GRUSZCZYŃSKI, Norbert and PERKOWSKI, Radosław. Assessment of balance and risk of falls in people over 60 years old. Journal of Education, Health and Sport. 2024;61:51833. eISSN 2391-8306.
https://dx.doi.org/10.12775/JEHS.2024.61.51833
https://apcz.umk.pl/JEHS/article/view/51833

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).
Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).
The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 27.04.2024. Revised: 10.05.2024. Accepted: 04.06.2024. Published: 05.06.2024.

Assessment of balance and risk of falls in people over–60 years old

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Abstract

Introduction: Falls of the elderly are a significant problem for public health and healthcare. They are also included in the geriatric giants, and the assessment of balance and risk of falls is an important part of the comprehensive geriatric assessment (CGA). It is estimated that almost one in three people over the age of 65 living independently in a community suffers one fall per year. These estimates increase with age, and in people older than 80 years, every second senior may experience at least one fall. The aim of the study was to assess the balance and risk of falls in people over 60 years of age living independently in society. **Materials and**

methods: The study enrolled 40 seniors over the age of 60 who agreed to participate in the study and met the inclusion criteria. Three functional tests were used to assess balance and the risk of falls among seniors: the Timed Up and Go (TUG), the Four Square Step Test (FSST) and One-leg standing (OLS). **Result:** The study shows that as age increases, subjects perform worse on the Timed Up and Go rho = 0.38 test; $p < 0.05$ and in the Four Square Step Test rho = 0.53; $p < 0.01$. No statistically significant differences were observed between genders or age groups in the One Leg Standing test (OLS), although older people scored worse than younger age groups. There were no statistically significant associations between performance test results and BMI. The average results of the clinical tests show that the seniors in the study had good balance and a low risk of falling.

Key words: elderly, balance, risk of fall, obesity, healthy adults

Introduction

The average age of the populations of the European Union countries is still increasing. Recent forecasts do not indicate that this trend will reverse in the near future. The result is an increasing percentage of older people in society. [1,2].

The aging process lasts a lifetime and is characterized by progressive and cumulative impairment of physiological functions, which results in a gradual decrease in functional and motor skills. We are subject to inevitable involutionary processes, during which our general fitness, physical capacity and cognitive functions gradually decline. As a consequence, this can lead to postural instability, the most important manifestation of which is the deterioration of balance. These factors lead to an increased risk of falls in the elderly, which is the leading cause of injury among seniors. Causing an increase in hospitalizations, complications, and even premature loss of independence [2,3,4,5].

The senses of sight and hearing play a particularly important role in controlling the posture of the elderly. Superficial and deep sensation and the efficiency of the integration of sensory stimuli also play an important role in maintaining the stability of the body and adequate reactions to factors that throw it out of balance. The weakening of the above-mentioned factors significantly increases the risk of falls and related injuries in people over 60 years of age [2,4,7].

Falls of the elderly are a significant problem for public health and healthcare. They are also included in the geriatric giants, and the assessment of balance and risk of falls is an important part of the comprehensive geriatric assessment (CGA) [6].

It is estimated that almost one in three people over the age of 65 living independently in a community suffers one fall per year. These estimates increase with age, and in people older than 80 years, every second senior may experience at least one fall [3,7,8] As a result of falls in older people, 10-25% of cases result in fractures or other injuries requiring medical intervention or hospitalization [9,10,30]. Lack of correction, control and prevention of factors increasing the risk of falls often leads to further incidents and deterioration of the quality of life [9]. Occasional falls are sometimes mistakenly perceived as part of the aging process and are therefore accepted and downplayed by the patient and his family [9].

Most falls do not cause serious injury, but post-fall anxiety disorder can be a significant problem, developing in people who have suffered or been close to falling. It has a destructive effect on the well-being, mobility and activity of elderly patients. It is also often associated with social isolation, anxiety, and sometimes even depression. The chance of its occurrence is higher in people who live alone, have cognitive and/or motor disorders and a history of previous falls [2,9,10].

The concern is further increased by the fact that not all seniors are able to get up from a lying position after a fall, which consequently leads to long periods of lying down [9].

Clinical tests are often used to assess balance and are an easy and quick form of testing. It is easily accessible and does not generate large financial costs. The reliability of the tests depends on the experience and skills of the examiner [4].

The ability to maintain body stability in motion and during static positions, which deteriorates with age, is an important element affecting the quality of life and making everyday functioning difficult. Regular physical activity of appropriately selected intensity and exercises that improve body balance, slow down this process [4,8]. The aim of the study was to assess the static and dynamic balance and the occurrence of an increased risk of falls among older people over 60 years of age living in society.

Material and methods:

The study enrolled 40 people (31 women and 9 men) aged 61 to 78 years with an average age of 68.58 years, living independently in the community.

Inclusion criteria are: written consent to participate in the study, being over 60 years of age, and being physically and mentally fit to function independently and to be able to communicate. Patients with severe cognitive impairment, stroke survivors, advanced Parkinson's disease, and advanced osteoporosis were excluded from the study.

The consent of the Bioethics Committee of the Nicolaus Copernicus University in Toruń at the Collegium Medicum in Bydgoszcz was also obtained - protocol code KB 484/2023, Bydgoszcz 12.12.2023.

The respondents were subjected to an original questionnaire. Basic anthropometric features were measured: height (cm) and body weight (kg), on the basis of which BMI indices were calculated.

The following tests were used to assess balance and fall risk: Timed Up and Go (**TUG),** Four Square Step Test **(FSST)** and One-leg standing **(OLS).** The characteristics of the tests are shown in Table I.

The tests were preceded by a briefing on how to perform the task. A better result from the tests performed is taken into account.

Table I. *Characteristics of the tests*

Test	*Characteristics of the tests*
Timed Up and Go) (**TUG)**	The test consists of three phases, during which the subject gets up from the chair, walks a 3-meter distance and then walk return to take a sitting position again. Participants were asked to move at a dynamic but safe pace. The measured factor is the time [seconds] needed to complete the task. Lower scores indicate a better ability to maintain balance. A 15-second cut-off threshold above which there is an increased risk of falling has also been determined [10,11,12].
Four Square Step Test (**FSST**)	It is a popular tool used to assess dynamic balance and determine if there is an increased risk of falling. A time result of ≥15 s indicates a higher risk of falling in the subject. The test takes place on a square divided into four smaller fields, numbered consecutively from 1 to 4. Patients started the test on the first square with their faces toward the field marked with the number two. The sequences of steps (2,3,4,1,4,3,2,1) are performed first clockwise and then counterclockwise. Both limbs had to be in contact with the ground in each square [16,17].

One-Leg Standing (OLS	The test evaluates static balance based on the time score obtained while standing on one leg. The tests were carried out with the eyes open, the patient looked straight ahead at a point at eye level. The arms should be kept along the torso and the non-supporting leg raised halfway the length of the lower legs. The test ended after 30 seconds or when the raised leg touched the ground [4,18].

Characteristics of the study group

The following Tabel II presents characteristics of the group. The study group consisted of 40 seniors, 77.5% of women and 22.5% of men took part in the study. The subjects were between 61 and 78 years old with an average age of 68.58 years. Between 51-65 years of age there were 30% of the population, between 66-70 years of age 40%, between 71-75 years of age 22.5% and between 76-80 years were 7.5%. Calculating the body mass index (BMI) in the study subjects, it was shown that 40% of the subjects had a normal body weight, 32.5% were overweight, 22.5% were obese of the first degree, 2.5% were obese of the second degree and 2.5% were obese of the third degree. 25% of people lived in villages, 72.5% lived in cities with up to 100,000 inhabitants, and one person lived in city with more than 100,000 inhabitants. People with primary education constituted 12.5% of the study group, with vocational education 35% of the study group, with secondary education 30% of the study group and with higher education 22.5% of the study group. Slightly more than half of the respondents (52.5%) had been doing manual work for most of their lives, 20% had office work, 25% had mental work, and one person had their own business. 15% of people have not been taking any medication at all, 22.5% have been taking one medication, 20% have been taking two medications, 10% have been taking three medications, and 32.5% have been taking four or more medications. Within a year, 15% of the participants (6 people) had a fall, of which 83.3% of these people had one fall, and 2 people suffered limb injuries as a result of these falls.

Table II. *Characteristics of the study group*

	N	*%*		*N*	*%*
Age			**Sex**		
61-65 years old	12	30,0%	Woman	31	77,5%
66-70 years	16	40,0%	Man	9	22,5%
71-75 years old	9	22,5%	**How much medication do you take per day?**		
76-80 years	3	7,5%	None	6	15,0%
BMI			One	9	22,5%
Norm	16	40,0%	Two	8	20,0%
Overweight	13	32,5%	Three	4	10,0%
First degree obesity	9	22,5%	Four and more	13	32,5%
Obesity of the second and third degree	2	5,0%	**Have you had a fall in the last year?**		
Domicile			No	34	85,0%
Village	10	25,0%	Yes	6	15,0%
City up to 100,000 inhabitants	29	72,5%	**How many falls have you had in the past year:**		
A city with more than 100,000 inhabitants	1	2,5%	One	5	83,3%
Education			Two	1	16,7%
Basic	5	12,5%	**Have you been injured as a result of falls?**		
Vocational	14	35,0%	No	4	66,7%
Secondary	12	30,0%	Yes	2	33,3%
Higher	9	22,5%	**How would you rate your overall fitness on a scale of 1 to 10?**		
What kind of profession have you had most of your life:			5 points	2	5,0%
Manual worker	21	52,5%	6 points	4	10,0%
Office Worker	8	20,0%	7 points	5	12,5%
Mental worker	10	25,0%	8 points	18	45,0%
Other	1	2,5%	9 points	11	27,5%

Analysis of results

The following Table III presents descriptive statistics for the results of the fitness tests. In the Timed Up and Go -TUG test, the subjects scored between 4.8 – 17.9 seconds, with an average of 7.40 seconds with a deviation of ± 2.29 seconds. In this test, 1 person made a 15 second cut-off attempt. Then, Four Square Step Test, the participants obtained results between 5.5 – 13.7 seconds, with the mean being 8.19 seconds with a deviation of ± 2.11 seconds. In the FSST test, no person exceeded the 15-second threshold. In the OLS- One leg standing test, subjects obtained results between 4.3 – 30 seconds, with the average being 22.68 seconds with

a deviation of ± 8.77 seconds. 21 people (52.5%) lasted a full 30 seconds on one leg, and only 1 person achieved a result of less than 5 seconds.

Table III. *Fitness Test Results*

	Min	*Max*	*M*	*SD*	*Me*
Timed Up and Go- TUG [s]	4,8	17,9	7,40	2,29	6,81
Four Square Step Test- FSST [s]	5,5	13,7	8,19	2,11	7,635
One leg standing test- OLS [s]	4,3	30	22,68	8,77	30

Min – minimum, *Max* – maximum, *M* – mean, *SD* – standard deviation, *Me* – median

In the first place, it was examined whether sociodemographic characteristics and BMI in the group of studied seniors could have influenced the occurrence of a fall over the last year. For this purpose, a *X2* Pearson test analysis was carried out and the results are shown in Table IV. These results turned out to be statistically insignificant $p > 0.05$. This means that there was no association between the occurrence of the fall and the above characteristics.

Table IV. *Association of the occurrence of collapse with sociodemographic characteristics and BMI*

		No Fall		Downfall		*V*	*p*
		N	*%*	*N*	*%*		
Sex	Woman	27	87,1%	4	12,9%	0,11	0,491
	Man	7	77,8%	2	22,2%		
Age	Up to 69 years	20	90,9%	2	9,1%	0,18	0,247
	70 and more years	14	77,8%	4	22,2%		
BMI	Norm	15	93,8%	1	6,3%	0,30	0,301
	Overweight	10	76,9%	3	23,1%		
	First degree obesity	8	88,9%	1	11,1%		
	Obesity of the second and third degree	1	50,0%	1	50,0%		
Domicile	Village	8	80,0%	2	20,0%	0,08	0,609
	City	26	86,7%	4	13,3%		
Education	Basic	4	80,0%	1	20,0%	0,32	0,248
	Vocational	10	71,4%	4	28,6%		
	Secondary	11	91,7%	1	8,3%		
	Higher	9	100,0%	0	0,0%		
Profession	Manual worker	16	76,2%	5	23,8%	0,28	0,207
	Office Worker	10	100,0%	0	0,0%		
	Other	8	88,9%	1	11,1%		

V - strength of the V Cramer, *p* - level of statistical significance

The aim of the study was to assess the factors influencing the risk of falling in seniors, which was measured by fitness tests. First, the results of fitness tests in men and women were compared. For this purpose, analyses were performed using the U Mann-Whitney test, and the results are presented in Table V. The results of these analyses can be concluded that the gender of seniors was statistically significantly related to the result in the Timed Up and Go test $Z = 2.15$; $p < 0,05$; $r = 0.34$ and with a score on Four Square Step Test $Z = 2.72$; $p < 0,01$; $r = 0.43$. Women performed better on the Timed Up and Go test and on the Four Square Step Test test than men.

Table V. *Relationship between performance in fitness tests and gender*

	Women			Men			*Z*	*p*	*r*
	M	*SD*	*Me*	*M*	*SD*	*Me*			
Timed Up and Go - TUG [s]	7,23	2,50	6,56	7,95	1,32	7,72	2,15	0,031*	0,34
Four Square Step Test [s]	7,84	2,16	7,09	9,39	1,46	9,25	2,72	0,007**	0,43
One leg standing test- OLS [s]	23,17	8,58	30,00	20,97	9,73	22,00	0,72	0,473	0,11

M – mean, *SD* – standard deviation, *Me* – median, *Z* – U Mann-Whitney statistic, *p* – level of statistical significance, *r* – size of differences, *$p < 0.05$; **$p < 0.01$

Similarly, the relationship between results of fitness tests and age was examined using U Mann-Whitney test. On the basis of the results presented in Table VI, it can be concluded that age was statistically significantly related to the score on the Timed Up and Go test $Z = 2.12$; $p < 0,05$; $r = 0.34$ and with a score on the Four Square Step Test $Z = 3.22$; $p < 0,01$; $r = 0.51$. People up to 69 years of age had better scores on the Timed Up and Go test and on the Four Square Step Test than older people.

Table VI. *Relationship of performance in fitness tests with age*

	Up to 69 years			For 70 years			*Z*	*p*	*r*
	M	*SD*	*Me*	*M*	*SD*	*Me*			
Timed Up and Go- TUG [s]	6,77	1,43	6,66	8,15	2,90	7,68	2,12	0,034*	0,34
Four Square Step Test [s]	7,41	1,88	6,90	9,14	2,03	8,58	3,22	0,001**	0,51
One leg standing test- OLS [s]	23,92	8,84	30,00	21,16	8,68	19,50	1,00	0,317	0,16

M – mean, *SD* – standard deviation, *Me* – median, *Z* – U Mann-Whitney statistic, *p* – level of statistical significance, *r* – size of differences, *$p < 0.05$; **$p < 0.01$

Also with the help of analyses using the U Mann-Whitney test, the relationship between the results in the fitness tests and the place of residence was examined. The results of these analyses are presented in Table VII and on their basis it can be concluded that there was a relationship between the place of residence and the result in the Timed up and go test $Z = 1.84$; $p = 0.065$; $r = 0.29$ (a result on the edge of the statistical tendency) and a result in the One leg standing test $Z = 2.20$; $p < 0,05$; $r = 0.35$. People living in cities had better scores on the Timed Up and Go test and on the One Leg Standing test.

Table VII. *Relationship between fitness test results and place of residence*

	Village			City			*Z*	*p*	*r*
	M	*SD*	*Me*	*M*	*SD*	*Me*			
Timed Up and Go- TUG [s]	8,29	2,17	7,73	7,10	2,29	6,66	1,84	0,065	0,29
Four Square Step Test- FSST [s]	8,90	2,50	8,27	7,95	1,96	7,36	1,02	0,310	0,16
One leg standing test- OLS [s]	18,18	9,54	18,50	24,18	8,11	30,00	2,20	0,028*	0,35

M – mean, *SD* – standard deviation, *Me* – median, *Z* – U Mann-Whitney statistic, *p* – level of statistical significance, *r* – size of differences, $*p < 0.05$

The seniors' performance in fitness tests was then compared according to the work they performed. Comparisons were made using Kruskal–Wallis tests, and the results are presented in Table VIII. These results showed that there was a statistically significant relationship between the TUG score and the kind of work they had been performing $X2 = 9.51$; $p < 0,01$; $h2 = 0.20$. Better scores on the TUG test were performed by people who had been performing office or self-employed work than those who had been performing mental and physical work. No more statistically significant associations were found between performance in fitness tests and work.

Table VIII. *Relationship between performance in fitness tests and the work performed*

	Manual work			Office work			Other			*X2*	*p*	*h2*
	M	*SD*	*Me*	*M*	*SD*	*Me*	*M*	*SD*	*Me*			
TUG [s]	7,96	2,69	7,22	7,41	1,91	6,78	6,05	0,73	5,74	9,51	0,009**	0,20
FSST[s]	8,59	2,01	7,80	7,73	2,43	7,15	7,76	2,02	7,27	2,74	0,254	0,02
OLS[s]	20,46	9,40	20,00	26,25	6,18	30,00	23,89	8,96	30,00	3,12	0,211	0,03

M – mean, *SD* – standard deviation, *Me* – median, *χ2* – Kruskal-Wallis statistics, *p* – level of statistical significance, *η2* – size of differences, $**p < 0.01$

Again, the U Mann-Whitney test analysis was used to examine the relationship between performance in fitness tests and the occurrence of a fall. The results of these analyses are presented in Table IX, but they were not statistically significant $p > 0.05$, meaning there was no difference between those who had a fall and those who had not fallen in the past year in terms of performance on the fitness test.

Table IX. *Relationship between performance in fitness tests and the occurrence of a fall*

	No Fall			Fall			*Z*	*p*	*r*
	M	*SD*	*Me*	*M*	*SD*	*Me*			
Timed Up and Go- TUG [s]	7,20	1,61	6,81	8,48	4,71	6,84	0,04	0,970	0,01
Four Square Step Test- FSST [s]	8,17	2,04	7,70	8,29	2,71	7,47	0,04	0,970	0,01
One leg standing -OLS [s]	22,60	8,84	30,00	23,15	9,12	26,00	0,16	0,870	0,03

M – mean, *SD* – standard deviation, *Me* – median, *Z* – U Mann-Whitney statistic, *p* – level of statistical significance, *r* – size of differences

The association of performance tests with age, BMI, education, medication use, and fitness assessment was also examined using Spearman's rho correlation analyses, and the results are presented in Table X. These showed that older adults performed worse on the TUG test $rho = 0.38$; $p < 0.05$ and in the FSST $rho = 0.53$; $p < 0.01$. It was also shown that people with higher education had better scores on the One leg standing test $rho = 0.32$; $p < 0.05$ and those taking more medication had worse results in the OLS test $rho = -0.37$; $p < 0.05$. There were no statistically significant correlations between performance tests and BMI and self-fitness assessment, although there is a tendency to perform better in people with a lower BMI and better assess their physical fitness.

Table X. *Relationship of performance tests with age, BMI, education, medication and fitness assessment*

	Age	BMI	Education	Quantity of medication	Efficiency
Timed Up and Go- TUG [s]	0,38*	0,23	-0,22	0,14	-0,16
Four Square Step Test [s]	0,53**	0,18	-0,22	0,11	-0,19
One leg standing- OLS [s]	-0,22	-0,30	0,32*	-0,37*	0,31

*$p < 0,05$; **$p < 0,01$

Discussion

The aim of the study was to assess the balance and risk of falls in people over 60 years of age. It was also checked how age, gender and BMI affect the results of the tests used. This is important because early detection of an increased risk of falling, even in middle age, can allow for adequate preventive interventions and reduce the risk of occurrence or delay the occurrence of the first incidents of sudden loss of balance [18,22,23,24]. The relationship between the results in fitness tests and the occurrence of a fall was examined, and the results turned out to be statistically insignificant $p > 0.05$. This means that there were no statistically significant differences between those who had a fall and those who had not fallen in the past year in terms of performance on a fitness test. Despite the good balance expressed in the results of the tests used, 15% of the surveyed people (6 people) suffered a fall during the year, of whom 83.3% had one fall. Balance, which is one of the internal risk factors for falls, plays an important role in repeated falls. In the case of people who suffered a single fall, external factors resulting from environmental hazards can have a significant impact [18]. The characteristics of people who have suffered a single fall are more similar to those of non-falling people than those of people who have risk of many falls [18]. According to the World Guidelines, classification as a low-risk group does not mean that there is no risk of falling [10,30]. A fall can occur at any age. [10,30,31]. The incidence of falls among the surveyed group of seniors is also lower than the estimated value of 28% of seniors who fall within a year for the group of people ≥65 years of age [3]. According to the data cited in the Cleary et al. study, only 13% of people in the 65-69 age group report imbalance [16].

The results of studies carried out by other authors indicate that in the elderly population, falls are more common in women than men. This also applies to falls resulting in injury [18,23,29]. The incidence of falls increases with age [29,31]. In this study, 4 out of 6 falls reported by participants were women. Of whom, one woman and one man suffered the consequences of minor injuries. The study results in founding that older adults performed worse on the Timed Up and Go test $rho = 0.38$; $p < 0.05$ and in the Four Square Step Test $rho = 0.53$; $p < 0.01$. Age affects the deterioration of TUG and FSST test scores, which is consistent with the findings of other researchers. [2,14,19,20,21]. Changes that occur during the aging process, such as a decrease in mobility, gait speed or changes in the neuromuscular system, may explain the increase in the time it takes to complete a task in the ≥70 age group. [16,19,20]. In the study group, statistically significantly better results in the TUG and FSST tests were

presented by women than men. This contrasts with the results of other researchers, in which men scored better on the above-mentioned tests [14,20,21]. However, in the Nakhostin-Ansari et al. study, seniors from the 60-69 age group obtained the following results: 8s men and 8.1s women in the TUG, which was a statistically insignificant result, meaning that there were no large differences between the results [19]. Time thresholds of ≥15 s [10,11] and ≥13.5 s [13] have been set for the TUG test, which are the cut-off points above which there may be an increased risk of falling. Only 1 person exceeded the above time thresholds and achieved results at the lower end of norm, or low in the remaining 2 tests. This person has also suffered a fall in the last 12 months. The average time score of the whole group in this test is 7.4s, which is better than the average score of 8.2s, obtained by all study participants [11]. However, differences in results may be due to group size, gender distribution, and average age of the participants. There are also differences in the methodology of the TUG study adopted by the researchers. The most common differences were in the distance used: 3 m [2,19] or 2.44 m [15] and the instructions given to patients: "walk at a normal pace" [21] or "quickly as safely as possible" [2,21]. The small size of the group and the small proportion of men may also have influenced the results [20]. Timed Up and Go test is a reliable and rapid test to assess gait and balance disorders [2,11]

On the other hand, for the FSST test , a borderline result of 15s was adopted, which, if exceeded, should allow to distinguish people who fall repeatedly from other people with a sensitivity of 85% and specificity of 88–100% [28]. It is assumed that people between 65 and 80 years of age should be able to perform FSST in ≤10 seconds [26,27]. The mean of study participants was 8.19 seconds with a deviation of ± 2.11 seconds was within the normal range. Only 5 people achieved a result of ≥10s. The weakest time result of 13.7 seconds was below the cut-off point. The FSST test allows you to study dynamic balance and mobility while performing a complex sequence of fast steps with crossing small obstacles. It requires the patient to remember and plan movement and dynamic changes in the direction of gait [16, 27]. Moore et al., in their systematic review, assessed FSST as an effective and useful method for assessing the dynamic balance and risk of decline in older people, and its reliability was described as good [27]. This test also shows at least a moderate to even strong correlation with TUG in the case of elderly people living alone and in people with balance disorders [16, 27].

In the OLS test, the average time of the whole group obtained in the study was 22.88s with a deviation of ± 8.77 seconds. No statistically significant differences were observed between

genders or age groups, although older people had a worse average score than younger age groups. Also in the study of Nakhostin-Ansari et al., people in the 60-69 age group maintained the test position statistically significantly longer than people ≥70 years [19]. In the study, men scored significantly better than women in both age groups [18,19]. In a study conducted on healthy and independent seniors from Iran, those in the 60-69 age group achieved an average time of 35s for the right leg and 30.4s for the left leg, which is significantly better results [19]. However, the differences in results may have been due to discrepancies in the methodology of conducting the study among the researchers. In a systematic review of Frisendahl et al. the most common differences relate to: duration of 30s, 60s and the number of tests performed [22]. As well as the position of the upper limbs, the tested leg, the footwear used and the elevation height of the other lower limb. A significant influence on the time of holding the position by the respondent was also whether he had his eyes open or closed [18,19,22]. People who have achieved a (<15s) OLS score may be at higher risk of recurrent falls [18]. On the other hand, in studies the time (<5s) in OLS was used as the cut-off value for balance disorders [22,23]. The results of the study by Blodgett et al. suggest that a higher amount of medication adversely affects test results and is one of the risk factors for falls [18,29]. Similarly, in this study, people taking more medication had worse scores on the OLS test rho = -0.37; $p < 0.05$.

There are differences in the results of balance tests and norm values among the populations studied in different countries. This may be due to the different characteristics of these groups and other factors affecting the ability to maintain balance [19]. The majority of the respondents declared regular recreational physical activity, which is considered by researchers to be a factor having a significant impact on the state of functional fitness and balance of seniors [13,18,24,27]. Due to the complex and multifactorial nature of equilibrium, it is worth conducting research using more tests to increase their validity [18,24,27].

Conclusion:

The study group achieved good results in balance tests. The seniors in the study had high physical fitness and balance and a low risk of falling, as the clinical tests showed. People in the 61-69 age group scored significantly better on the TUG and FSST tests than the ≥70 age group. In the study group, women had better results in the TUG and FSST tests than men. There were no statistically significant associations between performance tests and BMI, although there was a tendency to perform better in people with a lower BMI.

Limitations of the study:

This study was conducted on a relatively small and homogeneous group, which limits the generalizability of the results of the current study. The results may have been influenced by the characteristics of the group and the small percentage of men in the study. The study did not specify the circumstances of the fall, which could help determine the cause of the falls. The number of falls suffered was reported by the respondents, so their accuracy depends on the memory of the participants, which may result in an inaccurate estimation of their number. Further studies in a larger and more diverse sample of the population are needed to confirm the results.

Funding Statement: This study did not receive special funding.

The study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Bioethics Committee of the Nicolaus Copernicus University in Toruń at the Collegium Medicum. Ludwik Rydygier in Bydgoszcz - protocol code KB 484/2023, Bydgoszcz 12.12.2023r.).”

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Conflict of Interest Statement: non

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