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Selected factors influencing physical fitness in the elderly

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ABSTRACT

Introduction. In effect of the ageing process, there are involuntional changes in older adults both in the mental and in the physical spheres. Some factors may slow down the ageing process. Physical activity is one of these factors. Physical ability is one of the most important indicators of quality of life of older adults, and it can be shaped by physical activity.

Aim. The aim of the study was to assess chosen factors that influence physical ability of adults older than 65 years.

Material and methods. The study involved 63 older adults. The criterion for inclusion in the study was the age - older than 65 years. There were 37 women and 26 men in the study population. All the subjects were able to walk without assistance, and they had no contraindications to do functional tests. We used a questionnaire of our own design, three SPPB trials, Up&Go test; we calculated the BMI indices and assessed depression scale.

Results. We found that older adults rarely engage in physical activity. The low level of physical activity of the older adults was reflected in equally low physical ability level, as assessed by functional tests. We found a directly proportional dependence between body mass and the level of functional limitations and risk of falls.

Conclusion. In our functional tests, we found a statistically significant correlation with regard to age and BMI index.

Keywords. age, BMI, older adults, physical ability, sex

Introduction

The process of ageing is irreversible. An older adult undergoes involuntional changes both in the mental and the physical spheres. Gradually, functional ability deteriorates, and difficulties in activities of daily life arise. Numerous needs and interest diminish.^{1,2} In spite of changes to the body, the ageing process may be slowed down. In the desired process of ageing there are some

necessary elements, and these are: forming healthy habits, avoiding risky behaviour, maintaining the highest possible level of physical activity and maintaining independence. These are key factors in both prevention and treatment.^{3,4}

One of the most worrying problems of the 21st century is hypokinesia (the word derives from Greek: kinesis – movement, and hypo – decrease, shortage, limitation). It

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affects developed societies such as that found in Poland. It can be characterized by lack of sufficient physical activity, or the disproportion between the increasing load for the nervous system and the decreasing load for the locomotor system, and it leads to disorders in the functioning of the systems of human body. The World Health Organization declares that hypokinesia is, directly and indirectly, the main cause of death, and that it is constantly increasing.⁵

Physical activity helps to control the pathology of ageing, as it reduces the risk of developing cardiovascular disorders, reduces the development of hypertension, regulates the intestine rhythm thus decreasing fat tissue and helping to avoid obesity, reduces the risk of developing cancer, prevents osteoporosis (bone fractions), increases the muscle strength and muscle endurance, maintains motor and cognitive functions, reduces stress levels and increases self-esteem.

The aim of the study was to assess the level of physical ability and chosen factors that affect physical ability in adults older than 65 years.

Material and method

The study involved 63 older adults. The criterion for inclusion in the study was an age over 65 years. The subjects expressed their written consent to participate in the study. The study population consisted of 37 women (58.7%) and 26 men (41.3%) We used the snowball sampling technique.

The age of the subjects was between 65 and 81 years, the mean age was 73.76 years \pm 4.43 years. The mean age for women was 73.18 years, and for men 74.34 years (Table 1).

To conduct this study, we used our own questionnaire. We assessed physical ability using the Short Physical Performance Battery (SPPB). We assessed three areas: lower extremity strength, static balance and gait velocity.⁶ To assess functional ability and the risk of falls, we used the Up&Go test.⁷ We also calculated Body Mass Index and we checked the subjects for depression.

The subjects were guaranteed anonymity. They expressed their informed consent to participate, and they

Table 1. General characteristics of the study population

Variable	n	%
Professional activity in the past		
Yes	63	100.0
No	0	0.0
Total	63	100.0
The type of professional activity in the past		
Active	12	19.0
Sedentary	23	36.5
Mixed	28	44.4
Total	63	100.0
Lifestyle before turning 65		
Very active (activity at least twice a week)	6	9.5
Moderately active (activity at least once a week)	16	25.4
Minor activity (activity at least twice or three times a month)	23	36.5
Inactive	18	28.6
Total	63	100.0
Frequency of doing physical activity		
Every day	15	23.8
Several times a week	11	17.5
Rarely	22	34.9
None	15	23.8
Total	63	100.0
Chronic diseases in the study population		
Cardiovascular diseases	35	55.6
Pulmonary diseases	14	22.2
Gastrointestinal diseases	13	20.6
Genitourinary diseases	18	28.6
Endocrine system diseases	15	23.8
Locomotor system disorders	36	57.1
Bone fractions after the age of 60 years	3	4.8
Cancer	0	0.0
Other	1	1.6

were presented with the plan of the tests. The order of the conducted tests was the following: filling out the questionnaire, doing and analyzing the SPPB test, doing the Up&Go test and depression assessment.

Table 2. Functional limitations, according to SPPB scale

Functional limitations, according to SPPB scale	n	%
Serious limitations(0-3 points)	2	3.2
Moderate limitations (4-6 points)	10	15.9
Minor limitations (7-9 points)	30	47.6
No limitations (10-12 points)	21	33.3
Total	63	100.0

Table 3. Risk of falls, according to Up&Go test

Risk of falls, according to Up&Go test	n	%
Normal, minimal risk of falls	11	17.5
Average risk of falls	39	61.9
High risk of falls	13	20.6
Total	63	100.0

Statistical analysis

To assess relationships between the chosen variables, questions on nominal scales from the following tests were used: V Cramer test (tables 2×3, 4×5 etc), the Phi test (tables 2×2). These are symmetric measurements, based on the chi-squared tests, and they inform of the strength of relationship between variables in contingency tables. All the measurements for the strengths of relationships have been normalized, so that they take values from the (0-1) range. There are the following strengths of relationships: 0-0.29 denotes a weak relationship, 0.3-0.49 denotes a moderate relationship, 0.5-1 denotes a strong relationship. For numerical values, we calculated descriptive statistics, i.e. the mean, the median, the min-

imum, the maximum, the first and the third quartiles, and standard deviation. We established statistical significance at $p < 0.05$. We conducted the statistical analysis using the software package Statistica 10.0.

Results

There were two subjects (3.2%) in the study population who had serious functional limitations, 10 subjects (15.9%) who had moderate limitations, 30 subjects (47.6%) who had minor limitations and 21 subjects (33.3%) who did not have any functional limitations (Table 2).

There were 11 subjects (17.5%) without risk of falls, or with minimal risk of falls. There were 39 subjects (61.9%) with average risk of falls. There were 13 subjects (20.6%) with high risk of falls (Table 3).

We found a statistically significant relationship between the age of the studied subjects and assessment of their suppleness ($p=0.009$) and their balance ($p=0.043$). Both relationships had moderate strength ($V Cr=0.32$). Younger subjects had better suppleness and lower risk of falls than older subjects (Table 4).

We found a statistically significant relationship between the sex of older adults and their susceptibility to depression ($p=0.038$). This relationship had moderate strength ($V Cr=0.32$). Depression was more common in women than in men (Table 5).

We found a statistically significant relationship between the body mass category of the studied older adults and the level of their functional limitations ($p=0.034$) and their balance ($p=0.041$). These relationships were: moderate ($V Cr=0.33$) or weak ($V Cr=0.28$), respectively. The higher BMI of the studies seniors, the greater their functional limitations. Also, with increasing body mass, the risk of falls of the subjects increased too (Table 6).

Table 4. Functional test results, depending on age

Tests	65-73 years		73-81 years		P	
	N	%	n	%		
=Depression scale	Normal	17	51.5	20	66.7	$\chi^2(2)=2.77$ $p=0.249$
	Moderate depression	14	42.4	10	33.3	
	Serious depression	2	6.1	0	0.0	
SPPB	Serious limitations	1	3.0	1	3.3	$\chi^2(3)=0.28$ $p=0.962$
	Moderate limitations	5	15.2	5	16.7	
	Minor limitations	15	45.5	15	50.0	
	No limitations	12	36.4	9	30.0	
Suppleness	Poor	22	66.7	28	93.3	$\chi^2(1)=6.82$ $p=0.009$ $\Phi=0.32$
	Good	11	33.3	2	6.7	
Up&Go	Normal. low risk of falls	9	27.3	2	6.7	$\chi^2(2)=6.27$ $p=0.043$ $\Phi=0.32$
	Average risk of falls	16	48.5	23	76.7	
	High risk of falls	8	24.2	5	16.7	

Table 5. Functional tests results, depending on sex

Tests	Females		Males		P	
	N	%	N	%		
Depression scale	Normal	17	46.0	20	76.9	$\chi^2(2)=6.52$ p=0.038 V Cr=0.32
	Moderate depression	18	48.7	6	23.1	
	Serious depression	2	5.4	0	0.0	
SPPB	Serious limitations	2	5.4	0	0.0	$\chi^2(3)=1.48$ p=0.685
	Moderate limitations	6	16.2	4	15.4	
	Minor limitations	17	46.0	13	50.0	
Suppleness	No limitations	12	32.4	9	34.6	$\chi^2(1)=0.16$ p=0.688
	Poor	30	81.1	20	76.9	
	Good	7	18.9	6	23.1	
Up&Go	Normal. low risk of falls	6	16.2	5	19.2	$\chi^2(2)=0.75$ p=0.684
	Average risk of falls	22	59.5	17	65.4	
	High risk of falls	9	24.3	4	15.4	

Table 6. Functional tests results, depending on BMI

Tests	Norm		Overweight		Obesity		P	
	n	%	n	%	n	%		
Depression scale	Normal	8	57.1	18	69.2	11	47.8	$\chi^2(4)=3.04$ p=0.549
	Moderate depression	6	42.9	7	26.9	11	47.8	
	Serious depression	0	0.0	1	3.9	1	4.4	
SPPB	Serious limitations	0	0.0	0	0.0	2	8.7	$\chi^2(6)=13.58$ p=0.034 V Cr=0.33
	Moderate limitations	0	0.0	3	11.5	7	30.4	
	Minor limitations	6	42.9	14	53.9	10	43.5	
Suppleness	No limitations	8	57.1	9	34.6	4	17.4	$\chi^2(2)=2.52$ p=0.282
	Poor	9	64.3	22	84.6	19	82.6	
	Good	5	35.7	4	15.4	4	17.4	
Up&Go	Normal. low risk of falls	4	28.6	6	23.1	1	4.4	$\chi^2(4)=9.98$ p=0.041 V Cr=0.28
	Average risk of falls	9	64.3	17	65.4	13	56.5	
	High risk of falls	1	7.1	3	11.5	9	39.1	

Discussion

Our study confirmed the sedentary lifestyle of older adults. More than a half of the study population performed physical activity rarely, or even declared lack of any physical activity. The results of the study by Maciatowicz were even less optimistic, as he found that 74% of older subjects did not perform any physical activity, and that 12% did it rarely.⁸ According to the recommendations of American College of Sports Medicine, to improve the health of an older adult, one has to do physical activity for 30 minutes three times a week.⁹

According to Zadworna-Cieślak et al. the age does not impact a more or less often engagement in physical activity. They only found correlation between sex and health of adult citizens.¹⁰ Zielińska-Więczkowska and Kędzióra-Kornatowska found that institutions such as the University of the Third Age prevents the exclusion of older adults, and it significantly increase their activity and self-esteem.¹¹ Ćwirlej-Sozańska proved that older adults who declared leading an inactive lifestyle have difficulties in performing activities of daily life and in movement, which in turn negatively affect their self-es-

teem. In her study, Ćwirlej-Sozańska found a significant relationship between physical activity of her study population and difficulties in movement.¹²

All subjects had been professionally active in the past. Usually they had work of mixed character, and least often they had work that required physical activity. According to Zużewicz and Konarska, the process of ageing leads to decreased physical and psychological ability.¹³ Cutting down on hard physical work, and on work in difficult conditions, e.g. at night, slows down the ageing process. Performing work in difficult conditions speeds up the ageing process. Decreased ability to perform intellectual work manifests itself later, approximately after 65 years of age, and, in contrast to hard physical and shift work, it is different in different individuals.

Low physical activity in senior citizens may have been caused by their multiple diseases. The most common diseases in the study population were the locomotor system disorders and cardiovascular diseases. More than a half of the subjects had to take prescribed medicines. Approximately 35% of the subjects also used OTC

drugs. Rubenstein and Josephson stressed the multiple diseases in older adults. They believed it was multiple diseases, and not only the involuntional process, that is the main reason for reduced muscle strength and decreased physical activity in older adults.¹⁴

Adamczyk et al believe that it is necessary to educate older adults, as it may result in forming and maintaining high level of physical ability.¹⁵

Zielińska-Więczkowska and Kędziora-Kornatowska named the level of physical ability as the most important determinant of quality of life of senior citizens.¹⁶ Kocemba et al. believe that the ageing process has an individualized character. The chronologic age does not always appropriately match the biological age of individuals. It is important to engage in preventive activities that delay the ageing process and build physical fitness.¹⁷ A higher body function results in higher self-esteem. Bień reports that a low level of physical fitness in the Polish society is a significant social issue. The reasons for this are lack of preventive actions, the development of automobile industry and computerization.¹⁸

It worried us that our study found 24 cases of moderate depression and 2 cases of serious depression among our study population. There was a relationship between the sex of the respondents and the incidence of depression - women were more susceptible to it. Bień et al. confirmed it. Depression is one of the most serious diseases of affluence. The constant hurry increases the symptoms. Although the disorder affects all age groups, older adults are particularly sensitive to it.

In the Short Physical Performance Battery (SPPB), which assesses physical ability, the majority of subjects had results that showed minor limitations (30 subjects) or no limitations (21 subjects). The best results were found in the balance trial. As many as 59 subjects scored four points. The gait velocity was on average level - the mean result was 6.7 second, which usually meant a score of two points. The poorest results were found in the chair stand trial. The mean result was 15.1 seconds, which meant a score of 2 points. According to Guralnik et al. the SPPB result helps to determine the risk of disability.¹⁹ Huang et al also used this test to determine the limitations to performing activities of daily living.²⁰ Miller reported a decreased risk of death for each additional point scored in the test.²¹ Protas et al. used SPPB to assess the effectiveness of rehabilitation in older adults.²²

The Up&Go test results determined that in the majority of subjects (39 persons) the risk of falls was average. The results were therefore in the rage 10-19 seconds. The second biggest group were the subjects with high risk of falls (13 persons) with results higher than 19 seconds. In their study, Adamczyk et al found that the mean time of the test was 5.58 seconds, i.e. normal result, and meant a low risk of falls. In our study only

11 subjects had such results. Osiński et al. mentioned that older people have an increased risk of falls due to reduced muscle strength and deteriorated motor coordination. They believe that approximately half of the falls result in injuries, of which 10-15% are serious injuries to the head, and 5-6% are fractures to the femoral head. Thomby observed that as many as 10-20% of falls in older females lead to death.²⁴ Cwirlej-Sozańska et al. mention that along with the ongoing tendency of ageing societies, the test of balance in older adults is particularly significant. Moreover, the Up&Go test results correlate with other clinical results - Tandem Walk or Pivot 180°.²⁵ Nordin et al. found the Up&Go test reliable in assessing the risk of falls, and mention that this test is used as a determinant by the British Geriatrics Society.²⁶ A review of the literature by Beauchet et al. confirm the theory of the prognostic function of risk assessment among subjects older than 60 years.²⁷ Our study found a relationship between age and the Up&Go test result. The risk of falls was lower in younger subjects. Beauchet et al. stressed the need to study this correlation, as well as the impact of sex. In our study, the sex did not have impact on results.²⁷

Konieczny and Rasińska stated that 40-60% of European Union older adults have sedentary lifestyle.²⁸ In Poland, physical activity of older adults is very poor. Only 12% of Poles reported they do physical exercise once a week.²⁹

The ongoing ageing of societies brings new challenges to the healthcare system. It shall be necessary to take action to activate older adults and to draft a strategy that would result in facilitating the process.

Conclusions

We found a statistically significant correlation in functional tests in relation to sex and to BMI.

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