3 levels on the basis of their level of physical activity:

- High – to which persons meeting 1 of the following criteria are classified:
 - 3 or more days of vigorous physical exercise, totalling a minimum of 1,500 MET-min/week,
 - 7 or more days of any combination of efforts (walking, moderate or vigorous) exceeding 3,000 MET-min/week.
- Sufficient – specifying people who meet 1 of the following criteria:
 - 3 or more days of vigorous physical activity lasting no less than 20 minutes a day,
 - 5 or more days of moderate efforts or walking lasting no less than 30 minutes a day,
 - 5 or more days of any combination of efforts (walking, moderate or vigorous) exceeding 600 MET-min / week.
- Insufficient – assigned to people who do not demonstrate any physical activity or who do not meet the conditions for a sufficient and high level of physical activity [19].

Fitness assessment of basic and complex everyday activities was performed using the ADL (Activities of Daily Living) and IADL (Instrumental Activities of Daily Living) scales [20, 21].

The ADL is a 0-1 scale consisting of 6 questions assessing independence in such activities as: bathing, dressing and undressing, using the toilet, getting out of bed and moving to an armchair, independent eating and controlled excretion of urine and stool. Obtaining a result of ≤ 2 points indicates that a person is severely handicapped. A score of 3-4 points indicates moderate disability, and obtaining 5-6 points means that the person is fit.

The IADL and Lawton scales were used to evaluate complex daily activities. It consists of 8 questions, which on a point-scale, assess whether the examined person is able to perform the given action independently or not. The examined person obtains from 8 to 24 points, where 8 points means total independence in performing complex activities, while the result of 24 points indicates total independence. On this scale, the total number of points is relevant only to a particular patient, and its decrease over time will indicate deterioration in general condition.

Emotional state was assessed using Yesavage's Geriatric Depression Scale (GDS), which was developed specifically for self-assessment of the population above the age of 60. It is a 0-1 scale and consists of 15 questions. The examined person makes an assessment of well-being regarding the previous 2 weeks. A score of

0-5 points is normal, 6-10 points indicate moderate depression and 11-15 points, severe depression.

Efficiency of the locomotor system as well as the risk of falls was tested with the Tinetti test, which consists of 2 parts. The first contains 9 balance tests, for which the examined may receive a maximum of 16 points. The second part concerns the gait test - the maximum number of points is 12. In total, the subject can score 28 points in this test.

Achieving less than 19 points indicates a high risk of falls - the risk of falling increases 5 times. A score between 19 and 26 points means a tendency towards falls. If the subject scores above 26 points, it means that the risk of falling is low [22, 23].

The study was supplemented with a survey containing questions about the examined person, such as age, gender, place of residence or preferred forms of physical activity. The collected data were subjected to statistical analysis. Spearman's rank correlation coefficient was used to assess the relationship between the level of physical activity and efficacy in basic and complex everyday activities, balance and gait, depression and age. Differentiation in the level of physical activity in groups distinguished by sex, place of residence and occurrence of chronic diseases was examined via the Mann-Whitney U test. The Kruskal-Wallis ANOVA was used to assess the relationship between education and self-assessment of health status and the level of physical activity. The level of significance was $\alpha = 0.05$.

Results

The mean age of the examined group was 73 years (age range 60-95, $SD \pm 9.06$). Based on the results of the SDPAR questionnaire, it was found that the respondents spent a total of 25 hours on physical activity during the whole week (Tab. 1).

Based on statistical analysis, significant correlations were noted between physical activity and:

- ADL scale – the level of physical activity increases along with the increase in efficiency of performing basic everyday activities.
- IADL scale – an increase in the level of physical activity is accompanied by an increase of efficiency in performing complex daily activities.
- Depression scale – the lower the level of physical activity, the higher the level of depression.
- Tinetti test – the level of physical activity decreases along with an increase in the risk of falls
- Age - the level of physical activity decreases with increasing age (Tab. 2).

On the basis of the conducted statistical analysis, no significant relationships were noted between sex and level of physical activity (Tab. 3).

Table 1. Time devoted by respondents to particular activities during the week

Physical activity	Time (h/week)
Moderate and vigorous	Mean = 25.19 SD \pm 18.83
Low	Mean = 94.93 SD \pm 18.75
Sleep	Mean = 47.96 SD \pm 6.45

Table 2. Correlations between physical activity and tested variables

	ADL scale	IADL scale	Depression scale	Tinetti test	Age
Physical activity	0.5266	0.5987	-0.4840	-0.4476	-0.4634
	N=50	N=50	N=50	N=50	N=50
	p=0.0001	p=0.0001	p=0.0004	p=0.0013	p=0.0013

Table 3. Sex and average physical activity per week

Sex	Mean [MET-min/week]	SD [MET-min/week]	Z	p
Female (n=28)	7722.9	8223.3	-0.0763	0.9395
Male (n=22)	7902.9	8090.7		

Table 4. Place of residence and average physical activity per week

Place of residence	Mean [MET-min/week]	SD [MET-min/week]	Z	p
Country (n=23)	6381.8	4905.5	-1.1115	0.2720
City (n=27)	8955.6	9902.9		

Table 5. Chronic diseases and average physical activity per week

Chronic diseases	Mean [MET-min/week]	SD [MET-min/week]	Z	p
No (n=17)	8662.5	4659.2	2.5101	0.0121
Yes (n=33)	738.8	9340.9		

Table 6. Level of education and average physical activity per week

Level of education	Mean [MET-min/week]	SD [MET-min/week]	Z	p
Primary (n=6)	1720	236	11.1029	0.0039
Secondary (n=33)	9060	9443.9		
Higher (n=11)	7451	3104.5		

Table 7. State of health and average physical activity per week

State of health assessment	Mean [MET-min/week]	SD [MET-min/week]	Z	p
Very good (n=4)	11520	8191	7.1302	0.0678
Good (n=23)	8373	6470		
Average (n=19)	5722	7353		
Bad (n=4)	10800	16855		

On the basis of the conducted analysis of results, no significant differentiation in the level of physical activity was recorded for the respondents residing in the country or city (Tab. 4).

A significant relationship was demonstrated between the occurrence of comorbidities and undertaking physical activity. People who suffer from comorbidities undertake significantly lower levels of physical activity than those without these diseases (Tab. 5).

Statistical analysis of the obtained results showed a significant relationship between education and the level of undertaken physical activity. People with secondary and higher education perform higher levels of physical activity than those with primary education (Tab. 6).

On the basis of analysis of results, no significant relationships were indicated between state of health assessment and the level of physical activity (Tab. 7).

The respondents indicated the following as factors motivating them to take up physical activity: improvement of well-being and functional fitness, company, doctor's recommendations, as well as weight loss (Fig. 1).

More half of the questionnaire respondents stated that there were no reasons for them not to undertake physical activity. Some people indicated state of health and lack of willingness as a factor influencing their lack of physical activity. The study group also included people who did not perform exercise because of the lack of company, preference for passive recreation or lack of access to facilities, equipment (Fig. 2).

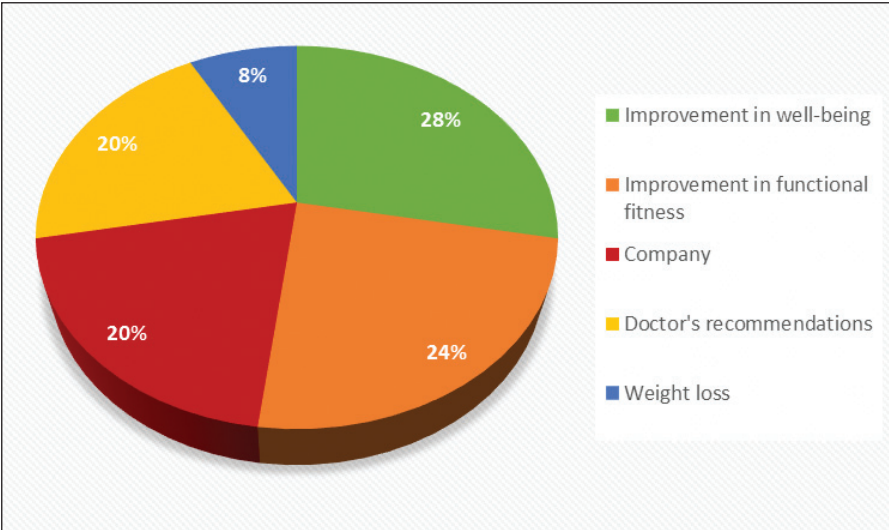


Figure 1. Percentage distribution of factors motivating respondents to undertake physical activity

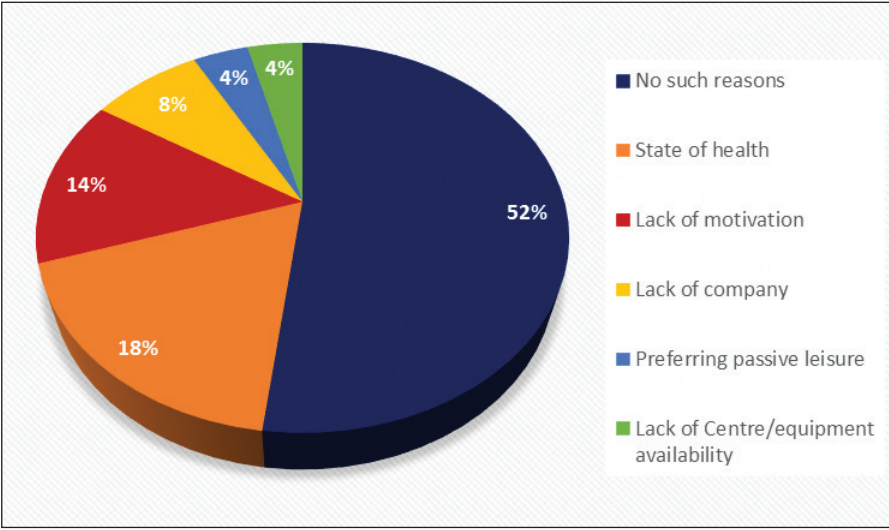


Figure 2. Percentage distribution of factors influencing the decision to not undertake physical activity

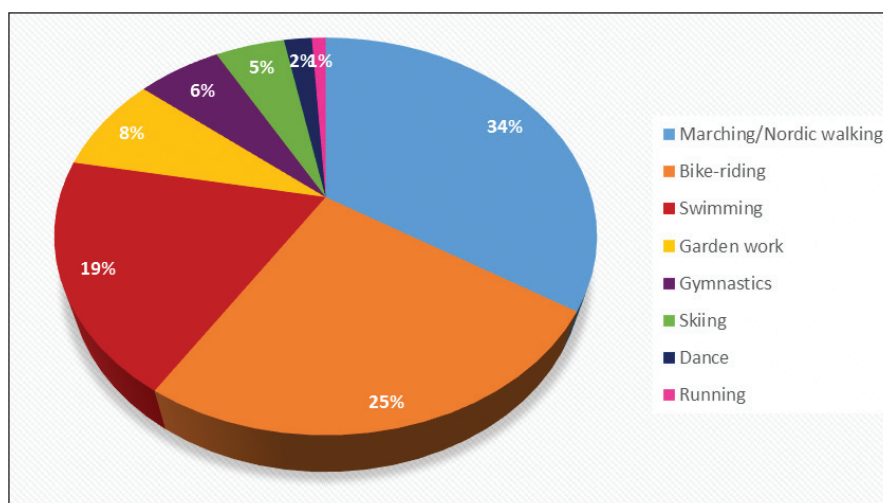


Figure 3. Percentage distribution of preferred forms of physical activity

Among the various types of physical activity, the majority of respondents preferred marching/Nordic walking, bike-riding and swimming (Fig. 3).

Discussion

A priority in the case of older people should be such behaviour aiming to maintain fitness and activity, enabling independent functioning and to achieve a high quality of life [9, 20]. The results of the authors' research indicate that the level of physical activity has a significant relationship with functional and locomotor fitness, as well as the emotional state of the elderly. There was also a significant correlation between age, education, occurrence of chronic diseases and the level of physical activity. Education is one of the important factors reducing the risk of a significant decrease in the level of functional fitness. It also affects the formation of attitudes, including those towards one's old age. In addition, it teaches how to solve problems and deal with difficult situations, such as adjusting to life after retirement and dynamically changing reality. It is clearly shown in the research that people with secondary and higher education undertake physical activity because they are aware of its significant impact on human health [9]. This is confirmed by the results of the authors' research, in which the most common reason for undertaking physical activity, the respondents indicated improvement in well-being, as well as improvement in functional fitness. Equally important is the analysis of the reasons for giving up physical activity. The results of this study clearly show that for more than half of the examined group, there are no reasons not to undertake physical activity. The study group also included people who, as a barrier limiting physical activity, indicated poor health,

not allowing them to engage in physical activity, as well as a lack of willingness. It is confirmed in literature on the subject that one of the most common reasons for not engaging in movement is health [24]. It has been shown that people who are chronically ill undertake significantly less physical activity.

Marchewka and Jungiewicz [25] showed that physical activity before the age of 35 has a positive effect on the quality of later life. It should also be noted that regular physical activity of older people, even initiated at a later age, has positive influence on quality of life, prolonging life expectancy, as well as significantly reducing the risk of developing chronic diseases [17].

The most common form of activity among older people is marches, Nordic walking, as well as cycling, i.e. forms of movement that do not require special financial input or specialised infrastructure. Elderly people also often choose swimming as a form of movement [1, 17]. The results of the authors' research confirm the above observations.

The authors of subsequent studies have shown that care for health, well-being and doctor's recommendations, are the most common motivating factors for engaging in physical activity [1]. Similar results were obtained in this study, in which, the respondents also indicated the need for the company of other people. as a motivating factor. In order to reduce the risk of falls, older people are offered various forms of physical activity. The choice should be based on forms of movement that the older person will have able to practice safely at home. For this purpose, multi-sensory exercises with the use of devices such as aero-step pillows, Swiss balls, moving platforms or foam pads and mattresses are effective. They improve coordination and hence, the functional fitness and quality of life of seniors [26]. Despite the proven effectiveness of traditional

exercise programmes to reduce the risk of falls, modern, interactive and also forms of physical activity possible for the elderly to perform at home are welcomed [27].

Physical activity significantly correlates with lower levels of depression and anxiety [28]. This was confirmed in subsequent studies, which showed that exercise can provide similar effects to those obtained with antidepressants [29]. On the other hand, Moor et al. [30] are of a different opinion. They did not find a significant relationship between physical exercise and the level of anxiety. On the other hand, the results of the authors' research indicate a significant correlation between the level of physical activity and the occurrence of depression.

Concluding, it is important to emphasize the great role of physical activity in the prevention and treatment of limited functional and motion abilities of older people, as well as its positive impact on the emotional state of these people. In scientific research, it is confirmed that physical activity has a positive effect on all older people, regardless of age, disease or general health. Movement exercises improve mobility, balance and coordination. They also have an effect on increasing gait speed, muscle strength and range of motion. They allow to reduce the number of falls or the probability of their occurrence, increase bone mineral density,

reduce pain in the joints. Their role in improving mood and general well-being is also important.

Conclusions

On the basis of the obtained research results, the following conclusions may be formulated:

- 1) In the case of seniors, of superior significance are such actions allowing them to maintain the highest possible level of fitness and activity, and thus, enabling independent functioning and maintaining high quality of life.
- 2) Level of physical activity is related to functional and motion skills, as well as the emotional state of seniors.
- 3) There is a correlation between age, education and the occurrence of chronic diseases and the level of motor activity. No relationships between sex, place of residence or self-assessment of health status and level of physical activity were noted.
- 4) The most important motivational factor for undertaking physical activity is improvement of well-being, and the most frequently indicated barrier is state of health.
- 5) Forms of movement preferred by older people are walking, cycling and swimming.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Ethics Committee

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Address for correspondence:

Edyta Mikołajczyk
 ORCID:0000-0003-4109-9409
 Zakład Kinezyterapii, AWF Al. Jana Pawła II 78,
 31-571 Kraków
 e-mail: edyta.mikolajczyk@awf.krakow.pl