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Functional ability of the elderly and related factors in the Subcarpathian Region

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Abstract

Introduction and Objective. Functional ability is the ability to independently perform basic life activities, such as moving, eating, controlling the physiological functions of the body, and maintaining body hygiene. Functional ability is measured by the living environment's degree of independence and self-reliance. The Activities of Daily Living (ADL) is mainly based on physical and health factors, while the Instrumental Activities of Daily Living (IADL) is more closely related to psychosocial and cognitive resources. The aim of the study was to assess functional fitness and its determinants among seniors from the Subcarpathian Region.

Materials and Method. The study was conducted in a group of 300 seniors in the Subcarpathian Region. The study used two standardized research tools: The Lawton Instrumental Activities of Daily Living (IADL) and Scale and the Up and Go Test.

Results. The functional status of the elderly in terms of instrumental daily activities totalled 21.08; median – 24 points; interquartile range – 5.75 points. Timed Up and Go Test enabled evaluation of the risk of falls in the research group (a high score equals a higher risk of falls). The average score was 19.07 seconds, with a median of 15.25 seconds and an interquartile range of 927 seconds. The risk of falls proved to be moderate with nearly half of the respondents – 46.7%, and high – 25%.

Conclusions. The examined group of seniors showed a relatively good level of functional fitness in terms of instrumental activities of daily living. At the same time, however, there was a relatively high risk of falls. The subjects' functional fitness level was differentiated by education, age, place of residence, professional status, and financial situation. Interdependencies were found between the level of education, age, marital status, professional status and the risk of falls.

Key words

risk of falls, functional ability, elderly

INTRODUCTION

The literature on the subject states that there is no precise date for the beginning of old age and its periodization due to discrepancies related to extending the average human lifespan. The conventional boundary of old age is 65 years. In reality, however, this period is characterized by a different course for each senior due to the occurrence of diseases and the associated polypharmacy. In older people, problems with several causes coincide: organic, psychological, social, and cognitive [1].

In early old age, most seniors maintain physical and mental fitness and are independent in everyday functioning. However, in late old age, there is a significant reduction in the fitness of seniors in all areas of functioning [2].

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Involuntary changes that appear in the fourth decade of life and intensify with age significantly reduce the level of physical fitness of the senior body achieved at the peak of development, consequently leading to a decrease in functional fitness. Functional fitness is the ability to perform basic life activities independently, such as moving, eating, controlling the physiological functions of the body, and maintaining body hygiene. The above measure is the degree of independence and self-reliance in the living environment [3].

Maintaining independence requires maintaining intellectual and physical fitness, at least to the extent that allows for free movement. A deterioration in the ability to function may result from a disorder in one fitness area or several components simultaneously [4].

While the Activities of Daily Life (ADLs) are mainly based on physical and health factors, the Instrumental Activities of Daily Life (IADLs) are more strongly related to psychosocial, cognitive, and economic resources. Moreover, a decline in IADLs usually precedes limitations in ADLs and therefore can predict future decline in ADLs. Conversely,

independence in ADLs acts as a prerequisite for autonomy in IADLs. Although limitations in ADLs and/or IADLs may be partially reversible, disability is known to have negative consequences. These include loss of autonomy and dependence on formal or informal care, institutionalization, increased mortality rates and health care costs, and reduced quality of life [5].

The aim of the study was to assess functional fitness and its determinants among seniors from the Subcarpathian Region.

MATERIALS AND METHOD

The study was conducted in a group of 300 seniors in the Subcarpathian Region of south-eastern Poland, by employing a random sampling method. The population under consideration consisted of individuals residing in the Subcarpathian Region who were of post-productive age, defined as 60 years and older for women, and 65 years and older for men. This demographic accounted for approximately 460,000 individuals. However, the research focused on individuals aged 65 years and older, which excluded women aged 60–64 from the population size, effectively reducing its scope. The minimum required sample size was calculated at 318 participants. The study ultimately enrolled 350 participants.

A key limitation of the study was the age-specific nature of the group, which resulted in incomplete data from 50 individuals. Full data were successfully collected from 300 participants. Consequently, the maximum margin of error increased from 5% to 6%, assuming a 95% confidence level, and a proportion of 0.5. The primary challenge in meeting the minimum random sample size was related to the age of the participants. Advanced age often contributed to incomplete data or difficulty in achieving representative participation.

Inclusion criteria for the study. Age ≥ 65 years, place of residence – the Subcarpathian Region, assessment of the level of general cognitive functioning using the Mini-Mental State Examination (MMSE) scale (min. 24 points), and consent to participate in the study,

Exclusion criteria for the study. Age < 65 years, place of residence – outside the Subcarpathian Region, assessment of the level of general cognitive functioning using the MMSE scale (below 24 points), lack of consent to participate in the study.

Research tools. The study used two standardized research tools: The Instrumental Activities of Daily Living (IADL) Scale and the Up and Go Test.

IADL Scale. Assesses life independence, determining the ability to cope independently at home and in the external environment (outside the house). The assessment concerns complex instrumental activities (housework, home repairs, shopping, preparing meals, using the telephone, taking medications independently, and managing money). The study duration was 3–5 minutes [6, 7]. Reliability coefficient: Cronbach's alpha coefficient for the IADL scale in the conducted studies was 0.93.

TUG test (Timed Up and Go test). A tool focused on assessing two basic functions of daily living: moving from a sitting to a standing position and walking a short distance. The task of an elderly person is to rise from a sitting position on a chair to a standing position as quickly as possible (using hands for support is allowed). The person must then walk a distance of three meters, turn 180 degrees, return to the chair and sit down again. The main test was preceded by a verbal description and a trial performance. The test is repeated twice, and the time measured using a stopwatch. The result from the better trial is used for analysis. Non-disabled people should take about 10 seconds to complete the test, and infirm people at least 20 seconds. An increased risk of falls occurs in people with a result exceeding 14 seconds. Achieving more than 30 seconds in the test suggests the need to use a walking aid [8].

Statistical analysis. The distribution of results was analyzed using the Kolmogorov-Smirnov test, as well as visual assessments through histograms and Q-Q (quantile-quantile) plots. These analyses revealed that the assumption of normal distribution was not met. This deviation from normality had implications for the choice of subsequent statistical methods, requiring non-parametric or distribution-independent approaches for robust analysis. Descriptive statistics were applied to present the research. Mann-Whitney test was used to compare differences in the dependent variables and the Kruskal-Wallis test. Also, Dunn's test provided pairwise comparisons between groups. Statistical significance was $p<0.05$. Statistica 10.0 software was used to analyse the data and perform calculations.

Ethics approval. The study was reviewed and approved by the Medical *Ethical Committee* of the *Medical University in Lublin, Poland* (Approval No. KE-0254/336/2018), and conducted according to accepted ethical standards. Informed consent to participate was obtained from the respondents.

RESULTS

Among the 300 surveyed seniors, 65.3% were women. Nearly half (44.0%) of the respondents had secondary education. The largest age group consisted of people aged 68–79 (48.0%). Additionally, 52.0% of the respondents were in a relationship, and 66.3% lived in a city. The majority of the seniors (84.3%) were retirees, and 54.0% reported their financial situation as satisfactory. A detailed analysis of the socio-demographic characteristics of the respondents is presented in Table 1.

The functional status of the elderly, in terms of instrumental daily activities, averaged 21.08 points on a scale of 8 to 24 (with a higher score indicating better functional status). The median score was 24 points; interquartile range – 5.75.

The Timed Up and Go Test enabled an evaluation of the risk of falls in the study group (a high score equaled a higher risk of falls). The average score was 19.07 seconds, with a median of 15.25 seconds and an interquartile range of 927 seconds. The risk of falls proved to be moderate among nearly half of the respondents (46.7%), and high with 25% (Tab. 2).

The elderly who had primary education showed lower functional ability in instrumental activities of daily living (Me=17.00) than those ones with vocational, secondary, or higher education. Dunn's test confirmed statistically significant differences between the primary education group

Table 1. Study group characteristics (N=300)

		N	%
Gender	women	196	65.3
	men	104	34.7
Education	primary	61	20.3
	vocational	55	18.3
	secondary	132	44.0
	higher	52	17.3
Age	65- 67	76	25.3
	68-79	144	48.0
	over 79	80	26.7
Marital status	single	144	48.0
	married / in a romantic relationship	156	52.0
Place of residence	countryside	101	33.7
	city	199	66.3
Employment	employed	8	2.7
	unemployed	6	2.0
	disability pensioner	33	11.0
	Age-related pensioner	253	84.3
Financial situation	bad	15	5.0
	satisfactory	162	54.0
	good	113	37.7
	very good	10	3.3

Table 2. Assessment of IADL and risk of falls (TUG)

	M	SD	Min.	Max.	Me	IQR
Assessment of Instrumental Activities of Daily Living (IADL)	21.08	4.31	8	24	24.00	5.75
Risk of falls (TUG)	19.07	19.82	6.84	166	15.25	9.27

M – mean; SD – standard deviation; Min. - minimum value; Max.. - maximum value; Me – median; IQR - interquartile range

and the other three education levels, while no significant differences were observed among vocational, secondary, and higher education groups.

Seniors in a marital relationship demonstrated significantly higher functional status in performing complex activities (Me=24.00), compared to single individuals (Me=23.00). The difference was statistically significant (p=0.0004).

Seniors residing in urban areas showed a significantly higher functional status in performing daily complex activities (Me=24.00) than those living in rural areas (Me=23.00). This difference was statistically significant (p=0.0037).

Working seniors had better functional status than their non-working and disability-pension counterparts. Moreover, retirees exhibited better functional status than individuals receiving disability pensions. Kruskal-Wallis test confirmed significant differences within the study population, and Dunn's test validated these intergroup differences.

Material conditions significantly impacted functional status (p=0.0020). Seniors with poor financial situations demonstrated significantly worse functional status compared to those with satisfactory, good, or very good material conditions (Tab. 3).

This analysis highlights the multifaceted impact of education, age, marital status, place of residence, employment, and financial situation on the functional abilities of seniors

Table 3. Assessment of IADL according to specific criteria

IADL	M	SD	Min.	Max.	Me	IQR	*p-value*
Gender							
women (N=196)	21.12	4.32	8.00	24.00	24.00	5.00	Z=-0.483; p=0.6293a
men (N=104)	21.01	4.32	8.00	24.00	24.00	6.00	
Education							
primary (N=61)	17.80	4.73	8.00	24.00	17.00	10.00	H=47.640; df=3; p<0.0001b
vocational (N=55)	20.87	4.68	8.00	24.00	24.00	7.00	
secondary (N=132)	21.97	3.66	8.00	24.00	24.00	2.75	
higher (N=52)	22.90	2.60	11.00	24.00	24.00	1.00	
Age							
65-67 (N=76)	22.38	3.43	8.00	24.00	24.00	1.00	H=61.238; df=2; p<0.0001b
68-79 (N=144)	22.23	3.52	8.00	24.00	24.00	1.00	
over 79 (N=80)	17.79	4.67	9.00	24.00	17.00	9.75	
Marital status							
single (N=144)	20.27	4.57	8.00	24.00	23.00	7.00	Z=-3.539; p=0.0004a
married/ in a romantic relationship (N=156)	21.83	3.93	9.00	24.00	24.00	2.00	
Place of residence							
countryside (N=101)	19.81	5.11	8.00	24.00	23.00	8.50	Z=-2.901; p=0.0037a
city (N=199)	21.73	3.70	9.00	24.00	24.00	3.00	
Employment							
employed (N=8)	23.88	0.35	23.00	24.00	24.00	0.00	H=15.570; df=3; p=0.0014b
unemployed (N=6)	18.67	4.32	12.00	24.00	19.00	7.50	
disabilitypensioners (N=33)	18.91	5.61	8.00	24.00	21.00	9.00	
old-agepensioneer (N=253)	21.34	4.08	9.00	24.00	24.00	5.00	
Financial situation							
bad (N=15)	16.80	5.00	8.00	24.00	16.00	8.00	H=14.746; df=3; p=0.0020b
satisfactory (N=162)	20.91	4.47	8.00	24.00	24.00	6.25	
good (N=113)	21.86	3.64	11.00	24.00	24.00	3.00	
verygood (N=10)	21.60	4.06	12.00	24.00	24.00	4.00	

M – mean; SD - standard deviation; Min. - minimum value; Max. - maximum value, Me - median, IQR - interquartile range; p – statistical significance; a - Mann-Whitney test; b - Kruskal-Wallis test

in performing complex daily activities (Tab. 3).

Mann-Whitney test (p=0.9170) proved that men and women showed comparable risk of falls (Me=15.25 and Me=15.46, respectively). The study revealed statistically significant links between the risk of falls and educational background of the respondents (p=0.0001). Primary education respondents were more likely to fall compared to the other study groups. The respondents aged over 79 proved to be more prone to falls; however, those aged less than 67 and those aged 68 – 79 were more resistant to falls. Dunn's test showed an increased risk of falls with the respondents over 79 compared to the remaining study groups. Also, there was no significant difference between the latter groups. Single respondents had a higher tendency to fall than the respondents in relationships. The differences were statistically significant (p=0.0004). The place of residence was not a relevant factor impacting the risk of falls (p=0.5499). The group of employed respondents was less likely to fall than the other groups of unemployed respondents, disability pensioners and old-age pensioners. Furthermore, disability pensioners were at a higher risk of falls than old-age pensioners. Financial situation had no crucial influence on the risk of falls (p=0.1261) (Tab. 4).

Table 4. Risk of falls according to specific criteria

Risk of falls (TUG)	M	SD	Min.	Max.	Me	IQR	*p-value*
Gender							
women (N=196)	18.97	19.27	6.84	166.00	15.25	10.52	Z=-0.104; p=0.9170a
men (N=104)	19.25	20.92	6.92	144.00	15.46	8.15	
Employment							
primary (N=61)	32.15	32.94	9.10	166.00	21.02	12.94	H=53.029; df=3; p<0.0001b
vocational (N=55)	16.82	14.78	7.50	107.00	14.52	8.94	
secondary (N=132)	16.05	14.19	6.84	130.00	13.93	8.57	
higher (N=52)	13.75	4.06	8.03	26.10	15.03	7.77	
Age							
65-67 (N=76)	13.42	8.20	6.84	52.00	10.13	7.25	H=73.720; df=2; p<0.0001b
68-79 (N=144)	17.23	19.96	7.12	166.00	14.76	7.65	
over 79 (N=80)	27.74	24.27	8.01	144.00	20.18	9.60	
Marital status							
single (N=144)	22.86	25.97	7.00	166.00	16.11	10.13	Z=-3.549; p=0.0004a
married / in a romantic relationship (N=156)	15.56	10.48	6.84	84.00	14.52	7.97	
Place of residence							
countryside (N=101)	21.77	23.34	7.00	143.00	15.12	10.65	Z=-0.598; p=0.5499a
city (N=199)	17.69	17.68	6.84	166.00	15.41	9.32	
Employment							
employed (N=8)	8.38	0.53	7.50	9.17	8.26	0.75	H=29.686; df=3; p<0.0001b
unemployed (N=6)	61.38	73.17	7.99	166.00	20.23	140.15	
disability pensioners (N=33)	29.01	30.19	10.22	143.00	18.92	13.48	
old-age pensioners (N=253)	17.10	13.46	6.84	117.00	15.11	8.60	
Financial situation							
bad (N=15)	25.78	20.77	8.93	86.00	16.20	14.05	H=5.720; df=3; p=0.1261b
satisfactory (N=162)	19.37	21.37	6.84	166.00	15.05	10.27	
good (N=113)	18.22	18.03	7.00	144.00	15.82	8.81	
very good (N=10)	13.71	7.08	8.20	32.00	12.00	6.50	

M – mean; SD - standard deviation; Min. - minimum value; Max. - maximum value; Me – median; IQR - interquartile range; p – statistical significance; a - Mann-Whitney test; b - Kruskal-Wallis test

DISCUSSION

The decline in functional capacity during aging leads to difficulties in performing basic activities of daily living (ADLs), such as bathing, dressing, feeding, transferring/walking, and bowel control, as well as instrumental activities of daily living (IADLs), which include managing finances, using a telephone or computer, managing medications, and shopping. IADLs require more complex physical functioning and neuropsychological organization compared to ADLs [9].

An essential element of elderly functioning is maintaining independence, fundamentally supported by physical fitness. However, functional fitness deteriorates with an increasing lifespan and the natural aging process. As a result, it becomes progressively more difficult for the elderly to perform complex daily tasks and, over time, even basic self-care activities [10–12].

In Europe, the disability rate among older adults, measured by the presence of at least one disability in ADLs, ranges from 11% – 44%. In contrast, the rate for IADLs ranges from 8% – 40%, depending on age and gender [13–15].

The results of the study show that most seniors have a relatively high level of IADL skills. In the study by Patel et al., almost 8% of older people reported that they were not independent in ADL, and another 57% of older people reported that they were not independent in IADL [16].

In the light of the current study, a significant influence was observed of age, marital status, professional status, economic situation, and education on the functional status affecting the performance of complex activities. Similar relationships were obtained by Wróblewska et al. [17]. The results highlight the significant influence of age and place of residence on the functional fitness of seniors. Lewko et al. [18] assessed functional fitness concerning daily activities, and found that fitness levels depended on the respondents' age. Chen et al. [19] similarly demonstrated that functional capacity, as measured by IADL, decreases with age — a finding that was also confirmed in the current study

One of the most common and severe health problems faced by the elderly population is falls [20]. Due to the increasing number of elderly people in many countries, especially in industrialized countries, the number of injuries caused by falls is also predicted to increase among this group of seniors.

About one-third of people aged 65 years and older fall every year, and about 10% of those who fall require medical care. Several epidemiological studies have investigated fall risk factors in recent decades. Older age, motor and sensory limitations, cognitive impairment, specific diseases, use of medications (drugs that increase the risk of falling), lifestyle behaviours, mood disorders, and previous falls are some of the most important risk factors [21].

The risk of falls was also found among the examined seniors in the current study. In all analyzed variables, this difference was statistically significant (except for gender and financial situation. In studies by Taiwanese reseasrchers, several socio-demographic and biological factors, including female gender, difficulties in performing one basic activity of daily living, difficulties in performing two or more instrumental activities of daily living, blurred vision, comorbidities, urinary incontinence and depressive symptoms, were significantly associated with falls [22]. The studies by Talarska et al. [23] showed that the risk of falls increases in people who are less independent in basic and complex activities of daily living and people with depression. Most risk factors can be modified and it is therefore necessary to develop a standard procedure to prevent falls in the elderly.

A study by Zhang et al. [24] found that falls occur more frequently among rural older adults than their urban counterparts. In both cases, older adults are more likely to fall outside their homes. However, the location and circumstances of outdoor falls differ between rural and urban settings; urban older adults are more likely to report falls on the road, while rural older adults tend to experience falls in the yard. Although falls inside or around the home are common, few occur in public places. Additionally, the hospitalization rate for urban older adults after a fall is higher than for rural older adults, a result also obtained in the current study study found similar results.

Masugi et al. [25] demonstrated that gait-related parameters, such as TUG time, maximal walking speed, and usual walking speed, are significantly associated with future IADL decline in community-dwelling older adults.

Regular monitoring of these gait function parameters could be useful in detecting the future risk of IADL decline.

Limitations of the study. The study has limitations and caution should be exercised in drawing conclusions. The shortcomings include the small sample size, and the selection of participants from only one region/province. In future, the study should be expanded with a more extensive group of respondents, Despite its limitations, the study confirmed the importance of assessing functional capacity and its determinants for improving senior care, particularly nursing care. Analyzing the functional capacity of older adults can help inform modifications to health and social policy, aligning them with demographic trends in aging populations. The study can therefore serve as a starting point for further in-depth analysis.

CONCLUSIONS

In the examined group of seniors, a fairly good level of functional fitness was observed in terms of instrumental activities of daily living. However, there was also a relatively high risk of falls. The level of functional fitness varied based on factors such as education, age, place of residence, professional status, and financial situation. Inter-dependencies were found between the level of education, age, marital status, professional status and the risk of falls.

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