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Gender differences in postural stability in elderly people under institutional care

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Purpose: The aim of the research was to assess the postural stability indicators of older women and men receiving institutional care. *Methods:* The study involved 123 people aged 65–85, living in residential care homes in Rzeszów district. The main research tool was the CQ-Stab 2P 2-platform posturograph. *Results:* There were statistically significant differences between women and men in the total statokinesiogram path length, the statokinesiogram path length in the anteroposterior direction, the mean COP displacement in the anteroposterior direction as well as the mean velocity of the COP point in the anteroposterior direction under eye control ($p = 0.04$). In the case of absence of visual control, men were characterized by significantly worse parameters in the area of mean COP displacement in the anteroposterior and lateral directions as well as the maximal COP displacement in the anteroposterior and lateral directions. It indicated that without visual control body balance parameters in men significantly worsened along with increasing age. A statistically significant difference was found between both genders in terms of the statokinesiogram path length, the mean COP displacement and the mean COP velocity ($p < 0.05$). *Conclusions:* Gender differences in postural stability of older people under institutional care were noticed. Men were characterized by a lower level of postural stability compared to women. Elimination of visual control significantly worsened the balance of the body. The results obtained indicate the necessity of introducing therapeutic programs in nursing homes, taking proprioceptive exercises and exercises without visual input into account.

Key words: *aged, postural control, nursing home*

1. Introduction

Maintaining body balance is attributed to the postural control system, which includes the function of the motor, nervous and sensory systems [6]. Involutionary progress affects the changes in functioning of the vestibular, visual, somatosensory, musculoskeletal systems as well as central nervous system, which heavily influence the posture stability [8]. In turn, the ability to maintain body posture impacts on the performance of basic and complex activities of everyday life [2].

The main symptom of postural instability is the body balance disorders that lead to falls. Injuries related to falling are a serious health problem for the elderly [20]. They cause a decrease in function, activity and participation, and thus increase mortality and generate huge costs of healthcare [18]. The incidence and global burden of consequences of falls are expected to increase with the predicted increase in the number of the elderly [14].

The prolonging life expectancy causes a constant increase in the percentage of older people, and the more frequent occurrence of chronic diseases with a gradual deterioration of physical fitness causes an increase in the need for health care [15]. The problem of falls is particularly a threat in institutions dealing with 24-hour care of the elderly. The percentage of falls among older people living in their own homes varies

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from 20 to 40% [5], while among people living in nursing homes this percentage is higher and amounts to over 60% [24].

In long-term care homes, where the residents are usually less fit, the most often falls take place in the room due to simple self-care. A nursing home is an institution whose main goal is to provide an adequate standard of living and care services in order to supply a safe setting for people staying there. The aim of the research is to assess the stability of older women and men receiving institutional care.

2. Materials and methods

Participants

The study included 123 people aged 65–85, living in nursing care homes in Rzeszów district. The participants were randomly selected from among the nursing home residents who met the criteria for inclusion in the study protocol. The following inclusion criteria were used: age from 65 to 85 years, normal cognitive state or mild perception and memory impairment (Mini-Mental State Examination from 30 to 19 points), no depression or moderate depression (result in Geriatric Depression Scale from 0 to 10 points), the level of physical fitness enabling the standing position on the stabilometric platform, written consent of the patient and the physician working in nursing home for the participation in the examination. The exclusion criteria were: new injuries of the lower limbs, severe systemic diseases and severe neurological disorders.

Postural balance testing

The study was carried out in nursing homes in a suitably prepared, quiet office in the morning using the CQ-Stab 2P 2-platform posturograph (CQ Electronic System). The device recorded the location of the body centre of gravity from 6 sensors (3 force sensors were placed in each platform). Before testing, the platform plates were aligned. Two 30-second tests were carried out. The first test measured the postural stability in a standing position with eyes wide open (EO). The second test was carried out in the same position, but visual control was eliminated, i.e., the eyes closed (EC). The width and angle between the legs were natural and not forced. A fixation point was located at a distance of 1 meter opposite the elderly person. After entering the platform, the examined person stood motionless looking at the reference point on the wall. Each subject was, for safety reasons, belayed by a properly trained physiotherapist, in such a way as not to support the patient and not to disturb the measurements. Selected parameters measuring the centre of foot pressure (COP) movement were analysed (Table 1).

Table 1. Parameters describing the COP

Name and description	Symbol	Metric unit
Total path length on the *XY* axes	SP-EO	[mm]
Statokinesiogram path length measured on the Y axis direction	SPAP-EO	[mm]
Statokinesiogram path length measured on the X axis direction	SPML-EO	[mm]
Mean COP displacement (radius)	MA-EO	[mm]
Mean COP displacement from point 0 in the Y axis direction	MAAP-EO	[mm]
Mean COP displacement from point 0 in the X axis direction	MAML-EO	[mm]
Maximal COP displacement from point 0 in the Y axis direction	MaxAP-EO	[mm]
Maximal COP displacement from point 0 in the X axis direction	MaxML-EO	[mm]
Mean velocity of the COP point on the XY axis	MV-EO	[mm/s]
Mean velocity of the COP point on the Y axis	MVAP-EO	[mm/s]
Mean velocity of the COP point on the X axis	MVML-EO	[mm/s]
Sway area delimited by the COP	SA-EO	[mm^2]

Ethics

In accordance with the Declaration of Helsinki, the participants were informed about the aim and the course of the study and gave their informed consent to take part. The study design was approved by the Bioethical Committee of the University of Rzeszów.

Statistical analysis

The statistical analysis was carried out using the Statistica application (data analysis software system), version 13. For basic data analysis, basic measures of descriptive statistics were used. The normal distribution was examined by the Shapiro–Wilk test. In order to examine the significance of differences between variables characterizing women and men the chi-squared test of independence was used (for qualitative variables) and respectively Student's *t*-test for independent samples was applied (in the case of normal distribution of features in both samples) or the non-parametric Mann–Whitney *U*-test (in the absence of features of normal distribution in at least one sample). Linear correlation coefficients were determined between age, Body Mass Index, height, length of stay in the nursing home, number of falls, Mini-Mental State Examination and Geriatric Depression Scale, as well as postural variables. Gender-related differences were also examined using a significance test for two correlation coefficients. The statistical significance level was assumed $p < 0.05$.

3. Results

The study covered a group of 123 people, including 62 women and 61 men aged from 65 to 85 years old (mean 72.02 years, SD 7.17 years). Most of subjects were characterized by proper body mass (47.00%). The average length of stay in an institutional care centre was 4.63 years. People with normal cognitive state amounted 40.65% of the studied group. Moreover, 70.73% of residents did not experience depression. Basic sociodemographic data and stabilometric parameters performed both under visual control and without visual input are presented in Table 2.

Statistically significant differences between women and men were observed in the total statokinesiogram path length, the statokinesiogram path length in the anteroposterior direction mean COP displacement in the anteroposterior direction as well as the mean COP velocity in the anteroposterior direction under visual control ($p = 0.04$). Differences in other stabilometric parameters were not statistically significant.

The results obtained in individual stabilometric parameters were compared among older women and men with the absence of visual control. It was shown that men were characterized by significantly worse parameters in the area of mean COP displacement in the anteroposterior and lateral directions as well as in the maximal COP displacement in the anteroposterior and lateral directions (Table 3).

Table 2. Characteristics of the studied group

Variable	Men (n = 61)	Women (n = 62)	p-value
	Mean (SD) Total number (%)		
Age	70.21 (6.66)	73.81 (7.25)	**0.005[a)]**
Marital status			
married	10 (16.39)	1 (1.61)	**0.009[b)]**
widow / widower	15 (24.59)	28 (45.16)	
divorced	9 (14.75)	7 (11.29)	
single	27 (44.26)	26 (41.94)	
Body height	172.05 (7.66)	158.61 (7.68)	**0.001[c)]**
Body weight	78.78 (14.55)	67.81 (17.03)	**0.001[c)]**
Body Mass Index			
standard	24 (39.34)	25 (40.33)	0.844[b)]
overweight	23 (37.70)	20 (32.26)	
obesity	14 (22.95)	17 (27.42)	
Education			
basic	29 (47.54)	23 (37.10)	0.056[b)]
vocational	15 (24.59)	9(14.52)	
secondary and higher	17 (27.87)	30 (48.39)	
Length of stay in the centre	4.85 (3.94)	4.40 (4.52)	0.232[a)]
Number of falls	0.33 (0.68)	0.68 (1.04)	**0.025[a)]**
Mini-Mental State Examination			
normal result	26 (42.62)	24 (38.70)	0.848[b)]
cognitive disorders without dementia	16 (26.23	19 (30.65)	
mild cognitive impairment with dementia	19 (31.15)	19 (30.65)	
Geriatric Depression Scale			
without depression	42 (68.85)	45 (72.58)	0.500[b)]
with moderate depression	19 (31.15)	17 (27.42)	

[a)] Mann–Witney U-test;
[b)] Chi-squared independence test;
[c)] Student's t-test for independent samples.

Table 3. Values of stabilometric variables under visual control and without it

	Eyes open			Eyes close		
Postural variable	Men	Women	Gender difference *p*-value	Men	Women	Gender difference *p*-value
	Mean (SD)			Mean (SD)		
SP	435.33 (175.81)	374.00 (153.01)	**0.043**[a)]	507.87 (331.97)	395.19 (180.75)	0.079[a)]
SPAP	345.97 (151.89)	293.35 (134.94)	**0.046**[a)]	429.98 (294.21)	326.73 (176.64)	0.083[a)]
SPML	191.51 (93.56)	169.13 (81.23)	0.090[a)]	190.52 (134.88)	156.05 (66.86)	0.137[a)]
MA	5.52 (2.56)	4.91 (2.09)	0.236[a)]	5.10 (2.23)	4.11 (2.20)	**0.005**[a)]
MAAP	4.26 (2.10)	3.59 (1.42)	0.105[a)]	4.24 (2.00)	3.43 (2.14)	**0.009**[a)]
MAML	2.58 (1.75)	2.50 (1.98)	0.569[a)]	2.01 (1.07)	1.59 (0.89)	**0.021**[a)]
MaxAP	17.13 (8.94)	14.73 (6.87)	0.123[a)]	17.72 (8.96)	13.56 (8.85)	**0.003**[a)]
MaxML	13.02 (16.16)	12.03 (13.70)	0.816[a)]	7.37 (4.47)	6.82 (9.32)	**0.046**[a)]
MV	14.49 (5.86)	12.47 (5.10)	**0.048**[a)]	16.93 (11.06)	13.17 (6.02)	0.080[a)]
MVAP	11.53 (5.06)	9.78 (4.50)	**0.047**[a)]	14.33 (9.80)	10.89 (5.89)	0.084[a)]
MVML	6.39 (3.12)	5.64 (2.71)	0.092[a)]	6.36 (4.50)	5.20 (2.22)	0.134[a)]
SA	819.84 (695.48)	663.03 (616.73)	0.120[a)]	777.77 (752.70)	449.81 (341.80)	**0.009**[a)]

a) Mann–Witney *U*-test.

Table 4. Correlation of independent variables with outcome measures and their gender differences with eyes-open

Factors	Postural variables	Correlation coefficient			Gender diffrence *p*-value
		Total	Men	Women	
1	**2**	**3**	**4**	**5**	**6**
Age	SP-EO	**0.22**	**0.41**	0.16	0.13[d)]
	SPAP-EO	**0.20**	**0.37**	0.14	0.17[d)]
	SPML-EO	**0.20**	**0.34**	0.15	0.29[d)]
	MA-EO	0.03	0.13	–0.01	0.47[d)]
	MAAP-EO	–0.12	–0.01	–0.18	0.33[d)]
	MAML-EO	**0.20**	**0.28**	0.15	0.47[d)]
	MaxAP-EO	–0.01	0.10	–0.05	0.42[d)]
	MaxML-EO	**0.21**	**0.29**	0.16	0.47[d)]
	MV-EO	**0.22**	**0.41**	0.16	0.13[d)]
	MVAP-EO	**0.20**	**0.37**	0.14	0.17[d)]
	MVML-EO	**0.20**	**0.34**	0.15	0.28[d)]
	SA-EO	**0.23**	**0.34**	0.21	0.47[d)]
Body Mass Index	SP-EO	–0.09	–0.09	–0.08	0.97[d)]
	SPAP-EO	0.04	0.01	0.09	0.67[d)]
	SPML-EO	**–0.33**	–0.24	**–0.42**	0.26[d)]
	MA-EO	0.10	0.08	0.12	0.80[d)]
	MAAP-EO	0.08	0.04	0.15	0.54[d)]
	MAML-EO	0.06	0.13	0.01	0.51[d)]
	MaxAP-EO	0.04	0.07	0.00	0.70[d)]
	MaxML-EO	–0.15	–0.10	–0.20	0.57[d)]
	MV-EO	–0.08	–0.09	–0.08	0.98[d)]
	MVAP-EO	0.04	0.01	0.09	0.66[d)]
	MVML-EO	**–0.33**	–0.24	**–0.42**	0.27[d)]
	SA-EO	–0.05	0.01	–0.12	0.45[d)]

1	2	3	4	5	6
Length of stay in a care home	SP-EO	0.02	0.06	–0.05	0.12[d)]
	SPAP-EO	–0.05	0.03	–0.14	0.57[d)]
	SPML-EO	0.12	0.11	0.12	0.35[d)]
	MA-EO	–0.06	–0.03	–0.11	0.97[d)]
	MAAP-EO	–0.06	0.01	–0.17	0.66[d)]
	MAML-EO	–0.06	–0.08	–0.05	0.32[d)]
	MaxAP-EO	–0.09	–0.06	–0.14	0.86[d)]
	MaxML-EO	–0.02	–0.05	0.02	0.68[d)]
	MV-EO	0.02	0.06	–0.05	0.71[d)]
	MVAP-EO	–0.05	0.03	–0.14	0.57[d)]
	MVML-EO	0.12	0.11	0.12	0.35[d)]
	SA-EO	–0.05	–0.01	–0.10	0.95[d)]
Number of falls	SP-EO	0.05	0.24	–0.01	0.16[d)]
	SPAP-EO	0.07	**0.28**	0.00	0.13[d)]
	SPML-EO	–0.01	0.09	–0.03	0.50[d)]
	MA-EO	0.03	0.20	–0.06	0.17[d)]
	MAAP-EO	0.00	0.07	0.01	0.73[d)]
	MAML-EO	0.05	**0.27**	–0.07	0.06[d)]
	MaxAP-EO	0.15	**0.36**	0.06	0.09[d)]
	MaxML-EO	–0.00	0.12	–0.08	0.29[d)]
	MV-EO	0.05	0.25	–0.01	0.15[d)]
	MVAP-EO	0.07	**0.28**	0.00	0.13[d)]
	MVML-EO	–0.01	0.09	–0.04	0.49[d)]
	SA-EO	0.06	**0.30**	–0.06	0.05[d)]
Mini–Mental State Examination	SP-EO	–0.08	–0.05	–0.13	0.69[d)]
	SPAP-EO	–0.08	–0.07	–0.11	0.82[d)]
	SPML-EO	–0.06	–0.01	–0.13	0.53[d)]
	MA-EO	0.02	0.07	–0.04	0.56[d)]
	MAAP-EO	0.00	0.01	–0.01	0.93[d)]
	MAML-EO	0.03	0.12	–0.05	0.36[d)]
	MaxAP-EO	0.02	0.11	–0.09	0.28[d)]
	MaxML-EO	–0.04	0.01	–0.09	0.61[d)]
	MV-EO	–0.08	–0.05	–0.13	0.68[d)]
	MVAP-EO	–0.08	–0.06	–0.11	0.82[d)]
	MVML-EO	–0.06	–0.01	–0.12	0.54[d)]
	SA-EO	0.01	0.05	–0.05	0.57[d)]
Geriatric Depression Scale	SP-EO	0.15	**0.29**	–0.04	0.07[d)]
	SPAP-EO	0.13	**0.27**	–0.05	0.08[d)]
	SPML-EO	0.14	0.23	0.01	0.23[d)]
	MA-EO	–0.01	0.08	–0.16	0.18[d)]
	MAAP-EO	0.03	0.03	–0.02	0.78[d)]
	MAML-EO	–0.03	0.14	–0.19	0.07[d)]
	MaxAP-EO	0.06	0.09	–0.02	0.56[d)]
	MaxML-EO	0.06	0.16	–0.05	0.26[d)]
	MV-EO	0.15	0.29	–0.04	0.07[d)]
	MVAP-EO	0.13	0.27	–0.05	0.08[d)]
	MVML-EO	0.14	0.23	0.01	0.22[d)]
	SA-EO	0.07	0.21	–0.10	0.10[d)]

[d)] significance test for two correlation coefficients.

It was indicated that in the open-eyes test the mean values of the COP displacement increased with the age of the subjects. Significant deterioration was found in most of the parameters tested in men. BMI values in women influenced the length of the COP path and the mean velocity of the COP in the lateral direction. The number of falls in men significantly affected the mean and maximal COP displacement in the anteroposterior direction and the sway area delimited by the COP. The occurrence of depression in the case of men correlated with the total path length and the mean COP velocity. Nonetheless, there was no correlation between the parameters of body balance and age, BMI, length of stay in a care home, number of falls, MMSE and GDS between the genders (Table 4).

It was shown that in the case of the absence of visual control, body balance parameters in men significantly worsened along with increasing age. A statistically significant difference was found between the genders in terms of the length of the statokinesiogram path, the mean COP displacement and the average COP velocity ($p < 0.05$). BMI values of women affected the deterioration of the path length and the mean velocity of the COP. There were no statistically significant differences between the genders and the other studied variables (Table 5).

Table 5. Correlation of independent variables with outcome measures and their gender differences with closed-eyes

Factors	Postural variables	Correlation coefficient			Gender diffrence *p*-value
		Total	Men	Women	
1	**2**	**3**	**4**	**5**	**6**
Age	SP-EC	0.14	**0.34**	0.21	0.47[d)]
	SPAP-EC	0.15	**0.38**	–0.04	**0.02[d)]**
	SPML-EC	0.11	**0.39**	–0.03	**0.02[d)]**
	MA-EC	–0.06	**0.28**	–0.03	0.09[d)]
	MAAP-EC	–0.08	0.19	–0.18	0.04[d)]
	MAML-EC	0.05	0.15	–0.19	0.06[d)]
	MaxAP-EC	–0.07	0.24	–0.03	0.13[d)]
	MaxML-EC	–0.03	0.15	–0.17	0.08[d)]
	MV-EC	0.14	0.22	–0.13	0.06[d)]
	MVAP-EC	0.15	**0.38**	–0.04	**0.02[d)]**
	MVML-EC	0.11	**0.39**	–0.03	**0.02[d)]**
	SA-EC	0.08	**0.34**	0.21	0.47[d)]
Body Mass Index	SP-EC	–0.03	0.01	–0.12	0.45[d)]
	SPAP-EC	0.03	–0.19	0.24	**0.02[d)]**
	SPML-EC	**–0.19**	–0.16	**0.33**	**0.01[d)]**
	MA-EC	0.14	–0.20	–0.23	0.85[d)]
	MAAP-EC	0.16	0.05	0.23	0.32[d)]
	MAML-EC	0.01	0.06	**0.25**	0.29[d)]
	MaxAP-EC	**0.19**	–0.03	0.06	0.66[d)]
	MaxML-EC	0.09	0.08	**0.32**	0.18[d)]
	MV-EC	–0.02	0.10	0.10	0.98[d)]
	MVAP-EC	0.03	–0.19	0.24	**0.02[d)]**
	MVML-EC	**–0.19**	–0.16	**0.33**	**0.01[d)]**
	SA-EC	–0.00	0.01	–0.12	0.45[d)]
Length of stay in a care home	SP-EC	0.02	–0.01	–0.10	0.63[d)]
	SPAP-EC	–0.03	0.02	–0.02	0.80[d)]
	SPML-EC	0.15	–0.01	–0.11	0.58[d)]
	MA-EC	–0.07	0.12	0.21	0.62[d)]
	MAAP-EC	–0.11	–0.03	–0.13	0.61[d)]
	MAML-EC	0.02	–0.06	–0.17	0.54[d)]
	MaxAP-EC	–0.10	0.02	0.01	0.95[d)]
	MaxML-EC	–0.05	–0.15	–0.08	0.69[d)]
	MV-EC	0.02	–0.13	–0.02	0.53[d)]
	MVAP-EC	–0.04	0.03	–0.02	0.80[d)]
	MVML-EC	0.15	–0.01	–0.11	0.58[d)]
	SA-EC	0.00	–0.01	–0.10	0.63[d)]

1	2	3	4	5	6
Number of falls	SP-EC	–0.02	**0.30**	–0.06	0.05[d)]
	SPAP-EC	–0.02	0.09	–0.06	0.40[d)]
	SPML-EC	–0.03	0.10	–0.05	0.42[d)]
	MA-EC	–0.08	0.06	–0.06	0.50[d)]
	MAAP-EC	–0.09	0.10	–0.13	0.22[d)]
	MAML-EC	–0.06	0.06	–0.12	0.32[d)]
	MaxAP-EC	–0.04	0.08	–0.10	0.32[d)]
	MaxML-EC	–0.05	0.08	–0.05	0.48[d)]
	MV-EC	–0.02	0.09	–0.08	0.36[d)]
	MVAP-EC	–0.02	0.09	–0.06	0.40[d)]
	MVML-EC	–0.03	0.10	–0.05	0.42[d)]
	SA-EC	–0.08	**0.30**	–0.06	0.05[d)]
Mini–Mental State Examination	SP-EC	–0.04	0.05	–0.05	0.57[d)]
	SPAP-EC	–0.04	–0.10	0.05	0.40[d)]
	SPML-EC	–0.04	–0.11	0.07	0.32[d)]
	MA-EC	0.01	–0.04	–0.05	0.95[d)]
	MAAP-EC	0.03	–0.11	0.12	0.2[d)]
	MAML-EC	–0.07	–0.10	0.16	0.1[d)]
	MaxAP-EC	0.01	–0.09	–0.06	0.88[d)]
	MaxML-EC	–0.07	–0.14	0.15	0.12[d)]
	MV-EC	–0.04	**–0.26**	0.01	0.14[d)]
	MVAP-EC	–0.04	–0.10	0.05	0.40[d)]
	MVML-EC	–0.04	–0.11	0.07	0.33[d)]
	SA-EC	–0.02	0.05	–0.05	0.57[d)]
Geriatric Depression Scale	SP-EC	**0.19**	0.21	–0.10	0.10[d)]
	SPAP-EC	**0.18**	0.22	0.10	0.50[d)]
	SPML-EC	0.14	0.23	0.08	0.42[d)]
	MA-EC	**0.21**	0.14	0.12	0.88[d)]
	MAAP-EC	0.17	**0.28**	0.11	0.33[d)]
	MAML-EC	**0.25**	0.20	0.12	0.65[d)]
	MaxAP-EC	**0.19**	**0.43**	0.01	**0.02[d)]**
	MaxML-EC	0.02	0.22	0.13	0.63[d)]
	MV-EC	**0.19**	0.21	–0.07	0.12[d)]
	MVAP-EC	**0.19**	0.22	0.10	0.50[d)]
	MVML-EC	0.14	0.23	0.08	0.4 [d)]
	SA-EC	**0.18**	0.21	–0.10	0.10[d)]

[d)] significance test for two correlation coefficients.

4. Discussion

Aging causes involutionary changes in sensory systems that affect the balance and can lead to falls and severe injuries [21]. Residents of nursing homes are three times more likely to fall than their peers living in the community on their own, whereas the risk of more serious injuries resulting from a fall is ten times higher [4]. There are many factors that increase the risk of falls, such as reduced physical fitness, the presence of chronic diseases, lack of physical activity, taking many medications and the unancquaitance with a new environment [1].

The conducted studies demonstrated that older men are characterized by poorer balance parameters in the area of anteroposterior displacement of the COP under visual control and significantly increased mean and maximal COP displacements in the anteroposterior and lateral direction without visual control. The instability of body postures in men deepens along with age and changes in visual conditions.

As a result of the research, it was found that both in women and men the length of sway path in the anteroposterior direction was greater than in the lateromedial direction. It was also shown that there were greater COP displacements in the anteroposterior direction under visual control of older men when compared to women. Similar results were obtained by Sullivan et al. [22]. The authors presented that men were less stable than women. Also Era et al. [7], in an international study assessing the postural stability of people aged over 75, indicated that men were characterized by greater COP sway. Probably, these results were associated with a greater influence of involutionary changes of brain structures in men than in women. In contrast, Hageman et al. [9] did not show statistically significant differences between gender and posture stability, whereas different results were obtained by Riva et al. [17], who revealed that older women living in society were characterized by worse parameters of postural stability.

Changing the test conditions by elimination of visual control caused an increase in the mean values □□of the stabilogram observed for both genders. In the conditions of switching off visual control, increased COP displacements in the anteroposterior and lateromedial directions of older men were demonstrated. These differences may result from different postural strategies adopted by women and men in response to deteriorating mechanisms which regulate the balance of the body associated with aging. Vision has a significant impact on the posture [3]. Masai et al. [23] reported that in closed eye conditions, postural sway in the anteroposterior plane significantly increased. Ring et al. [16] also showed greater postural movements with close eyes.

The quantitative assessment of static posture by the use of the stabilometric platform enables the researcher to carry out an accurate analysis of postural control systems and the assessment of factors affecting the balance. The analysis indicated that as for the factors such as: age, BMI, number of falls, length of stay in a care home, cognitive state and depression occurrence, the age presented the strongest correlation with an increase in stabilometric parameters. Men's postural balance significantly worsened with age. On the other hand, there were no differences between the impact of BMI, the number of falls, the length of stay in a care home, as well as cognitive state and depression occurrence between women and men in open eyes conditions. Lack of visual control, together with age influenced the deterioration of body balance in men. Kim et al. [13] revealed that the interactions between age and gender were significantly correlated with the increase in the amplitude of anteroposterior displacements. Illing et al. [10] stated that men are characterized by reduced stability of posture and functioning of the sensory system after the age of 60. Regarding their own studies with the absence of visual control, the increased body postural swaying was observed together with the increase in BMI among older women. Similar results were obtained by Kim et al. [11]. Considering the opinions about the gender impact on the balance control process are divergent. Riva et al. [17] showed gender-dependent differences in the values □□of stability components of seniors. Rogind et al. [19] did not find any differences in postural stability between the genders.

5. Conclusions

Previous studies indicated the need to consider an influence of age and gender on the posture balance [12]. However, most research focused on the older people living on their own. The results obtained due to our research may contribute to the development of preventive programs for the elderly who stay in nursing homes. The absence of visual control significantly worsens the balance of the body, especially in men. Therefore, therapeutic programs should include proprioceptive exercises and exercises without eye control. It is particularly necessary to pay attention to the participation of older men in organized improvement activities.

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